

A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.7 Environmental Statement – Appendix 9.3 Aquatic Ecology Survey Report

Part A

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



#### Infrastructure Planning

#### Planning Act 2008

# The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

### The A1 in Northumberland: Morpeth to Ellingham

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#### **Environmental Statement - Appendix**

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#### **EXECUTIVE SUMMARY**

This technical report presents the results of the aquatic ecology surveys undertaken by Jacobs UK Ltd. (Jacobs) on behalf of Highways England. The purpose of the survey was to establish the ecological status of watercourses and waterbodies in proximity to the proposed upgrade to dual carriageway of the A1 between Morpeth and Felton: Section A - Morpeth to Felton.

A desk study exercise was carried out in 2017, to obtain records of aquatic receptors up to 2km from the scheme. Records were returned by the Environment Agency and local records centre.

Field surveys were conducted, following best practice, for the following receptors:

- River habitat
- Macrophytes
- Macroinvertebrates
- Ponds
- Freshwater fish
- White-clawed crayfish
- Exposed riverine sediments

The majority of watercourses in the area were small, shallow and heavily shaded with poor ecological value. The River Coquet is a large watercourse, designated as a Site of Special Scientific Interest (SSSI) and provides high quality aquatic habitat for a number of receptors including freshwater fish and macroinvertebrates. Likewise, the Longdike Burn supports diverse macroinvertebrate and fish communities. The River Lyne was found to have poor ecological value and supported a significant population of the non-native North American signal crayfish.

Mitigation will be required to prevent impacts on water quality during construction and operation, and consideration should be given to the design of crossing structures to minimise loss of habitat or habitat fragmentation.

Biosecurity measures must be in place to prevent the transfer of non-native species and the diseases they carry.

#### 1 INTRODUCTION

#### **Scheme Background**

- 1.1.1 Following the outcomes of the 2014 A1 North of Newcastle Feasibility Study the Department of Transport confirmed, in its first Roads Investment Strategy, the intention to upgrade twenty-one kilometres of the existing A1 to a dual carriageway between Morpeth and Ellingham in Northumberland. This comprised two discreet sections:
  - Section A Morpeth to Felton, and;
  - Section B Alnwick to Ellingham.
- 1.1.2 At this stage of the project (PCF Stage 3) one option was under consideration for Section A, this is briefly described below:

#### **Section A - Morpeth to Felton**

 Offline Option – this option would be online at its north and south ends, but a large central section would form a new bypass to the west of the existing A1 between the Floodgate Burn crossing and Bockenfield Bridge. The existing A1 would be detrunked and form part of a local road network, which would separate local and strategic traffic.

#### **Report Rationale**

1.1.3 The aim of this report is to present the results of aquatic ecology surveys undertaken by Jacobs on behalf of Highways England. The information presented will be used to inform the preferred option and identify the requirement for additional surveys to be completed at PCF Stage 3. The data will ultimately inform the Environmental Impact Assessment (EIA) for the preferred options.

#### **Background to surveys**

- 1.1.4 Surveys have been completed by qualified ecologists within Jacobs, competent in their fields and holding appropriate qualifications (River Habitat Survey accreditation, white-clawed crayfish license, and electric fishing competency training). All lead surveyors were members of one of the following institutions: Chartered Institute of Ecology and Environmental Management (CIEEM), Royal Society of Biology (RSB) or Institute of Fisheries Management (IFM).
- 1.1.5 The objective of the surveys was to describe the baseline status of aquatic ecology receptors potentially affected by the proposed scheme. The surveys were undertaken between May and October 2017. Aquatic surveys and ecology receptors of interest were:
  - Aquatic Habitat Assessment
  - River Habitat Survey (RHS)
  - Macrophytes
  - Macroinvertebrates
  - Ponds
  - Freshwater fish
  - White-clawed crayfish (Austropotamobius pallipes)
  - Exposed Riverine Sediments (ERS)

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1.1.6 The survey programme included a desktop study to search for records of the receptors listed above and field survey to provide more detailed information. For the purposes of the surveys, "the site" was taken to mean the footprint of the scheme. Study area is the area covered by the desk study and survey area is used to describe the area covered by field surveys.

#### **Definitions**

- 1.1.7 The proposals refer to the footprint of the proposed development (scheme boundary).
- 1.1.8 The study area relates to a 2 km buffer around the proposed options for Section A in which desk study information has been collated via online and third party sources.
- 1.1.9 The survey area refers to a 250 m buffer around the offline option for Section A.

#### **Legislative and Regulatory Context**

1.1.10 A summary of the legislation and policy framework for relevant aquatic receptors is provided below. Full details, including information regarding the biology, habitat requirements and nature conservation status are provided in Appendix A.

#### **Water Framework Directive**

1.1.11 The 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy' (Water Framework Directive or WFD) was adopted and came into force in December 2000 in order to protect inland surface waters, groundwater, transitional waters and coastal waters. The aim of the directive was to ensure that all aquatic ecosystems meet Good Ecological Status. In England and Wales the WFD is transposed into UK legislation by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.

#### **Freshwater Fish**

- 1.1.12 Atlantic salmon (*Salmo salar*), brown/sea trout (*Salmo trutta*), river lamprey (*Lampetra fluviatilis*), sea lamprey (*Petromyzon marinus*) and European eel (*Anguilla anguilla*) are all listed as species of principal importance in accordance with the requirements of Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006. Atlantic salmon and all three species of lamprey are listed in Annex II of the Habitats Directive. Atlantic salmon, brown/sea trout and European eel are also listed as protected species within the Northumberland Biodiversity Action Plan.
- 1.1.13 European eel are protected under the Eels (England & Wales) Regulations 2009 which requires eel passage to be considered and the Environment Agency to be notified of any development likely to affect passage of eels.

#### **White-clawed Crayfish**

1.1.14 The white-clawed crayfish receives partial protection under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended) in respect of Sections 9(1) and 9(5). This makes it an offence to: intentionally take (capture); and sell, offer or expose for sale, or have in his possession or transport for the purpose of sale, any live or dead white clawed crayfish or part thereof. It has full protection under Annex II and V of the Habitats Directive (Council Directive 92/43/EEC) requiring the designation of Special Areas of Conservation for its protection and prohibiting the taking or disturbance of the species in the wild. The white-clawed crayfish is also listed in accordance with the requirement of Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006 and is listed as a protected species on the Northumberland Biodiversity Action Plan (Northumberland Wildlife Trust, undated).

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1.1.15	Licences can be granted by Natural England to allow development to take pla out in accordance with the provisions of the licence.	ce if carried
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#### Aquatic Ecology Survey Report

#### **2 AQUATIC HABITAT ASSESSMENT**

#### 2.1 Objective

2.1.1 An aquatic habitat assessment forms the preliminary phase of all aquatic ecology surveys, and is used to characterise watercourses and identify sites that are suitable for specific aquatic surveys.

#### 2.2 Desk Study

2.2.1 Seventeen watercourses and minor tributaries were identified as being crossed by the proposed route from a high level assessment of OS mapping overlaid with the proposed route option. Of these, three are designated Water Framework Directive (WFD) water classification rivers. Data from the 2016 monitoring cycle is shown in Table 2.1.

Table 2.1: Selected water body classification data for River Coquet, Longdike Burn and River Lyne (Environment Agency, 2017a).

Site name	River Coquet (from Forest Burn to Tidal Limit)	Longdike Burn	Lyne from Source to Tidal Limit
ID	GB103022076693	GB103022076550	GB103022076820
Overall	Good	Moderate	Poor
Biological	Good	Moderate	Poor
Fish	N/A	N/A (High in 2014)	Poor
Invertebrates	High	High	Moderate
Macrophytes + phytobenthos	Good	Moderate	Poor
Physicochemical quality elements	Good	Moderate (Phosphate)	Good
Chemical	Good	Good	Good

- 2.2.2 WFD classifications demonstrate that all biological receptors on the River Coquet are at good status or above, indicating only minor deviation from reference conditions. The Longdike Burn and River Lyne are influenced by environmental stresses so that they fail to meet Good status for their biological components, with the exception of macroinvertebrates on the Longdike Burn. Nutrient pressures are a potential cause of failure on the Longdike, either form point source discharges or diffuse agricultural sources. Elevated phosphate may influence the macrophyte community and result in the Moderate status of the aquatic flora elements.
- 2.2.3 The River Coquet forms part of the River Coquet and Coquet Valley Woodlands Site of Special Scientific Interest (SSSI). The aquatic notified features for this site include Atlantic salmon, brook lamprey and sea lamprey in addition to five different types of flowing water habitat.

#### 2.3 Field Survey

#### **Methods**

2.3.1 A preliminary walkover of the seventeen watercourses (Figures 1.1 – 1.4), identified by the desk study, that will be potentially impacted by the proposed scheme was undertaken in May 2017, in order to identify sites suitable for specific aquatic surveys. Surveys covered at least 100m up and downstream of the proposed crossing point where possible. Notes were made of the substrate composition, flow type, depth, ease of access and other general characteristics of each watercourse.

#### **Survey Limitations**

2.3.2 Due to access restrictions, only the area downstream (east) of the crossing points on the River Lyne and Floodgate Burn could be surveyed. Therefore, the character of these watercourses west of the A1 could not be determined. While this may present a limitation to assessment of habitat lost under the footprint, most potential impacts would affect the downstream habitat, which was surveyed.

#### **Results**

- 2.3.3 The results of the aquatic habitat assessment are given in Appendix B and an assessment of the suitability of each site for further survey is given in Table 2.2.
- 2.3.4 Of the seventeen sites surveyed, four were typical of small (<1m), predominantly dry or ephemeral water features, often associated with field boundaries and wet fencing (Unnamed Tributaries 1 and 2, Earnsdon Burn Tributary and Fenrother Burn Tributary 2). These sites were determined to be unsuitable to support aquatic receptors of any value and removed from any further survey.
- 2.3.5 The largest watercourse in the survey area was the River Coquet which is up to 40m wide flowing through a steep wooded valley. Habitats in the River Coquet were substantially different on the upstream and downstream sides of the existing A1, with the upstream side dominated by bedrock and the downstream having a shallower water depth and varied substrates and flow types. Longdike Burn and the River Lyne were the only other designated main rivers in the survey area, both around 3m wide flowing predominantly through woodland and rough pasture.
- 2.3.6 Sites selected for River Habitat Surveys were designated main rivers, permanently wetted and crossed by the proposed scheme.
- 2.3.7 Sites selected for macrophyte surveys were permanently wetted watercourses, that were not heavily shaded (overhead or marginal cover of >70%). Heavy shading will reduce the potential growth and diversity of macrophyte communities and any sites with marginal or overhead shading form riparian vegetation were screened out of further study.
- 2.3.8 Sites selected for macroinvertebrates were permanently wetted watercourses with water depths exceeding 5cm of water. Sites were chosen close to the proposed crossing point to best represent the habitat that may be affected by new infrastructure or changes to hydrology or channel morphology form discharge points.
- 2.3.9 Sites selected for fish surveys were permanently wetted channels, not choked with aquatic macrophytes, connectivity to the wider catchment for eel and salmonids, could be safely accessed for 100m through the study area. The Coquet was deemed too deep to survey safely and desk based assessments were used to evaluate the fish receptors in this watercourse. Where watercourses were shallow (<10cm), longitudinal connectivity broken up by frequent debris dams, or natural barriers to movement and water flow types indicated stagnant or slow flowing water types, sites were discounted from further study.
- 2.3.10 Sites selected for crayfish surveys were determined by a licenced surveyor. They confirmed the presence of optimal and sub optimal crayfish habitat types, taking cognisance of flow types, substrate, marginal and submerged cover, macrophytes and woody debris. An assessment was made during the aquatic habitat assessment of suitability for crayfish to bury and seek refuge under submerged structures. Where access allowed crayfish survey sites were selected to encompass the proposed crossing point.

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Table 2.2: Suitability of sites for further survey based on aquatic habitat assessment.

Site	RHS	Macro- phytes	Macro invertebrates	Fish	Crayfish	Reasoning
Minto's Dean Tributary	-	-	<b>✓</b>	-	-	Heavily shaded with little water depth. No suitable habitat for crayfish or fish
Minto's Dean	-	✓	✓	✓	-	Small and relatively shallow but with potential eel habitat
Back Burn Tributary	-	-	✓	✓	-	Heavily shaded but potential eel habitat. No suitable habitat for crayfish
River Coquet	✓	-	✓	-	✓	Too large and fast flowing to survey for macrophytes and fish
Thirston Burn Tributary	-	-	<b>√</b>	-	-	Very little water with lots of terrestrial grasses, unlikely to support fish, crayfish or macrophytes
Unnamed Tributary 1	-	-	-	-	-	Dry – no surveys undertaken
Unnamed Tributary 2	-	-	-	-	-	Dry – no surveys undertaken
Longdike Burn 1	✓	✓	✓	✓	✓	Habitat present for all receptors
Longdike Burn 2	✓	✓	✓	✓	✓	Habitat present for all receptors
Earsdon Burn Tributary	-	-	-	-	-	Dry – no surveys undertaken
Earsdon Burn	-	-	✓	-	-	Relatively shallow with silt substrate and heavily poached by cattle
Fenrother Burn 1	-	-	✓	-	-	Very little water and heavily shaded – no further surveys undertaken
Fenrother Burn 2	-	-	-	-	-	Dry – no surveys undertaken
River Lyne	✓	-	✓	✓	✓	Too heavily shaded for macrophytes
Floodgate Burn	-	-	✓	✓	-	Small and shallow but with potential eel habitat
Shieldhill Burn	-	-	✓	-	-	Very little water, heavily shaded and culverted for long distances
Shieldhill Burn Tributary	-	-	<b>~</b>	-	-	Ditch with septic input - no surveys undertaken

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#### **3 RIVER HABITAT SURVEY**

#### 3.1 Objective

3.1.1 RHS is used to assess overall habitat quality and the degree of artificial modification present to a watercourse. RHS can be used to determine a hydromorphological baseline against which modification to bank and bed structures can be assessed, and the effect of any modification on ecological functioning predicted. Outputs of RHS surveys are the Habitat Quality Score (HQS) and Habitat Modification Score (HMS). Habitat Quality Score refers to the "overall habitat diversity provided by natural features in the channel and river corridor. Points are scored for the presence of features such as point, side and mid-channel bars, eroding cliffs, large woody debris, waterfalls, backwaters and floodplain wetlands" (www.riverhabitatsurvey.org). The Habitat Modification Score (HMS) and subsequent class is an indication of artificial modification to river channel morphology, based upon the presence and extent of artificial features such as culverts and weirs, re-profiling and reinforcement of banks, bridges and outfalls and embankments.

#### 3.2 Desk Study

- 3.2.1 Results of previous RHS were obtained from www.riverhabitatsurvey.org/map-open-os/. Although the River Coquet, Longdike Burn and the River Lyne have all been previously surveyed, only the River Lyne site falls within the study area. This site (reference number 19694) was classed as predominantly unmodified in 2007 (HMS 120 and HQA 78).
- 3.2.2 Several sites on the River Coquet have previously been surveyed by RHS. The nearest sites to the study area lie 13.5km upstream (site 8818, surveyed in 1996) and 7.6km downstream (site 24033 surveyed in 2008). All sites ranged from pristine/semi-natural to obviously modified, with the exception of one site, at Warkworth Ford, which was classed as severely modified in 2011. The section of the River Coquet within the survey area has no previous RHS surveys. The Coquet within the survey area is not designated as artificial or heavily modified under WFD and the hydrological regime is classified as supporting good status (Environment Agency, 2017a). Areas of the Coquet catchment have been subject to historic dredging and straightening (The Wild Trout Trust, 2014).
- 3.2.3 The only previously surveyed RHS site on Longdike Burn is approximately 1.3km downstream of the survey area and was recorded as obviously modified in 1995. The Longdike Burn is not designated as artificial or heavily modified under WFD and the hydrological regime and morphology are classified as supporting good status (Environment Agency, 2017a).

#### 3.3 Field Survey

#### **Methods**

- 3.3.1 RHS was undertaken over a 500m stretch on the main watercourses encompassing, where access allowed, the crossing point of the proposed scheme (Figures 1.1 1.3, Appendix C). The survey was undertaken by an accredited surveyor, experienced in the assessment of lowland river typologies and having received the 2017 RHS update (Sean McGrogan RHS accreditation ID FA023E). RHS is a standard monitoring method and requires an audit of a 500m reach of the physical characteristics and surrounding land use of a river. Ten spot checks are taken at 50m intervals within the 500m survey reach, followed by a sweep up of overall channel, bank and riparian zone characteristics. Features of geomorphological, hydromorphological and ecological interest are also recorded (Environment Agency, 2003).
- 3.3.2 Surveys were undertaken in August 2017, during a period of normal summer flow. Whilst considered outwith the preferential time to conduct an RHS survey (May June) the low

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macrophyte cover in the survey reaches and shallow water at this time of year were deemed suitable to allow a full assessment of the river bed and banks at each site.

3.3.3 Once collected, RHS field data was Quality Assessed by a second accredited RHS surveyor Jon Barnes - AT004) before being provided to the Environment Agency (custodians of the national database) and compared to a nationwide network of reference sites.

#### **Survey Limitations**

- 3.3.4 Due to access restrictions the RHS survey on the River Lyne was conducted from the crossing point downstream, rather than including the section upstream and downstream. However, as previously mentioned, most potential impacts would occur downstream of the crossing point.
- 3.3.5 Surveying in August (outside of the preferred survey window of May June) is not considered a limitation. Spring surveys are preferred to avoid macrophyte growth obscuring bed and bank features. The proposed Scheme crossing points selected for RHS do not demonstrate heavy macrophyte growth and therefore this is not considered a limitation to the RHS survey.
- 3.3.6 Where possible the proposed crossing point was included within the RHS. With potential physical habitat modification occurring at the crossing point (and predominantly downstream in the form of changes to surface water drainage) a separate upstream RHS site was deemed unnecessary if the crossing point could be encompassed within a downstream site.

#### Results

3.3.7 The main watercourses crossed by the proposed scheme were surveyed between the 1<sup>st</sup> and 4<sup>th</sup> August 2017 (Figures 1.1 – 1.3). The survey results are presented in Table 3.1.

Table	3 1.	RHS	SHILAM	results.
Table	J. I.	КΠО	Survey	resuits.

Watercourse	Survey Reach	HQA	HMS	HMS class
River Coquet	u/s: NZ 17187 99820 d/s: NZ 17689 99877	54	365	3 – Obviously Modified
Longdike Burn 1	u/s: NZ 17838 97169 d/s: NZ 18051 97412	52	1860	5 - Severely Modified
Longdike Burn 2	u/s: NZ 18056 96711 d/s: NZ 17880 97024	60	800	4 – Significantly Modified
River Lyne	u/s: NZ 18570 91627 d/s: NZ 18899 91656	53	420	3 - Obviously Modified

- 3.3.8 All sites received a Habitat Modification Class of obviously modified to severely modified, predominantly due to the inclusion of the existing crossing structures in the survey reaches (Table 3.1). Inclusion of the crossing structure is also likely to account for the difference from the previous result of predominantly unmodified for the River Lyne.
- 3.3.9 The River Coquet received the lowest HMS (365) as it was the only site where no culverts were recorded. Contributory factors to the modification score on the Coquet include the presence of the existing A1 crossing and associated infrastructure, including bank reinforcement and an outfall. The river planform was predominantly natural, with no evidence of realignment or over deepening, although some isolated resection was recorded. The bank habitat features and flow diversity contributed to the HQA score. The RHS scores are comparable to the historic RHS cores reported from RHS surveys undertaken up and downstream of the A1 crossing.

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3.3.10 Both Longdike sites reported significantly or severely modified HMS scores, with over a third of each survey sites both realigned and over deepened. Site 1 on Longdike Burn received the highest HMS (1860) due to the presence of significant habitat modification. Both sites are affected by culverting, bridges, and significant amount of re-sectioning/reprofiling, whilst the Longdike Burn site 1 RHS also reported reinforced banks. Despite this the Longdike Burn Site 2 survey recorded the highest HQA, although tis was largely driven by marginal and adjacent habitat features rather than inchannel habitat diversity or quality.

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#### **4 MACROPHYTES**

#### 4.1 Objective

4.1.1 A survey of the macrophyte community in a watercourse can be used to assess ecological condition and indicate impacts of nutrient enrichment and alterations in flow.

#### 4.2 Desk Study

- 4.2.1 The citation for the River Coquet and Coquet Valley Woodlands SSSI indicates that the lower reaches of the river support a variety of aquatic plants, including river water-crowfoot (*Ranunculus fluitans*). The nearest NBN records for *R.fluitans* on the Coquet are beyond 5km both up and down stream of the current A1 crossing. Environment Agency macrophyte data from the wider catchment shows that the plant communities present in the River Coquet are diverse, consisting of many common and widespread species. There were no records of species with legislative designations or local conservation interest.
- 4.2.2 No macrophyte records were found for the other watercourses in the study area. No species of conservation interest were returned from the local biodiversity records centre data request.

#### 4.3 Field Survey

#### Methods

- 4.3.1 Macrophyte surveys were undertaken at three sites identified during the aquatic habitat assessment (Figures 1.1 and 1.2). These sites were chosen as they remained largely unshaded during summer months, were permanently wetted and supported substrates conducive to macrophyte communities to establish. The survey involved compiling macrophyte species lists and percentage cover from a 100m reach of the watercourse following the WFD compliant method (WFD-UKTAG, 2014a). Field data detailing the physical characteristics of each sample site were also collected including location, width, depth, substrate, habitats (for example pools and riffles), shading, water clarity and bed stability.
- 4.3.2 The results of the survey were analysed using the WFD assessment tool LEAFPACS2 (WFD-UKTAG, 2014a), which uses the following metrics:
  - River Macrophyte Nutrient Index (RMNI): a measure of nutrient enrichment at the site. Values range from 1 to 10, with high scores assigned to nutrient-tolerant taxa (Wilby *et al.*, 2012).
  - Number of macrophyte taxa (NTAXA): the number of truly aquatic taxa observed in the survey.
  - Number of functional groups (NFG): a measure of the functional diversity at the site.
  - Cover of green filamentous algae (ALG): the percentage cover of green filamentous algae observed over the whole of the survey reach.
- 4.3.3 An ecological quality ratio (EQR) was calculated for each of the above metrics as well as for the site as a whole. The EQR is the ratio of the observed conditions at the site to those expected in reference (i.e. high quality or pristine) conditions. The EQR ranges from zero to one, with one indicating that the observed conditions are equal to reference conditions. A WFD classification of High, Good, Moderate, Poor or Bad is also assigned to each site.

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#### Limitations

4.3.4 Macrophyte surveys were not conducted on the River Coquet due to the size and fastflowing nature of this river. No macrophytes were observed in the study area during other aquatic surveys at this location.

#### Results

- 4.3.5 Three sites, Minto's Dean and two sites on Longdike Burn, were surveyed for macrophytes between the 31<sup>st</sup> July and 2<sup>nd</sup> August 2017. Macrophyte surveyors were Environment Agency accredited and experienced in the monitoring and assessment of lowland macrophyte species.
- 4.3.6 Macrophytes were reported in low diversity at all sites (7 species on Minto's Dean and a 3 and 4 species on Longdike Burn 2 and 1 respectively). Of these, only 2 species on Minto's Dean, and 1 on the Longdike Burn sites are considered truly aquatic (NTAXA in table 4.1). Macrophyte coverage on the Longdike Burn was very low (1%), whilst the Minto 's Burn site was choked with 75% cover.
- 4.3.7 All sites were considered 'poor' quality using WFD compliant metrics. The metrics calculated for each site area given in Table 4.1 (and Appendix D).
- 4.3.8 Himalayan balsam (Impatiens *glandulifera*) was reported as marginal vegetation on the Minto's Dean site.

Metric	Minto's Dean	Longdike Burn 1	Longdike Burn 2
RMNI	8.06	7.60	7.55
RMNI EQR	0.431	0.609	0.616
NTAXA	2	1	1
NTAXA EQR	0.307	0.133	0.133
NFG	2	1	1
NFG EQR	0.465	0.204	0.204
Number of taxa (including non-hydrophytes)	7	4	3
Overall Macrophyte Cover (%)	75	2	1
ALG (%)	7.50	0.05	0.05
ALG EQR	0.925	1	1
Overall EQR	0.262	0.326	0.331
WFD Class	Poor	Poor	Poor

- 4.3.9 The RMNI and associated EQR for each site indicate that the macrophyte communities contain more nutrient-tolerant species than would be expected at sites sharing similar physical characteristics without nutrient enrichment. Both Longdike Burn sites indicate less nutrient tolerant macrophyte communities than Minto's Dean, however the lack of diversity results in the poor quality classification using the WFD metric.
- 4.3.10 The overall EQRs indicate that none of the macrophyte communities surveyed are comparable to what would be expected under pristine conditions and all three sites are impacted by poor community diversity, nutrient input and/or altered flows. No species of conservation interest were recorded.

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#### **5 MACROINVERTEBRATES**

#### 5.1 Objective

5.1.1 Macroinvertebrates are used to detect a range of environmental stressors, such as organic pollution, low flows, sedimentation and habitat quality. The use of biotic metrics (see below) can attribute community composition to different environmental factors. Whilst very few species are protected under UK legislation the distribution of many species are well documented and conservation metrics can be applied to both individual species and community composition.

#### 5.2 Desk Study

- 5.2.1 Results of Environment Agency macroinvertebrate sampling for WFD monitoring indicate that the River Coquet and Longdike Burn have a classification of High and the River Lyne has a classification of Moderate (Environment Agency, 2017a). Environment Agency data shows that the macroinvertebrate communities present in these watercourses are diverse, consisting of many common and widespread species. The caddisfly *Polycentropus kingii*, valued as of 'local' conservation interest (Chadd and Extence, 2004), but relatively common, was recorded from the River Coquet at Felton in 2012 and 2014, which is located approximately 1.2km downstream of the study area.
- 5.2.2 Riverfly Trust monitoring in 2015 returned good macroinvertebrate species abundance and diversity throughout the River Coquet but with a few samples showing impacts of nutrient (phosphorus) enrichment (Salmon & Trout Conservation UK, 2015).
- 5.2.3 No aquatic macroinvertebrates are listed on the Northumberland Biodiversity Action Plan (Northumberland Wildlife Trust, undated), nor data provided in a data request to the local biodiversity records centre.

#### 5.3 Field Survey

#### **Methods**

- 5.3.1 Samples were taken in May and October 2017 using the WFD compliant method, three-minute kick sample and a one-minute hand search at each site (Environment Agency, 2012). Samples were preserved using industrial methylated spirits (IMS) on site as per Environment Agency guidelines. Alongside aquatic invertebrate sampling, a standardised field sheet was completed to include details of channel and bank physical habitat (material of banks and substrates, flow types, physical processes, bank structure), riparian land use and potential sources of anthropogenic stress. Physio-chemical water quality data; temperature, dissolved oxygen, conductivity, salinity and pH was also collected by means of a calibrated YSI probe.
- 5.3.2 Species level identification was undertaken in the Jacobs aquatic ecology laboratory by experienced, Environment Agency trained, species level macroinvertebrate taxonomists. As per Environment Agency quality assurance procedure 10% of samples were reanalysed by a senior taxonomist. All samples passed internal quality assurance.
- 5.3.3 The following biological metrics were calculated from the community data of each site:

#### River Invertebrate Classification Tool (RICT)

5.3.4 Based on a comparison of macroinvertebrate communities observed at each study site, with macroinvertebrate communities observed at reference sites, RICT determines the ecological condition of a given location. Reference site selection is based on a similarity of physical attributes with the study site (for example; width, depth, substrate type, altitude, distance from source, alkalinity). RICT reference sites are deemed to be as close as possible to pristine conditions and not impacted by environmental stressors such as

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pollution, habitat modification or flow stress. Reference sites provide an expected macroinvertebrate community score for that river type. The observed macroinvertebrate community score at a given study site is divided by the expected community score. Reference and bias adjustments are then applied to obtain the Ecological Quality Ratio (EQR). RICT can derive EQR scores for a number of biological metrics including LIFE (measure of macroinvertebrate flow preferences), WHPT NTAXA (measure of macroinvertebrate richness) and WHPT ASPT (measure of macroinvertebrate tolerance to organic pollution); these metrics are discussed further below.

#### Whalley, Hawkes, Paisley & Trigg (WHPT) Metrics

5.3.5 The WHPT metric is the classification method for the assessment of macroinvertebrates in rivers in relation to general degradation, including organic pollution under the WFD (WFD-UKTAG, 2014b). In 2014 the WHPT scoring system replaced the BWMP scoring system; the WHPT metric is abundance weighted and scores have been revised to be more representative of the family as a whole and reflect general pollution rather than just organic pressures (Paisley et al., 2007). Scores are assigned to macroinvertebrate families based on tolerance to pollution with the final WHPT score taking into account the abundance of each of the families. Average Score Per Taxon (WHPT ASPT) EQR scores are calculated by dividing the WHPT score by the Number of Scoring Taxa (WHPT NTAXA). WHPT and WHPT ASPT scores are used as a measure of water quality; WHPT NTAXA is used as a measure of diversity.

#### WFD Classification

5.3.6 The WFD uses the pollution sensitivity (WHPT ASPT) and macroinvertebrate richness (WHPT NTAXA) EQR scores to determine whether a watercourse meets Good Ecological Status, as required under the Directive. There are five ecological status classes: Bad, Poor, Moderate, Good and High. Where a macroinvertebrate community is recorded at, or above Good Ecological Status, then biological or physical pressures including flow and pollution are not assumed to be affecting aquatic ecology. Watercourses failing to meet Good Ecological Status for macroinvertebrates may be influenced by a variety of stressors, and EQRs can be interrogated to determine the likely cause of failure to meet Good Ecological Status. For WFD classification the lower scoring of these EQR scores determines the macroinvertebrate classification of a given site. Classifications cannot be generated for sites less than 2.5 km from the watercourse source.

#### Community Conservation Index (CCI)

5.3.7 The CCI metric represents the national rarity and diversity of species identified within a site and designates a conservation value to the sampled community (Chadd & Extence, 2004). A conservation score (CS) is applied to each species based upon its national rarity. The CCI is calculated from the sum of conservation scores divided by the number of contributing species to obtain the mean value. This is then multiplied by the community score (CoS), derived from the rarest taxon present. CCI scores are assigned into conservation classes. The CCI value tends to fall in a range of between 0 and 40 (Table 5.1). CCI scores and classes can be adjusted to take into account local conditions. For example, a species may be nationally scarce but relatively common in a particular location, and vice versa.

Table 5.1: CCI conservation classes (Chadd and Extence, 2004).

Conservation Class	Score	Description
Low	<5.0	Site supporting common species and low taxon richness
Moderate	5.0 to 10.0	Site supporting at least one species with limited distribution or moderate taxon richness
Fairly High	10.0 to 15.0	Site supporting at least one uncommon species or several of limited distribution or high taxon richness

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Conservation Class	Score	Description
High	15.0 to 20.0	Site supporting several uncommon species, one of which may be nationally rare or high taxon richness
Very High	>20.0	Site supporting several rare species or very high taxon richness.

#### Lotic-invertebrate Index for Flow Evaluation (LIFE)

5.3.8 Freshwater macroinvertebrates have specific requirements for flow conditions and can be used to determine not only predominant flow types (Extence *et al.*, 1999) but also changes in flow character. The LIFE metric uses abundance data to assign a flow preference score to macroinvertebrate families present in a sample and an overall score for the site can be interpreted as an abundance-weighted average score per taxon metric.

#### Proportion of Sediment-sensitive Invertebrates (PSI)

5.3.9 The PSI metric aims to act as a proxy for the quantity of fine sediment at a site (Extence *et al.*, 2011). Macroinvertebrate species are assigned a fine sediment sensitivity rating that ranges from highly insensitive to highly sensitive to fine sediment (Table 5.2). The PSI score is calculated as the percentage of sensitive taxa in the sample.

Table 5.2: PSI score interpretation (Extence et al., 2011).

PSI	River Bed Condition	
81 - 100	Minimally sedimented/unsedimented	
61 - 80	Slightly sedimented	
41 - 60	Moderately sedimented	
21 - 40	Sedimented	
0 - 20	Heavily sedimented	

#### Limitations

- 5.3.10 Due to access restrictions the spring and autumn macroinvertebrate samples on Minto's Dean were taken from opposite sides of the A1, with the spring sample being taken from downstream of the A1 and the autumn sample taken from upstream. Best efforts were made to ensure that the samples were taken from comparable habitats in each season, however micro variation in habitat (substrates and flow types for example) may result in minor differences in community composition. This is not considered a significant limitation to the interpretation of invertebrate data from this site. Both sites lie within 2.5km of the source of the Minto's Dean and as such cannot analysed using RICT (lack of suitable reference sites in headwater locations), however all other metrics were calculated separately.
- 5.3.11 Samples were taken from all wetted sites visited during the aquatic habitat assessment in May. In October the number of surveyed sites was reduced from 14 to eight, as a result of summer low flows reducing the wetted flow in a number of the watercourses. This affected sites on Thirston Burn, Minto's Dean Tributary, Longdike Burn 2 (sample 2), Fenrother Burn 1, Shieldhill Burn and Shieldhill Burn Tributary. All of these sites either dried up completely or water levels dropped below 5cm, (and therefore a compliant macroinvertebrate sample could not be collected). The lack of data from these sites in October indicate the ephemeral nature of the minor watercourses, reliant on rainfall or baseflow to maintain wetted area. It is considered that these sites provide limited permanent macroinvertebrate habitat.

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#### Results

#### **Biological Indices**

- 5.3.12 The site on the River Coquet had a diverse macroinvertebrate community (Appendix E), with a WHPT-NTAXA of 24 (Table 5.3). There were good abundances of pollution sensitive families including Heptageniidae, Ephemerellidae (mayflies) and Perlodidae (stoneflies), alongside ubiquitous families including Oligochaeta (worms) and Gammaridae (freshwater shrimp). A dominant flow type can be deduced from this community; with a number of macroinvertebrate families with a preference for faster flows recorded. This is reflected in the LIFE scores from this site, which are indicative of a community with a preference for faster flows (Table 5.3). PSI scores (Table 5.3) indicate that the site is minimally impacted by sedimentation, which is reflected by the presence of taxa which are intolerant of sedimentation.
- 5.3.13 Longdike Burn 1 and Longdike Burn 2 (sample 1) both exhibit a diverse macroinvertebrate community (Appendix E), with a WHPT-NTAXA of 24 at each site (Table 5.3). There are good abundances of pollution sensitive families including Ephemeridae, Heptageniidae (mayflies) and Leptoceridae (cased caddisflies) alongside common families including Elmidae (riffle beetles) and Gammaridae (freshwater shrimp). The macroinvertebrate community recorded at Longdike Burn 2 (sample 2) is dominated by a number of pollution-tolerant taxa (Appendix E), suggesting that the site is of moderate biological quality (WHPT-ASPT of 5.51; Table 5.3). This is supported by the reduced diversity (WHPT-NTAXA of 20; Table 5.3) recorded in the watercourse compared to the other sites on the Longdike Burn. LIFE scores from the three sites on the Longdike Burn, are indicative of a community with a preference for faster flows (Table 5.3). PSI scores (Table 5.3) indicate that the sites are slightly impacted by sedimentation, which is reflected by the presence of taxa which are intolerant of sedimentation.
- 5.3.14 The macroinvertebrate community on the River Lyne is dominated by ubiquitous pollution-tolerant families (Appendix E), including Oligochaeta (worms) and Chironomidae (non-biting midge), suggesting that the site is of moderate biological quality (WHPT-ASPT of 5.29; Table 5.3), which is supported by the lack of diversity (WHPT-NTAXA of 15) recorded in the watercourse. LIFE scores are indicative of a community with a preference for faster flows (Table 5.3). PSI scores (Table 5.3) indicate that the sites are impacted by sedimentation, which is reflected by the presence of taxa which are tolerant of sedimentation.
- 5.3.15 The remaining sites were located on a number of minor watercourses, these sites displayed macroinvertebrate communities typical of these habitats. The majority of these sites contained flow stressed macroinvertebrate communities typical of moderately to heavily sedimented habitats and display low community conservation scores (Table 5.3).

Table 5.3: Macroinvertebrate results.

Site	- ASPT	- NTAXA	LII	FE	P	SI	CCI S	core
	WHPT	WHPT	Spring	Autumn	Spring	Autumn	Spring	Autumn
Minto's Dean Tributary	3.89	10	6.00	-	22.22	-	1	-
Minto's Dean	5.60	21	6.86	7.00	59.26	63.64	5.33	4.15
Back Burn Tributary	5.90	19	6.75	6.42	61.76	75	11.07	5.33

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Site	- ASPT	WHPT - NTAXA	LII	FE	P	SI	CCI S	core
	WHPT	WHPT	Spring	Autumn	Spring	Autumn	Spring	Autumn
River Coquet	6.74	24	7.91	7.69	85	80	15.4	7.33
Thirston Burn Tributary	3.86	14	5.4	•	0	1	1.13	-
Longdike Burn 1	6.15	25	7.15	7.33	67.57	67.57	9.78	7.05
Longdike Burn 2 (sample 1)	6.22	25	7.36	7.50	78.57	70	13.73	7.25
Longdike Burn 2 (sample 2)	5.51	20	7.13	-	63.64	-	10.00	-
Earsdon Burn	5.22	19	7.06	6.80	63.64	62.07	8.25	7.73
Fenrother Burn 1	3.53	14	5.43	-	11.11	-	1.29	-
River Lyne	5.29	15	6.33	7.21	35.29	61.90	3.86	3.82
Floodgate Burn	4.54	22	6.27	6.21	40.63	45.16	3.00	3.25
Shieldhill Burn	2.45	6	5.67	-	0	-	1.00	-
Shieldhill Burn Tributary	3.33	10	5.80	-	5.88	-	1.14	-

#### River Invertebrate Classification Tool

- 5.3.16 RICT analysis was performed on five sites. The River Coquet and two sites on Longdike Burn achieved Good status for macroinvertebrates. The remaining site on the Longdike Burn and the River Lyne both achieved Moderate status (Table 5.4).
- 5.3.17 River Coquet achieved High WHPT-ASPT and Good WHPT-NTAXA classifications, suggesting that there is only a minor deviation from the macroinvertebrate community which would be expected under reference conditions.
- 5.3.18 Longdike Burn 1 and Longdike Burn 2 (sample 1) achieved Good WHPT-ASPT and High WHPT-NTAXA classifications, which again indicates that there is only a slight deviation from the macroinvertebrate community which would be expected under reference conditions.
- 5.3.19 Longdike Burn 2 (sample 2) and the River Lyne achieved Moderate WHPT-ASPT and High WHPT-NTAXA classifications, which suggests the community at this site is affected by environmental stress and dominated by pollution-tolerant species.

Table 5.4: RICT analysis output.

Site	Index	EQR	Class	Probability of class (%)	Macroinvertebrate Classification (Potential)	
Pivor Coguet	WHPT-ASPT	0.78	High	97.42	Good	
River Coquet	WHPT-NTAXA	1.06	Good	55	Good	
Longdike Burn	WHPT-ASPT	0.92	Good	78.64	Good	
1	WHPT-NTAXA	0.90	High	51.59	Good	
Longdike Burn	WHPT-ASPT	0.94	Good	73.38	Cood	
2 (sample 1)	WHPT-NTAXA	0.89	High	49.06	Good	
	WHPT-ASPT	0.82	Moderate	69.25	Moderate	

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Site	Index	EQR	Class	Probability of class (%)	Macroinvertebrate Classification (Potential)
Longdike Burn 2 (sample 2)	WHPT-NTAXA	0.89	High	75.19	
Divor Lyne	WHPT-ASPT	0.80	Moderate	88.43	Moderate
River Lyne	WHPT-NTAXA	0.58	Moderate	47.02	Woderate

#### Species of conservation interest

5.3.20 Four macroinvertebrate species of conservation interest were identified from the 14 sites surveyed (Table 5.5). The mayfly *Ecdyonurus insignis*, caddisflies *Athripsodes bilineatus* and *Beraeodes minutus*, although valued as Local (CCI score 5), are all relatively common. The Regionally Notable *Baetis buceratus* (Scarce Olive) is a widespread, though localised species. The aquatic nymph life stage typically lives amongst sand and gravel in riffles and in the generally in the North East are reported above the Riverfly Partnership / Freshwater Biological association threshold for this species.

Table 5.5: Macroinvertebrate species of conservation interest with CCI scores above 5 (Local)

Site	Species	Season	CCI Definition (score)
Back Burn Tributary	Baetis buceratus	Spring	Regionally Notable (6)
River Coquet	Ecdyonurus insignis	Spring	Local (5)
Longdike Burn 1	Athripsodes bilineatus	Spring	Local (5)
Longdike Burn 2 (sample 1)	Athripsodes bilineatus	Spring	Local (5)
Longdike Burn 2 (sample 2)	Athripsodes bilineatus	Spring	Local (5)
Earsdon Burn	Beraeodes minutus	Autumn	Local (5)

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#### 6 PONDS

#### 6.1 Objective

6.1.1 The Predictive SYstem for Multimetrics (PSYM) has been developed by the Ponds Conservation Trust (now the Freshwater Habitats Trust) and the Environment Agency to assess the ecological quality of still waters by comparing them to pristine ponds with similar physical features. Community conservation scores and water quality can also be assessed from PSYM output.

#### 6.2 Desk Study

6.2.1 Review of OS maps identified nine ponds within 300m of the proposed scheme. The Northumberland Biodiversity Action Plan suggests that Northumberland has not experienced the net decline in ponds that has been recorded on a national level (Northumberland Wildlife Trust, undated). No information regarding specific ponds within the survey area was found during the desk survey.

#### 6.3 Field Survey

#### **Methods**

- 6.3.1 PSYM surveys which include macrophyte and macroinvertebrate surveys were performed at five waterbodies within the 300m scheme buffer (Figures 2.1-2.4, Appendix F), the other four ponds were not accessible (see limitations section). Physical characteristics, including altitude, pH and presence of and inflow were also recorded at each pond in accordance with the standard survey method (Environment Agency & Ponds Conservation Trust, 2002).
- 6.3.2 Survey results were sent to the Freshwater Habitats Trust for comparison against the national database. Metrics used to compare with expected values in order to obtain final score were:
  - number of submerged and marginal plant species;
  - number of uncommon plant species;
  - Trophic Ranking Score (TRS) an average of the trophic scores of individual plant species depending on their affinity to particular nutrient conditions;
  - Average Score per Taxon (ASPT);
  - number of Odonata and Megaloptera Families (OM); and
  - number of Coleoptera families (CO).
- 6.3.3 Ecological Quality Indices (EQI), the ratio between the observed and expected values, are calculated for each metric as a measure of how close they are to the minimally impacted baseline condition. These are reported on a scale of 0 to 3 with 0 representing poor quality and 3 representing good quality.
- 6.3.4 The pond scores an Index of Biotic Integrity (IBI) based on the macrophyte and macroinvertebrate data which was used to determine the PSYM quality category. The following IBI ranges were used: IBI >75%=Good, 51-75%= Moderate, 25-50%=Poor and <25%=Very Poor.

#### 6.3.5 **Limitations**

Four ponds within 300m of the proposed scheme could not accessed due to on-going pond management at the time of survey and the presence of game birds which are easily disturbed. These ponds were not directly under the footprint of the proposed Scheme.

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#### Results

- 6.3.6 PSYM surveys were undertaken on five ponds between the 14<sup>th</sup> and 15 h August 2017. The survey team included surveyors accredited through the Environment Agency freshwater macrophyte training programme and competent of macroinvertebrate identification in the field.
- 6.3.7 Results are presented in Table 6.1. None of the ponds surveyed contained any species of conservation interest nor met the criteria to be classed as a priority pond (JNCC, 2016).

Table 6.1: Summary of PSYM results.

Indices	A5	A6	A14	A15	A17
NGR	NZ 18708 93718	NZ 18585 95240	NZ 18081 97126	NZ 18057 97368	NZ 17604 98184
No. of submerged + marginal plant species (SM)	2	4	12	14	14
EQI (SM)	0.11	0.21	0.63	0.62	0.76
Number of uncommon plant species (U)	0	0	0	1	0
EQI (U)	0.00	0.00	0.00	0.26	0.00
Trophic Ranking Score (TRS)	8.75	9.17	8.70	8.73	8.39
EQI (TRS)	1.57	1.63	1.17	1.11	1.48
Average Score Per Taxon (ASPT)	4.00	4.06	4.00	4.33	4.52
EQI (ASPT)	0.71	0.73	0.77	0.84	0.87
Odonata + Megaloptera (OM) families	2	2	2	2	3
EQI (OM)	0.68	0.77	0.60	0.62	0.96
Coleoptera families (CO)	3	3	4	2	4
EQI (CO)	0.85	0.84	1.04	0.53	1.02
Index of Biotic Integrity (%)	39	44	56	56	67
PSYM quality category	Poor	Poor	Moderate	Moderate	Moderate
Meet Priority Pond criteria?	No	No	No	No	No

- 6.3.8 Ponds A5 and A6, west of the A1 at Earsdon and Causey Park were classed as Poor quality (IBI between 25-50%) due to a low number of plant species relative to that expected from a pond with similar physical conditions in reference, or pristine condition. Ponds A14 and A15 both within Felmoor Park and A17 in the Northumbrian Woodland Burials site were all classed as Moderate (IBI = 51-75%). Both ponds demonstrate near identical invertebrate and macrophyte metrics.
- 6.3.9 Pond A17 is an ornamental pond and contained the non-native macrophytes New Zealand pigmyweed (*Crassula helmsii*) and curly waterweed (*Lagarosiphon major*). Despite this, Pond A17 reported the highest IBI score, driven by the highest number of macrophyte species, highest invertebrate scores and lowest trophic rank scores.

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#### 7 FRESHWATER FISH

#### 7.1 Objective

7.1.1 Electric fishing surveys are used to determine the presence or absence of fish species in watercourses crossed by the scheme. This enables identification of species of where species of conservation interest may be impacted by the scheme.

#### 7.2 Desk Study

- 7.2.1 The River Coquet is reported to be one of the best known migratory fisheries in northern England with Atlantic salmon, sea trout and brown trout present throughout most of the river system. Rod catch statistics place it in the top ten salmon fisheries in England and sea trout are caught in this river each year (Environment Agency, 2017b). It has also been reported that all three species of lamprey spawn in the River Coquet (Environment Agency, undated).
- 7.2.2 Table 7.1 presents the species of fish recorded by the Environment Agency from their monitoring sites on the River Coquet, Longdike Burn and River Lyne (more than 5km downstream of the survey area). The most recent results of WFD monitoring for fish classified the Longdike Burn as High and the River Lyne as Poor (Environment Agency, 2017a).

Table 7.1: Fish s	pecies recorded by	y the Environment Agency.
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Species	River Coquet	Longdike Burn	River Lyne
Atlantic salmon	✓		
Brown/sea trout	✓	✓	✓
European eel	✓	✓	✓
Lampetra sp.	✓	✓	✓
Bullhead			✓
Stone loach	✓	✓	✓
Minnow	✓	✓	✓
3-Spined Stickleback	✓	✓	✓

- 7.2.3 The Coquet supports a natural wild trout population in its head waters, supplemented by annual stocking by the Northumberland Angling Federation through the lower and medium catchment (The Wild Trout Trust, 2014).
- 7.2.4 Given the known sensitivity of fish species in the Coquet, the assumed presence of migratory species passing through the study area to reach spawning grounds in the tributaries and the large size of the Coquet within the study area it was deemed unnecessary to assess fish populations as part of this study. Site visits made for macroinvertebrates and Exposed Riverine Sediment species could accurately assess fish habitat suitability (Appendix B). All watercourse with a hydrological connection to the River Coquet would have the potential to support suitable habitats for migratory species.

#### 7.3 Field Survey

#### Methods

7.3.1 Freshwater fish were surveyed by means of electric fishing undertaken to the British Standard (BS) EN 14011:2003 (water quality – sampling of fish with electricity) and in compliance with fish monitoring requirements under the WFD. The survey was led by surveyors accredited in electric fishing and affiliated to either the IFM or CIEEM. All fisheries work was undertaken licence from the Environment Agency (EP/EW090-N-9560/02)

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- 7.3.2 An E-Fish backpack was used to carry out fully quantitative surveys (using a three run catch-depletion method) at three sites (River Lyne, Longdike Burn 1 and Longdike Burn 2). Catch depletion allows enumeration of a stock or stock component within a given site, and provides a reasonably accurate estimate of a given population.
- 7.3.3 Where the watercourse is very shallow, marginal areas heavily overgrown or fish are assumed not be present then a qualitative single-run survey was conducted. Minto's Dean, Back Burn Tributary and Floodgate Burn were assess using qualitative sampling which allows the determination of presence/absence of species.
- 7.3.4 Prior to the survey, water conductivity (µS/cm) and temperature (°C) measurements were recorded to determine the power output of equipment. Photographs of the site and habitat notes were also taken. Sites were stop-netted at upstream and downstream limits to stop the movement of fish in and out of the survey site.
- 7.3.5 Sampling was undertaken between the 18-20 h August 2017, within the optimal summer sampling period for lowland fish. Water levels and flows were typical of the time of year.

#### **Limitations**

- 7.3.6 Floodgate Burn and Minto's Dean had dense overhanging or encroaching vegetation in areas, which reduced the catch efficiency of the electric fishing methodology. Fish of conservation interest were unlikely to be found in these watercourses due to lack of suitable habitat.
- 7.3.7 River and brook lamprey species are difficult to speciate in the field, especially in larval or ammocete life stages. Whilst there remains difference in life cycle biology between the two species, both brook and river lamprey are similarly important in terms of conservation value, therefore all lamprey, regardless of species will result in the same value, and mitigation being applied to the watercourse.

#### Results

- 7.3.8 The results of the field surveys are shown in Table 7.2 (raw field sheets in Appendix G). No fish were caught during the qualitative surveys on the Back Burn Tributary or Minto's Dean. Both watercourses were less than 1m wide and shallow at an average of only 10cm deep and demonstrated predominantly low energy flow typologies (glide or ditch / no perceivable flow types with isolated areas of run or riffle flow. Substrates were a mix of coarse substrates (gravel, pebble cobble) with small fractions of sand and silt. Bordered by woodland, the Back Burn Tributary was heavily shaded (>75%) whilst Minto's Dean was moderately shaded (25-75%). The habitats within these two watercourses were considered to provide suboptimal habitats for freshwater fish species and unlikely to support typical habitats associated with species of conservational importance (see Appendix A and B).
- 7.3.9 Low numbers of 3-spined stickleback were caught in Floodgate Burn. This watercourse was characterised by very low energy flow types, (ditch 70%, pools 30%) over a predominantly fine substrate bed (sand 40%, clay 40%). Bordered on both banks by improved pasture the uniform bank structure creates limited habitat for fish. Stickleback are habitat generalists and tolerant of most types of pollution.

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Table 7.2: Number of fish captured at each site with size range (mm) in brackets.

Site	Brown trout	Lamprey	European eel	Stone Ioach	3-spined Stickleback	Minnow	Bullhead
Longdike Burn 1 U/S: NZ 17892 97329 D/S: NZ 18002 97336	14 (58-172)	8 (93-145)	0	19 (28-107)	60 (12-55)	53 (26-74)	0
Longdike Burn 2 U/S: NZ 17977 96904 D/S: NZ 17928 96968	56 (45-135)	12 (50-180)	1 (300)	2 (74-93)	70 (14-54)	164 (17-85)	0
River Lyne U/S: NZ 18652 91665 D/S: NZ 18678 91655	0	0	0	0	16 (24-59)	0	6 (62-83)
Floodgate Burn U/S: NZ 18596 91258 D/S: NZ 18756 91288	0	0	0	0	10 (14-55)	0	0
Back Burn Tributary U/S: not recorded D/S: NZ 17580 00548	0	0	0	0	0	0	0
Minto's Dean U/S NZ 17398 00939 D/S NZ 17457 00943	0	0	0	0	0	0	0

- 7.3.10 The sites on Longdike Burn contained several species of fish in relatively high numbers. This is reflective of the variety of habitats present in Longdike Burn with deeper slow-flowing areas with tree roots and woody debris suitable for trout and minnow and shallower stony riffles for stone loach. Channel substrates and flow types were diverse along the burn, providing habitat variation suitable for a range of fish species. Flows variation included higher energy run and riffle flows, interceded with pool and glide sections. Channel vegetation, both aquatic and encroaching terrestrial provided cover for stickleback and smaller trout. Minnow and stickleback were numerically at the Longdike Burn sites, 34% at Longdike Burn 1 and 54% at Longdike Burn 2 (minnow) and 39% and 23% (stickleback) at these sites respectively. One European eel was recorded at Longdike Burn 2 and one was observed at Longdike Burn 1 but evaded capture. This indicates good connectivity to the main river network, allowing the free movement of eel through the catchment.
- 7.3.11 Twenty lamprey ammocoetes (juveniles) were recorded in the Longdike Burn sites. Ammocoetes are difficult to identify in the field and could be identified only as either Lampetra *spp* (river or brook lamprey). The abundant areas of soft silt and sand substrate in this watercourse provide optimum habitat for these species. Sea and river lamprey migrate into freshwater catchments during their life cycle. Brook lamprey may undertake very localised migration within the catchment but never leave freshwaters. Brook lamprey are the commonest of the three species in freshwaters.
- 7.3.12 The River Lyne provided few areas of sufficient water depth to support adult fish. In areas where water depth was sufficient to support fish the predominantly sand and silt substrate provided little optimal habitat for feeding or spawning. Bullhead were recorded in low numbers in the sections of shallow stony riffle. Bullhead are sensitive to pollution and

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normally found in fast currents over stony ground. They are a key prey species for adult trout and habitat supporting bullhead often also supports minnow, stickleback and stone loach as there is similarity in their use of vegetation for cover. This species was not recorded in any other watercourse.

7.3.13 No salmon were recorded at any of the sites, however an incidental capture of a salmon parr was recorded during crayfish surveys on the River Coquet. A juvenile chub was also recorded from an invertebrate sample from the River Lyne.

#### 8 WHITE-CLAWED CRAYFISH

#### 8.1 Objective

8.1.1 The use of trapping and manual searching determines the presence or absence of whiteclawed crayfish (WCC) in watercourses that could potentially be impacted by the scheme, facilitating the development of appropriate mitigation.

#### 8.2 Desk Study

8.2.1 An NBN Atlas search returned Biological Records Centre records of WCC in the River Coquet at Felton in 1981 with records in nearby tributaries in 1997 (BRC, Crayfish (Crustacea; Astacura) data for Britain and Ireland 2003 obtained via NBN under CC-BY licence). The North American signal crayfish has been recorded throughout the UK, and is present in several catchments within 500m of the scheme. No historic records for WCC were returned from the local biodiversity records centre data request or Environment Agency for the study area or immediate catchment up and downstream.

#### 8.3 Field Survey

#### 8.3.1 Methods

WCC surveys were undertaken at the locations shown in Figures 2.1-2.4, between the 1<sup>st</sup> and 3<sup>rd</sup> August 2017 using a combination of survey methods as described below. A single visit was made to each site; this was deemed appropriate based upon the findings of the Habitat Assessment walkover survey.

#### Walkover Survey / Habitat Assessment

8.3.2 Prior to commencing surveys each site was assessed for crayfish suitability. This included a desk assessment of catchment geology, water quality and previous records, as described above. In the field each site was examined for habitat suitability, such as the presence of either soft banks (for burrows) or substrates, macrophytes or bank side vegetation that could provide cover to crayfish. This habitat assessment informed the screening of sites to take forward for field assessment (see below).

#### Manual Searches

8.3.3 Manual searches were undertaken at all four screened sites using the standard protocol for monitoring white-clawed crayfish (Peay, 2003). This involved searching under boulders and cobbles, examining undercut banks for signs of burrowing activity, and searching under large woody debris. Sweep netting for juvenile crayfish was undertaken in stands of vegetation and kick sampling was used in areas of the River Coquet that were too fast-flowing for trapping or hand searching.

#### **Trapping Survey**

- 8.3.4 A trapping survey was undertaken following the standard protocol for monitoring white-clawed crayfish (Peay, 2003). Only the sites on Longdike Burn were suitable for trapping, with areas of deep, slow-flowing water. A total of 24 crayfish traps, baited with cat food and pegged by a length of rope to the bank, were set at each site. The traps were left overnight and recovered the following morning. Any white-clawed crayfish present in the traps were recorded and returned to the river, any non-native crayfish were humanely destroyed on site.
- 8.3.5 The trapping was authorised by the Environment Agency and undertaken by a licensed surveyor (Permit Number: EP/EW090-Q-184/9593/01).

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#### Limitations

- 8.3.6 Water clarity of the Longdike Burn was poor meaning that manual searching was less efficient, however a combination of trapping and manual searching was used at these sites. As with other surveys, the River Lyne could only be surveyed downstream of the A1 due to access restrictions. In the absence of further information, species presence can be assumed to be contiguous along the length of the watercourse as the culvert is not expected to present a barrier to crayfish movement.
- 8.3.7 Due to the size and fast flows of the River Coquet the surveys were limited to the shallower margins of the northern bank, which could be safely accessed. Whilst the prevalence of bedrock in this area indicates the habitat has limited suitability, the known presence of WCC in the wider catchment should ensure full protection is extended to this species during construction and operation.

#### Results

- 8.3.8 The results of the crayfish surveys are shown in Table 8.1. No WCC were reported from any of the survey sites.
- 8.3.9 Of the four sites surveyed, North American signal crayfish (*Pacifastacus leniusculus*) were recorded in the River Lyne. Signal crayfish are listed under Schedule 9 of the Wildlife and Countryside Act 1981. Whilst there are limited examples of signal crayfish and WCC coexisting it is more commonly assumed that the presence of signal crayfish within a watercourse is often at the detriment to WCC, through the spread of disease carried by the signal crayfish and direct completion. In most recorded instances, the presence of signal crayfish results in the loss of WCC from the wider catchment.

Table 8.1: Crayfish survey results.

Site	Upstream NGR	Downstream NGR	No. Traps	No. Manual Searches	White- Clawed Crayfish	Signal Crayfish
River Coquet	NZ 17490 99834	NZ 17512 99864	0	3	0	0
Longdike Burn 1	NZ 17772 97297	NZ 17918 97312	24	4	0	0
Longdike Burn 2	NZ 18049 96838	NZ 17949 96923	24	3	0	0
River Lyne	NZ 18580 91627	NZ 18685 91635	0	4	0	31

- 8.3.10 North American signal crayfish were also recorded during the fish surveys and both the spring and autumn invertebrate sampling on the River Lyne. This indicates that the population of signal crayfish in the River Lyne may be high, reducing the potential for a coexisting WCC population.
- 8.3.11 The site on the River Coquet provided isolated areas of habitat capable of supporting crayfish species. The watercourse substrate was predominantly boulder and cobbles, providing suitable conditions for crayfish refuge. There were several areas along the bank with exposed tree roots, which have to the potential to provide refuge. Variability in seasonal flows may restrict the distribution of crayfish within the Coquet to areas that provide suitable protection and refuge during periods of flood flows.
- 8.3.12 The sites on the Longdike Burn both provided numerous areas of habitat suitable to support crayfish species. The watercourse substrate was dominated by cobbles, with areas of boulders, which provided suitable conditions for crayfish refuge. There were numerous

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areas of exposed bankside roots along the watercourse which are suitable crayfish refuge. Despite this neither species of crayfish were reported from the Longdike Burn during the 2017 surveys.

#### 9 EXPOSED RIVERINE SEDIMENT

#### 9.1 Objective

- 9.1.1 Exposed Riverine Sediment (ERS) surveys determine the presence of unique beetle communities of conservation importance which may be impacted by the scheme.
- 9.1.2 Exposed riverine sediments represent important primary habitats within the aquatic terrestrial interface of the river corridor. In active rivers, the deposition of gravel/shingle bars in marginal areas that are typically seasonally inundated under high flow conditions, provide a unique habitat supporting a wide range of invertebrate taxa. Taxa associated with ERS have a high fidelity to the habitat type, in that taxa may be ERS specialists and not widely associated with other aquatic or terrestrial habitats in the catchment. As such many ERS species receive protection in regards to their rarity.
- 9.1.3 ERS varies considerably in both distribution within a river catchment and in composition, which depends on the hydromorphology and geology of the catchment.

#### 9.2 Desk Study

9.2.1 The citation for the River Coquet and Coquet Valley Woodland SSSI states that the riverside shingle and sand habitats support an important assemblage of ground beetles with several nationally scarce species including *Bembidion schuppeli*. The Northumberland Biodiversity Action Plan for rivers and streams states that in 2005 the River Coquet was found to be the second best river in England for Exposed Riverine Sediment quality (Northumberland Wildlife Trust, undated).

#### 9.3 Field Study

#### **Methods**

- 9.3.1 Discrete areas of ERS were noted during the initial aquatic habitat assessments. Of these only one, a small island on the River Coquet (NZ 17509 99842), downstream of the existing crossing (Figure 2.1), was considered to be suitable for survey. The smaller deposits of ERS were assessed to be more frequently inundated and therefore considered aquatic features.
- 9.3.2 Typical ERS taxa surveys require a network of pitfall traps to be set across the ERS structure and left in-situ. This method works well in areas of gravel and pebble. Due to the large substrate sizes pitfall traps could not be set level as required by the standard sampling method. Therefore, the survey method was adapted from Sadler & Bell (2002) and involved hand searching and the creation of ten small excavations down to the water level. Water pooling in these excavations carry invertebrates from the surrounding sediment and were collected, preserved in alcohol before being sent for identification. Identification was undertaken by an experienced invertebrate taxonomist to species level.
- 9.3.3 The survey was undertaken on 3<sup>rd</sup> August 2017.

#### **Limitations**

- 9.3.4 The ERS identified for survey was comprised of large substrate types, atypical of high quality ERS habitats. Despite this the potential value of ERS to aquatic/terrestrial habitats is such that survey as considered valid.
- 9.3.5 Due to the large substrate sizes excavations were limited in size and number but samples are expected to be representative of communities present.

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#### Results

9.3.6 The area sampled was a small island of approximately 140m² with 85% simple vegetative cover. The substrate comprised 60% boulder, 25% cobble, 10% pebble and 5% gravel. The presence of terrestrial vegetation indicated that the ERS structure was only infrequently inundated, most likely during high winter flows.





9.3.7 Four species of beetle were identified from the ERS sample (Table 9.1). All of these species are typical of river shingle and none have any conservation designations.

Table 9.1: ERS results. Conservation status from Sadler & Bell (2002).

Species	No. Recorded	Conservation Status
Paranchus albipes	4	n/a
Bembidion decorum	1	Common
Bembidion tibiale	11	Common
Bembidion femoratum	1	Local

- 9.3.8 *P.albipes, B.decorum* and *B.tibiale* are principally associated with aquatic habitats, common through the UK and found in gravelly river margins and banks. *B.decorum* and *B.tibiale* are often found together despite the former being confined to open gravelly rivers at low attitude, and the latter being characteristic of waters from a montane source. *B.tibiale* is also more tolerant of shaded conditions.
- 9.3.9 *B.femoratum* is a terrestrial species that may be found in open, sparsely vegetated gravel and sandy marginal environments, although its range extends through to clay and sand fully terrestrial habitats.

9.3.10	All three Bembidion species are considered to have a high fidelity to ERS habitats
	Therefore, whilst the overall abundance of ERS species is considered low, the importance
	of minor areas of ERS within the reach may be important in providing discrete areas of suitable habitat for specialist ERS taxa.

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#### 10 DISCUSSION AND CONCLUSIONS

- 10.1.1 An assessment has been made on 17 watercourses crossed by the proposed Scheme. Of these three are designated main rivers under the WFD (River Coquet, Longdike Burn and River Lyne). The remaining 14 watercourses identified from desk study are a mix of tributaries draining the main rivers listed above to minor field drains, largely ephemeral in nature.
- 10.1.2 The River Coquet is an important river in Northumberland as it provides habitat for Atlantic salmon, as evidenced by the incidental capture of a juvenile salmon in close proximity to the existing crossing during crayfish surveys. The desk study indicates that this river also provides habitat for other fish species of conservation interest; European eel, sea trout and lamprey species. Surveys were not undertaken as part of the 2017 assessment however the known migration of these species through the survey area, and importance of the Coquet as a salmonid river in the North East should ensure a high level of conservation importance ins placed upon this watercourse, and its adjoining tributaries. This is supported by invertebrate sampling which demonstrated a community of good ecological value, consistent with the 2016 WFD classification. White-clawed crayfish are reported from the River Coquet at Felton and although not recorded during the 2017 surveys, should be assumed present within the catchment, if not the immediate area around the A1 crossing.
- 10.1.3 Although the macrophyte community and level of physical habitat modification on Longdike Burn are considered poor, the burn supports a diverse community of fish and aquatic macroinvertebrates, reflective of the heterogeneous habitat available in the burn. Lamprey and European eel are important conservation species reported from the 2017 surveys and indicate a connectivity to the wider Coquet catchment.
- 10.1.4 The results of the surveys on the River Lyne are consistent with the most recent WFD classification of Poor for this watercourse, with no macrophytes recorded and only three fish species (bullhead, 3-spined stickleback and an individual juvenile chub) recorded in low numbers. The presence of a significant number of the invasive non-native North American signal crayfish in the River Lyne further reduces the ecological quality of this watercourse; this species is known to feed on fish eggs and juveniles in addition to invertebrates, often resulting in reduced diversity and richness (GB Non-native Species Secretariat, 2016). The fish community recorded in the survey area is much reduced from the community recorded by the Environment Agency at other sites on the burn in 2002 and 2010. While it is likely that this is due to different habitat types between the sites, it cannot be ruled out that anthropogenic stress, including the presence of non-native species has had a detrimental effect on the fish community at the survey site.
- 10.1.5 The minor tributaries and field drains surveyed for various receptors provide a wide range of predominantly low value aquatic habitat. No species of conservation interest were reported from the surveys of minor watercourses. Habitat diversity in these features was generally low, as a result of low summer or ephemeral flows and heavy shading of sites preventing macrophyte growth and associated habitat diversity. Ecological quality (and value) of these sites is considered typical for aquatic habitats type observed.
- 10.1.6 Whilst these watercourses hold limited ecological value on their own, modifications to hydromorphological condition or the use of minor tributaries to take construction and/or operation road drainage has the potential to affect WFD status of the wider catchment and therefore the importance of these watercourses may become greater during Scheme design.
- 10.1.7 None of the ponds potentially impacted by the proposed scheme contained any species of conservation interest, and are considered poor quality using the Index of Biological Integrity (IBI).

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- 10.1.8 During construction of the A1 upgrade the main potential impacts on the aquatic environment will include:
  - Modification of physical habitat through the use of culverts, bridges and outfalls.
     This may result in habitat loss, habitat fragmentation and the disruption to migratory pathways.
  - Disturbance to sensitive species. This is particularly important on the River Coquet, where both noise and visual stimuli may influence the seasonal migration of salmonids, eels and lamprey between spawning, nursery and feeding grounds. Even in the smaller waterbodies species may undertake localised migrations with the sub catchment to utilise different habitat types which may be affected by construction and operational activities.
  - Reduction in water quality form construction and operational discharges. Site runoff may include a wide range of chemicals (hydrocarbons, fuels, salt, metals) that
    can bioaccumulate in living organisms or accrete into soft sediments to become
    bioavailable in the future. Contamination of watercourses may result in
    behavioural responses by mobile species or in extreme cases, mortality in sessile
    organisms.
  - Modification to flow from new discharge points. In the minor tributaries that dominate the majority of new proposed crossings small changes in flow, especially linked to new road drainage or realigned watercourses has the potential to influence existing habitat types, leading to changes in geomorphological processes and habitat morphology.
  - Introduction or facilitation of movement of non-native species. Under the Wildlife and Countryside Act 1981 (as amended in England and Wales) it is an offence to release into the wild any animal which is not ordinarily resident in or a regular visit to Great Britain or to plant or cause in the wild a plant listed on Schedule 9, including New Zealand pigmyweed and curly waterweed. A significant population of North American signal crayfish was recorded in the River Lyne. This species is known to carry crayfish plague (*Aphanomyces astaci*) which can devastate populations of the native white-clawed crayfish. Several non-native plant species were recorded in the pond in the Northumbrian Woodland Burial site and care must be taken not to transfer these. Himalayan balsam was recorded as present along the Minto's Dean.
- 10.1.9 Design and mitigation measures to reduce these impacts include; controlling the timing of in-channel works during key sensitive times of the year, silt control during construction, design of appropriate drainage, including the use of Sustainable Urban Drainage Systems (SUDS), the use of pollution prevention guidance and minimising the footprint of crossing structures.
- 10.1.10 Cognisance should be made of the WFD, which in England and Wales covers not only the main stem waterbody identified by the Environment Agency as the competent authority but also the broad water catchment. This means that minor tributaries and drainage features that discharge into the designated river body should be considered part of the designated waterbody.

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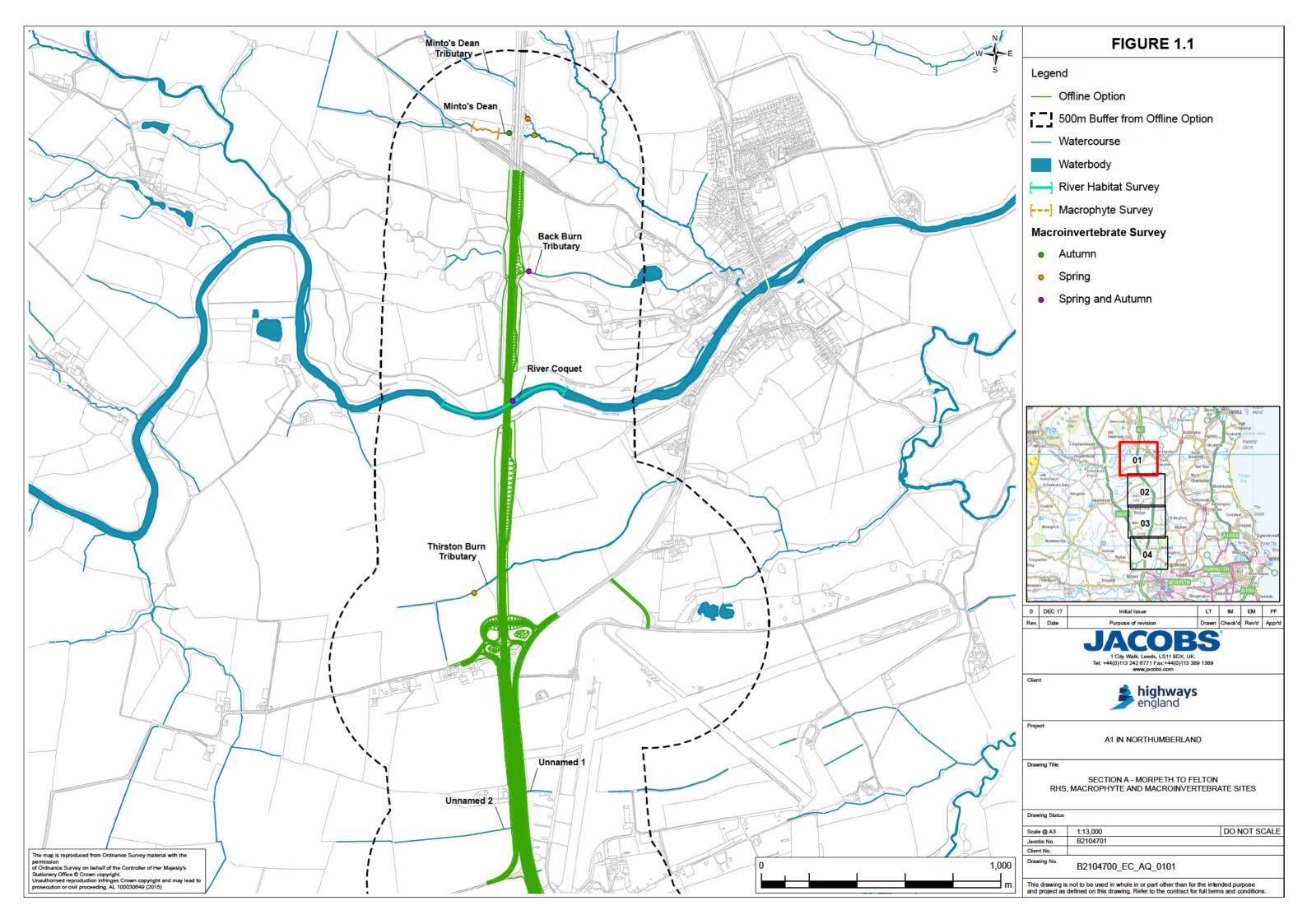
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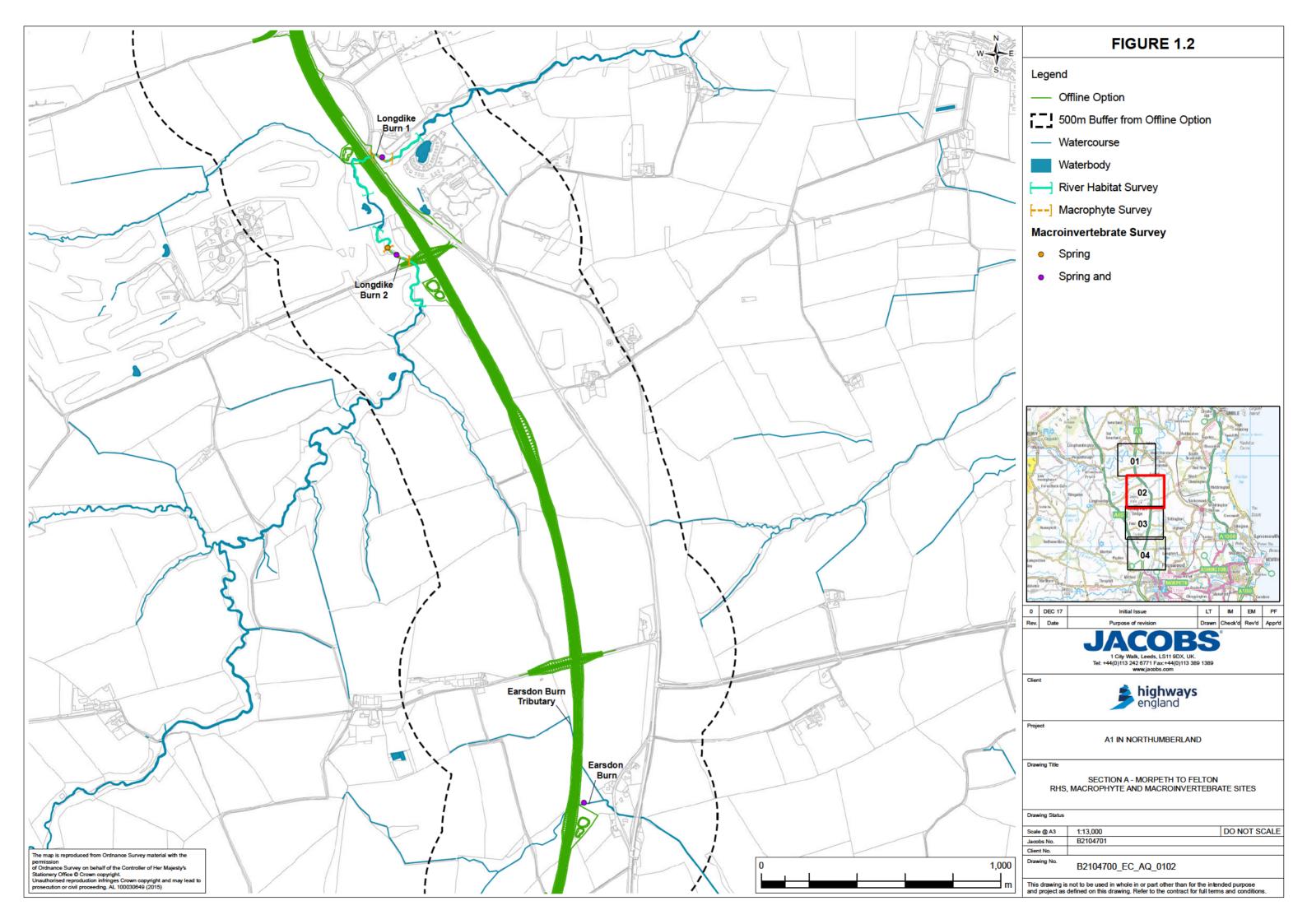
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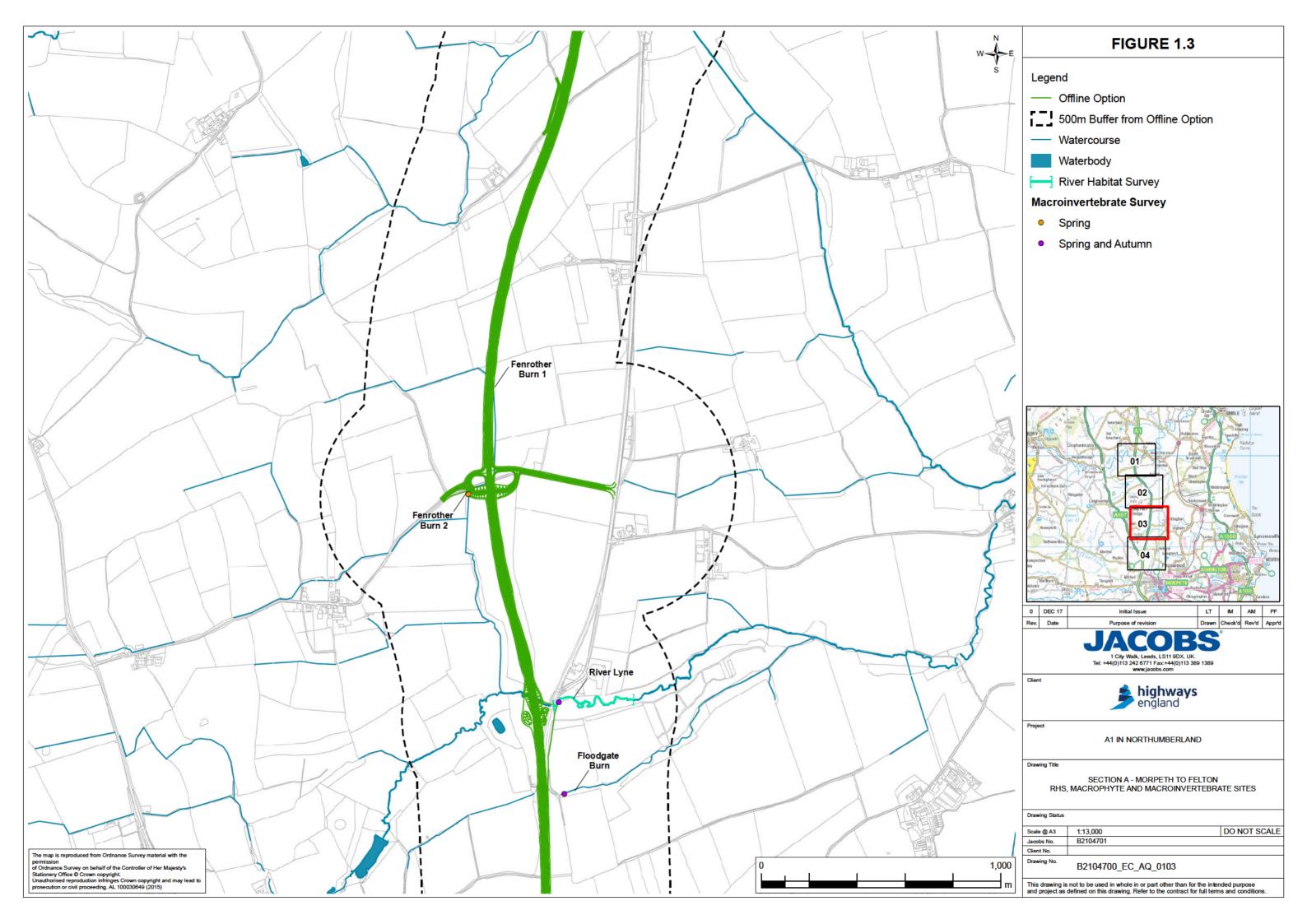
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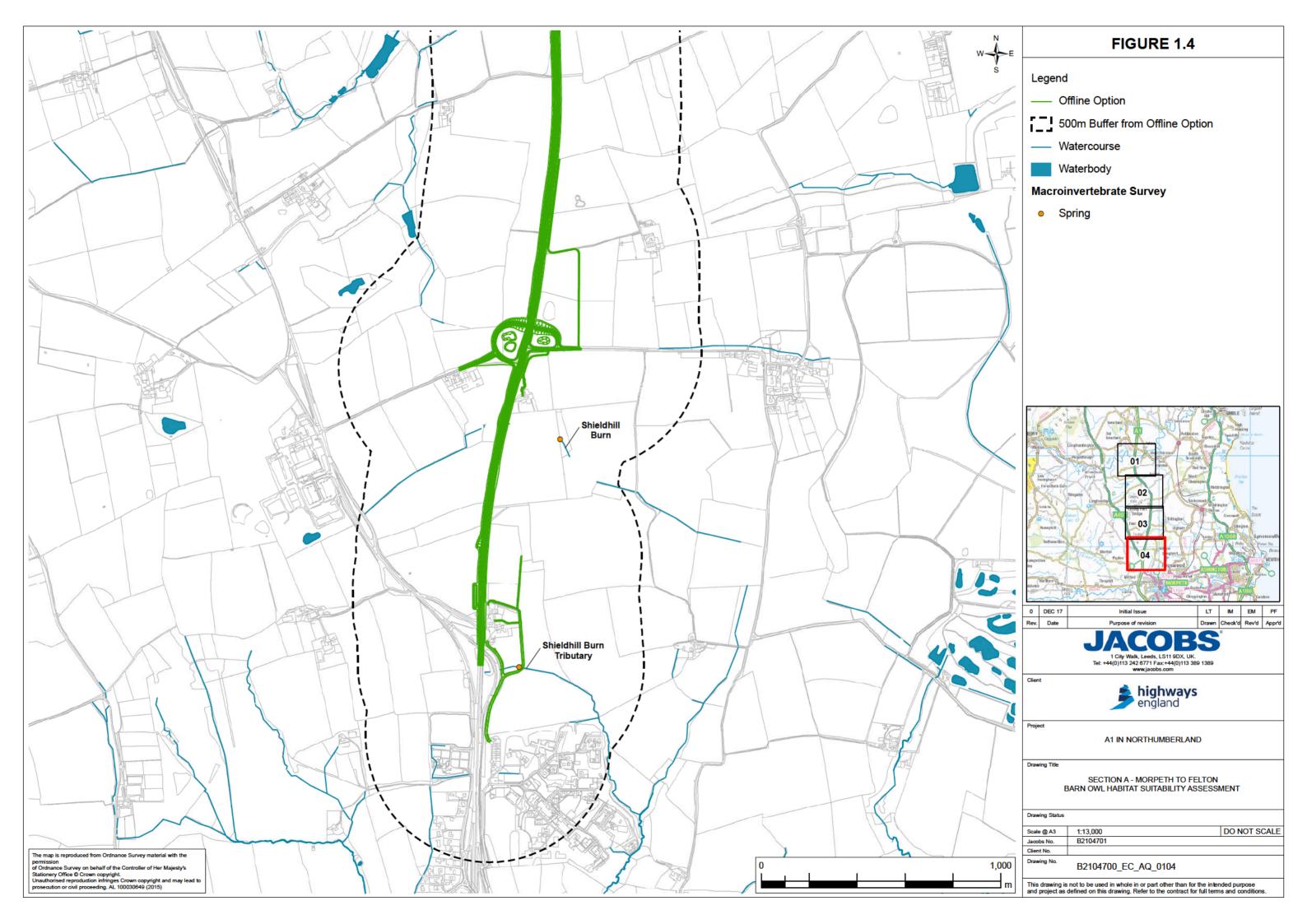
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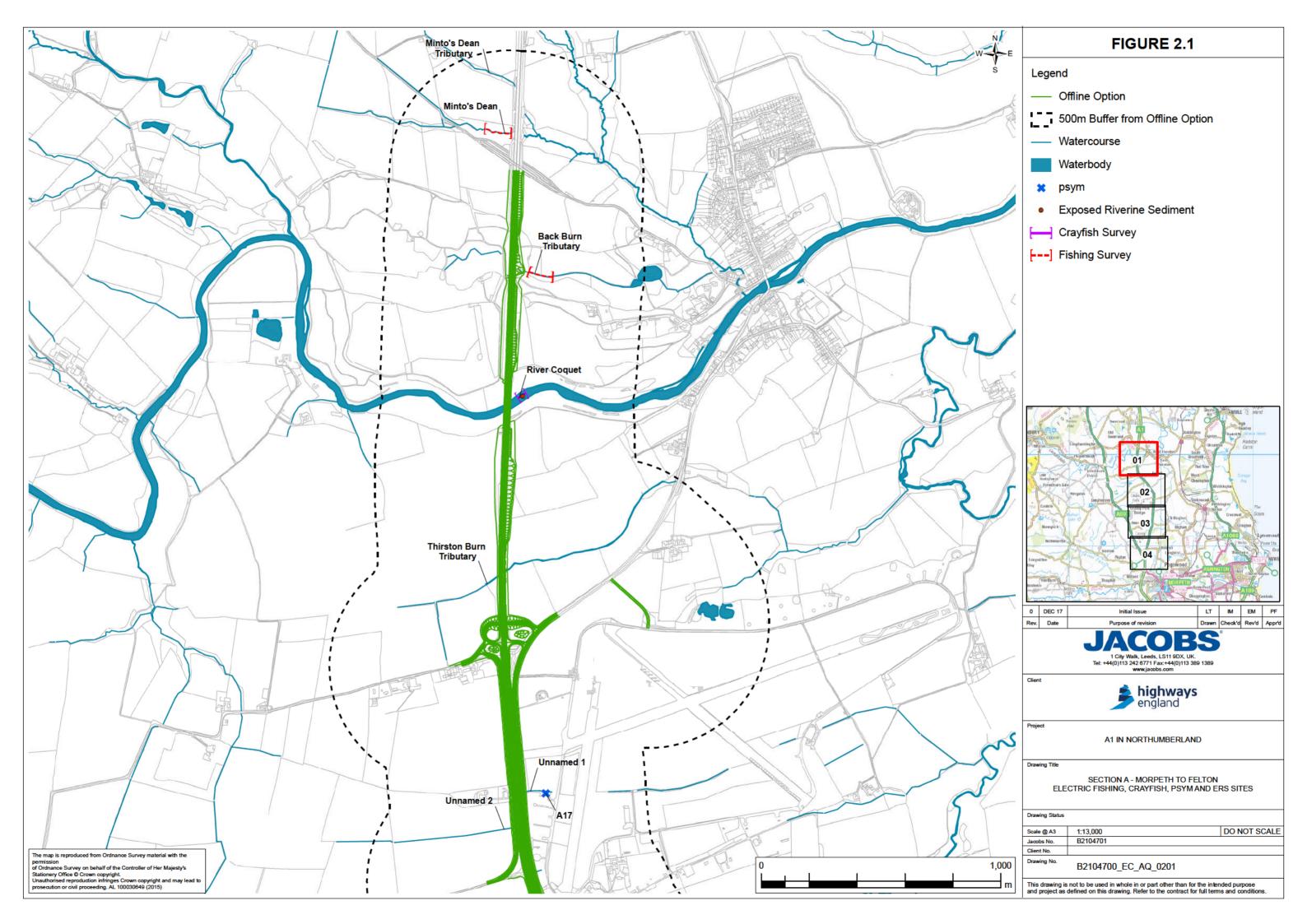
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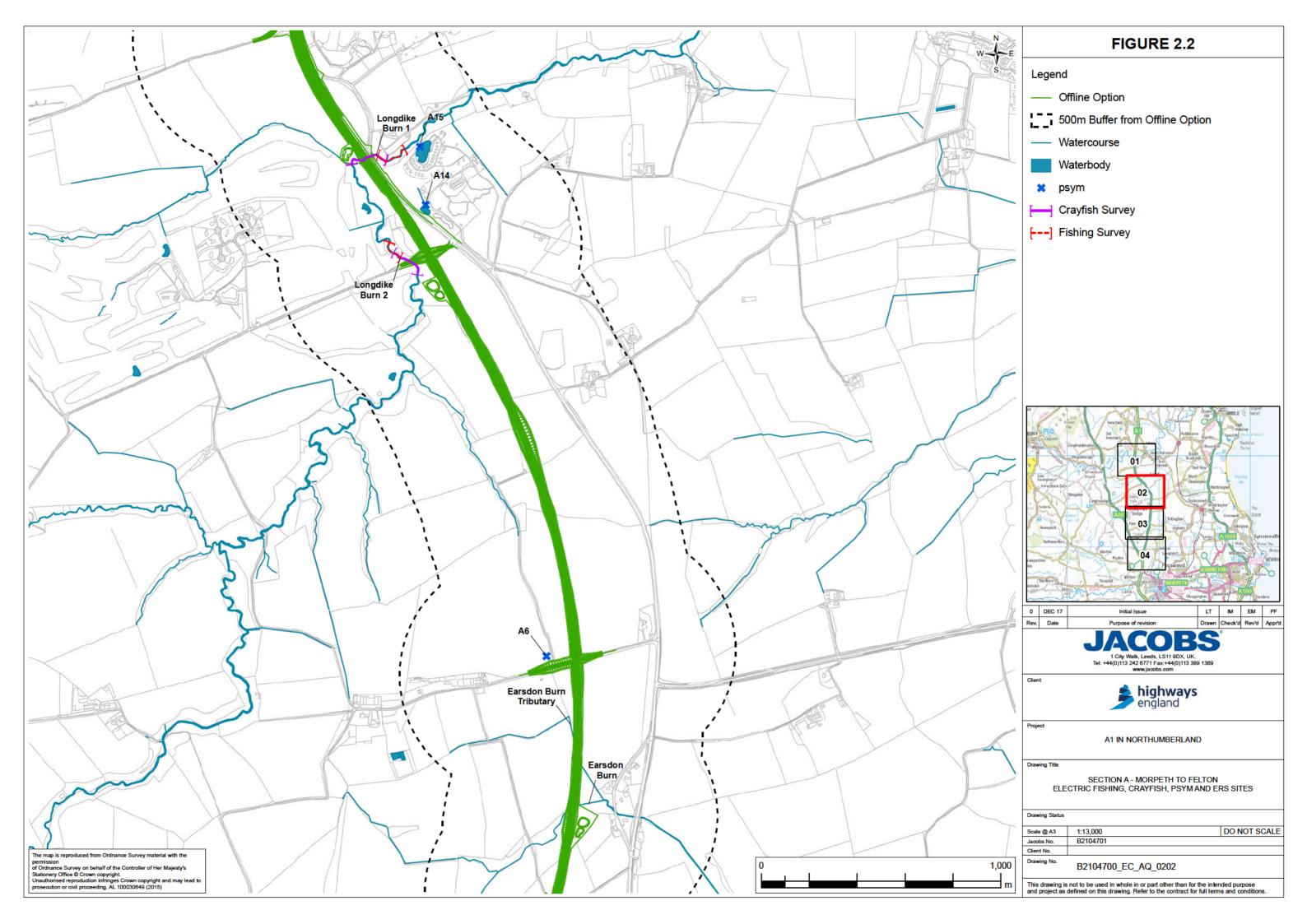


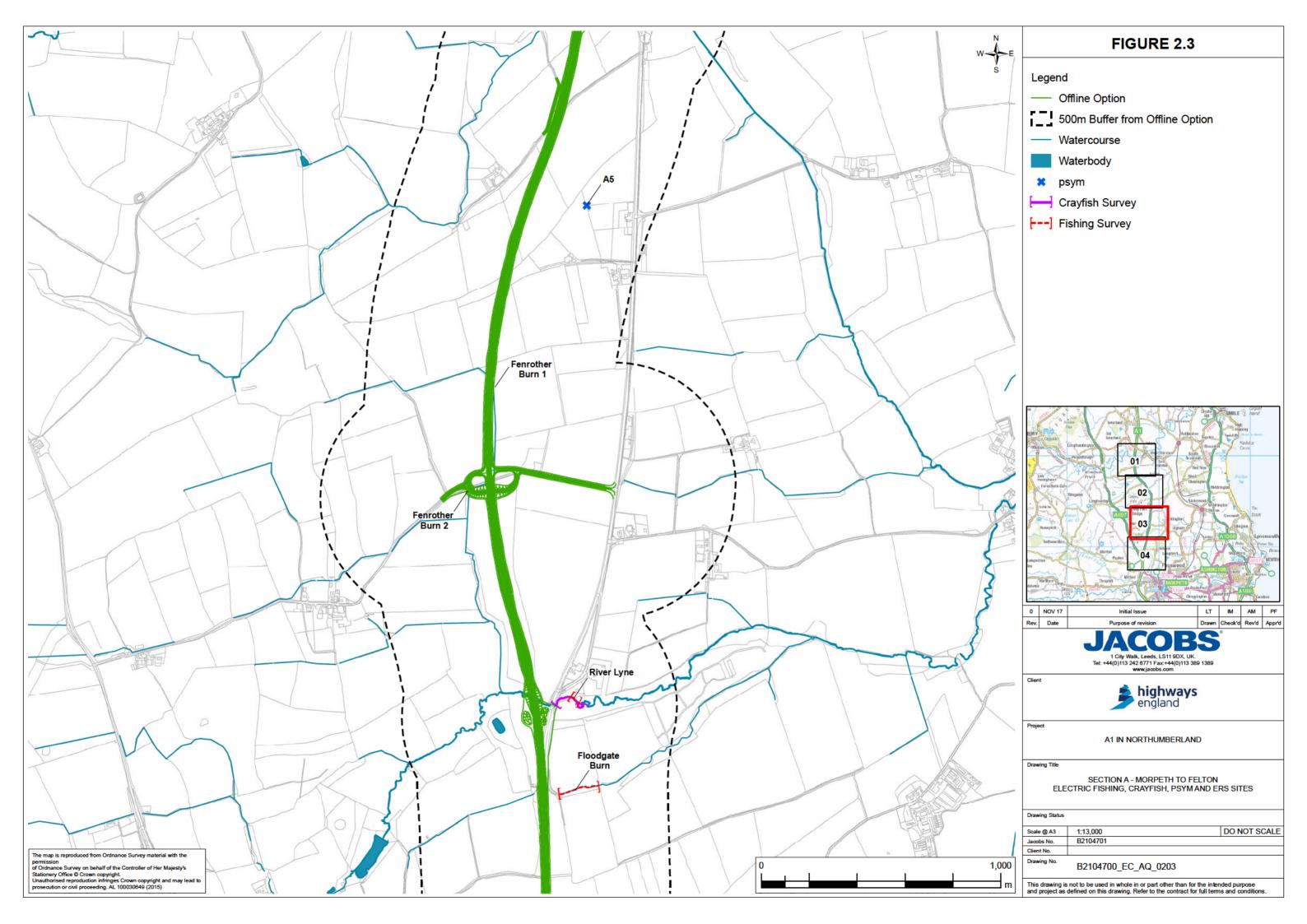


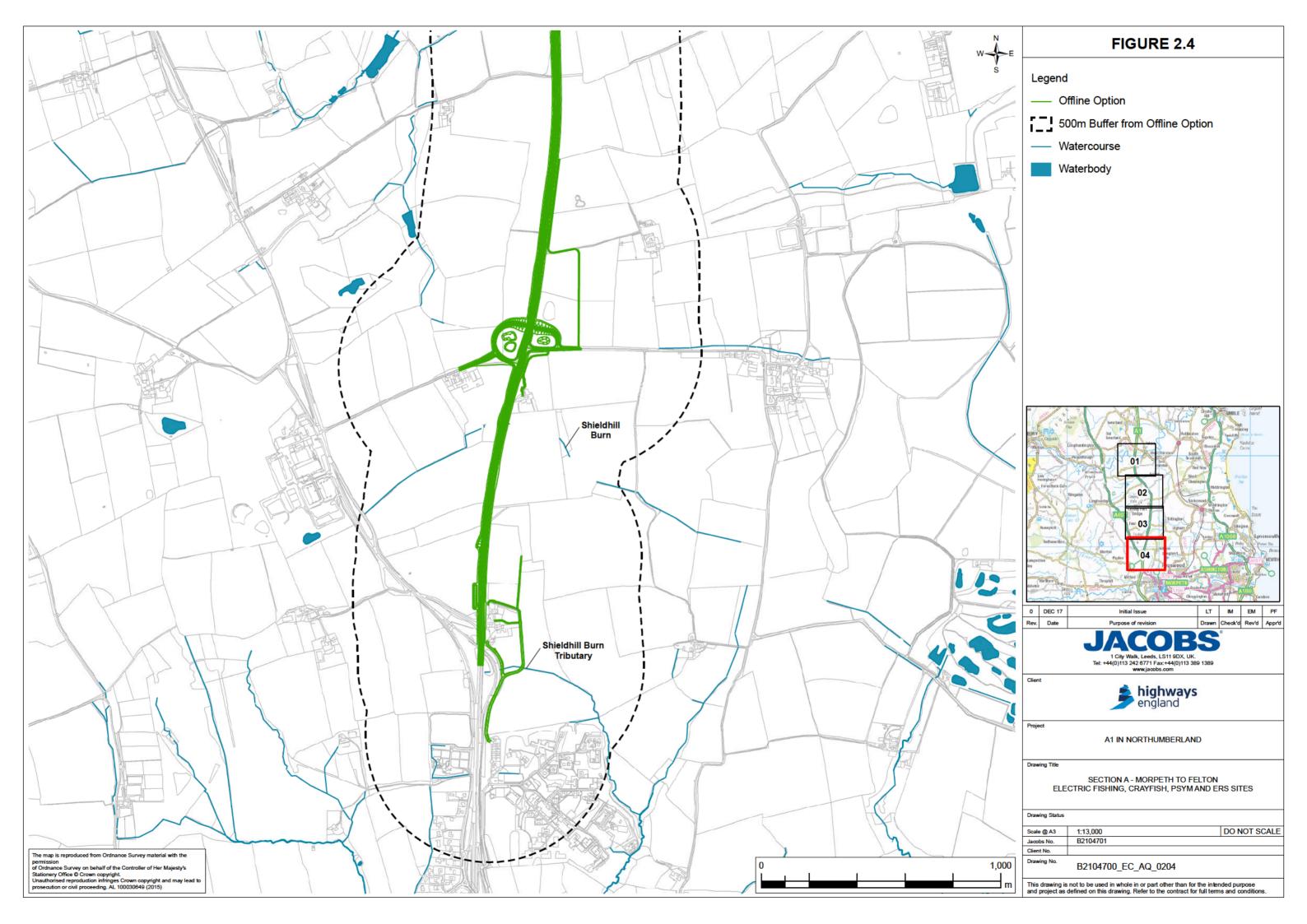












### APPENDIX A - BIOLOGY, HABITAT REQUIREMENTS AND CONSERVATION STATUS OF AQUATIC RECEPTORS

#### **Atlantic Salmon**

11.1.1 Atlantic salmon are anadromous, hatching and spending their juvenile life stages (fry and parr) in freshwater, migrating out to sea as smolts where they undergo rapid growth and, after a few years, return to their natal rivers as adults to spawn. During their freshwater phases, habitat requirements of salmon are relatively specific with clean cobble/ pebble mixes being the preferred habitat. Favourable locations for spawning are likely to occur where there is a river gradient of ≤3% and sites are typically in transitional areas between pool and riffle where suitable course gravels and cobbles are present. Relatively shallow depths (20-40cm) and fast flows (50-75cm/s) are optimal for juveniles, although migrating adults generally require higher flows especially if there are obstructions to pass. Slow flowing systems with a high proportion of silt are not suitable for Atlantic salmon (Hendry and Cragg-Hine, 2003). In general juvenile fish are more sensitive than adults as they are less mobile, being more dependent on specific habitats during development stages. However, much of the available data quantifying impacts relate to adults. Very good water quality is required at all stages of the salmon life cycle.

#### **Brown/Sea Trout**

11.1.2 Brown trout and sea trout represent different morphs of the same species. Sea trout are anadromous, hatching and spending their juvenile life stages (fry and parr) in freshwater, and migrating out to sea as smolts. Sea trout adults return to natal rivers to spawn, after spending several months to a year in rich coastal feeding grounds. Brown trout complete their entire life cycle in the freshwater environment. Interbreeding occurs between sea and brown trout, and habitat requirements for spawning and successful juvenile development are therefore the same. Trout share similar spawning preferences with Atlantic salmon, although trout will reproduce earlier in the season and use smaller headwaters (Armstrong et al., 2003). Relatively shallow depths (20-30cm) and moderate flows (20-50cm/s) are optimal for juveniles, although migrating adults generally require higher flows especially if there are obstructions to pass. In general juvenile fish are more sensitive than adults as they are less mobile, being more dependent on specific habitats during development stages. However, much of the available data quantifying impacts relate to adults. Very good water quality is required at all stage of the trout life cycle.

#### **European Eel**

- 11.1.3 Eels are catadromous, and live their adult lives in freshwater before returning to sea to spawn. Spawning takes places in the Sargasso Sea and elvers (juveniles) migrate back to freshwater systems in the UK, arriving in late winter to spring. Elvers then mature into adults and remain in freshwaters, feeding and growing for up to 40 years (Maitland, 2007).
- 11.1.4 Eel habitat is particularly hard to define, as the species is capable of thriving in all freshwater habitats, providing there is access to the sea. During the daytime eels remain buried under weeds, stones or in mud, but can be found on a variety of other substrate types (Maitland, 2007).
- 11.1.5 Vertical falls present a barrier to eel migration, as eels are incapable of swimming through strong laminar flows or jumping in excess of half their body length (Knights and White,

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1998). Traditional fish passes may not assist upstream migration of European eel, although utilisation of some fish pass types have been observed in larger (>30cm) individuals. Eels can use boundary layers and rough substrates to facilitate migration and the design of eel passes over barriers often incorporates brushes or bristles to encourage climbing as opposed to swimming (Solomon and Beach, 2004).

#### Sea/River/Brook Lamprey

- 11.1.6 There are three species of lamprey in the UK; sea lamprey, river lamprey and brook lamprey. Brook lamprey are typically a non-migratory species that reside in the same stretch of river throughout their entire life cycle, whereas young adults of sea and river lamprey migrate downstream to feeding grounds in estuaries (river lamprey) or the open ocean (sea lamprey). All three species require the same critical habitat in rivers for spawning and the development of ammocoetes (juveniles).
- 11.1.7 Spawning times for the three species differ and are dependent on temperature. Clean spawning gravels in relatively low energy flowing water are essential for spawning (Maitland, 2003). Hatching larvae migrate downstream to nursery areas in slow flowing reaches. Examples of potentially suitable habitat include large deposits of silt and sand on river or stream margins, detritus covering coarser substrates, patches of silt and sand found among tree roots, emergent vegetation, submerged woody debris and larger substrates. Ammocoetes burrow down into the silt/ sand substrate and spend several years developing in tunnels within the sediment. Older ammocoetes may prefer coarser sand and gravel during this time (Maitland, 2003; Dawson et al., 2015). Because of their habitat preferences, ammocoetes exhibit a patchy distribution at small and large spatial scales as they seek out suitable habitat. When ideal habitat is not found, ammocoetes will occupy less suitable habitat, such as areas with mobile coarse sand and gravel, at lower densities (Dawson et al., 2015). After metamorphosis, young adults of river and sea lamprey migrate downstream to estuaries (river lamprey) or open seas (sea lamprey), where they feed and develop into adults.
- 11.1.8 Adults of river and sea lamprey migrate upstream to suitable freshwater spawning habitat, resting in suitable vegetative or rocky cover until suitable water temperatures for spawning are achieved. Brook lamprey do not feed as adults, and therefore only require vegetative or rocky cover to provide hiding places to rest until optimal spawning conditions are achieved. If suitable spawning and ammocoete habitat are located close to each other, brook lamprey do not need to migrate, although individuals are capable of considerable migrations if required. Adult lamprey die shortly after spawning.

#### **White-clawed Crayfish**

- 11.1.9 The white-clawed crayfish is the only species of crayfish native to the UK. They have a preference for hard, mineral-rich water, and are commonly found under larger cobbles or patches of vegetation in rivers and lakes (Holdich, 2003). White-clawed crayfish are found at a range of depths, from shallow (5cm) streams to deep (up to 2.5m) lakes. Some individuals migrate into pools or burrow into river banks during colder winter months. Key habitat features noted by Smith *et al.* (1996) include vertical banks, tall overhanging vegetation and tree roots projecting into the watercourse.
- 11.1.10 The females hold fertilised eggs in a clutch attached to their abdomen until they are ready to hatch. Hatched juveniles develop in the suitable habitat available in their natal waters. Multiple moulting and growing phases are required for crayfish to reach full maturity, although habitat requirements are consistent throughout their life span.

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11.1.11 The UK population of white-clawed crayfish is in decline due to habitat loss and the spread of crayfish plague, both of which are largely attributed to the presence of invasive North American signal crayfish (*Pacifastacus leniusculus*). The North American signal crayfish is widespread throughout the UK and has reduced habitat quality for white-clawed crayfish by eroding muddy embankments in areas where they have become established. They can also act as vectors for crayfish plague, which causes no pathological effects in affected individuals of the North American species but has the capacity to greatly reduce native white-clawed crayfish populations in areas where the two species co-exist.

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#### **APPENDIX B: AQUATIC HABITAT SITE DESCRIPTIONS**

Watercourse	Upstream	Downstream	Description	Photograph
Minto's Dean Tributary	NU 17374 01194	NU 17567 00933	Small woodland channel, 40cm wide and up to 20cm deep in grassy wooded boundary between pasture fields. No macrophytes 70% silt clay substrate with cobbles (15%), pebbles (10%) and gravel (5%) Moderate shading (25-50%) Evidence of cattle poaching	
Minto's Dean	NU 17366 00966	NU 17595 00923	Small channel = 50-75cm wide and on average 10cm deep in small area of broadleaved woodland.  Cobbles (35%), pebbles (35%) gravel (20%) and silt/clay (10%)  Light shading (<25%)  Pool, run and ditch flow types	

#### Aquatic Ecology Survey Report

Watercourse	Upstream	Downstream	Description	Photograph
Back Burn Tributary	NU 17327 00446	NU 17634 00335	Small heavily shaded channel 50cm – 1m wide and an average depth of 5cm flowing through conifer woodland west of the A1 and mixed woodland to the east.  No macrophytes Silt/clay (50%), pebbles (25%) and gravel (25%) Heavy shading (>50%) Run flow types	
River Coquet	NZ 17258 99797	NZ 17532 99867	Large channel up to 40m wide with depth varying from a few centimetres to over 1m. Upstream (west) of the A1 bedrock dominates whereas downstream (east) the substrate is a mixed with small amounts of bedrock at the channel edges.  No macrophytes  Cobbles (40%), Pebbles (20%), gravel (20%), boulders (15%), bedrock (4%), sand (1%)  Riffle, run and glide flow types	

#### Aquatic Ecology Survey Report

Watercourse	Upstream	Downstream	Description	Photograph
Thirston Burn Tributary	NZ 17308 99021	NZ 17575 99152	0.5m wide ditch along hedgerow in arable field. Much of channel contains terrestrial grasses. Water depth ranges from 0-15cm over a soft silt substrate.  No macrophytes 100% silt/clay bed Heavy shading (>50%) Ditch flow type	
Unnamed Tributary 1	NZ 17543 98195	NZ 17634 98188	Small dry channel along hedgerow in arable field.	

### Aquatic Ecology Survey Report

Watercourse	Upstream	Downstream	Description	Photograph
Unnamed Tributary 2	NZ 17371 98023	NZ 17478 98039	Dry channel connected to ornamental pond.	
Longdike Burn1	NZ 17781 97294	NZ 17954 97320	Medium sized channel with an average width of 2.5m and depth ranging from 10cm to 1m. Upstream (west) of the A1 the watercourse flows between two rough pasture fields. Downstream of the A1 the watercourse flows along the boundary on a caravan park, wooded on one bank and open on the other. Pebbles (40%), cobbles (20%), gravel (20%), silt/clay (15%) and sand (5%) Run and glide flow types	

### Aquatic Ecology Survey Report

Watercourse	Upstream	Downstream	Description	Photograph
Longdike Burn 2	NZ 18046 96792	NZ 17916 96946	Medium sized channel with an average width of 3m upstream of the B-road and 2m downstream. Water depth ranges from 10cm to 1m.  Gravel (40%), pebbles (30%), cobbles (15%) sand (5%), silt/clay (5%).  Overlying silt (20%)  Light shade (<25%)  Pool, run and slack flow types	
Earsdon Burn Tributary	NZ 18674 95031	NZ 18717 94830	Small dry channel under hedgerow at edge of grazing pasture	N/A
Earsdon Burn	NZ 18665 94589	NZ 18839 94638	Small watercourse in over-deepened channel 1m wide along boundary of grazing pasture. Average water depth of 15cm  No macrophytes Silt/clay (65%), gravel (20%), pebbles (10%), cobbles (5%) Moderate shade (25-50%) Heavily poached by cattle Run and ditch flow types	

#### Aquatic Ecology Survey Report

Watercourse	Upstream	Downstream	Description	Photograph
Fenrother Burn 1	NZ 18329 92707	NZ 18210 92402	Small channel under hedge row between arable and pasture fields. Mostly dry with 1-2cm water depth in areas.  No macrophytes Gravel (40%), silt/clay (30%), pebbles (25%) and cobbles (5%) Heavy shading (>50%) Over deepened Ditch flow type	
Fenrother Burn 2	NZ 18267 93031	NZ 18329 92863	Dry channel in scrubby boundary between two arable fields	

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Watercourse	Upstream	Downstream	Description	Photograph
River Lyne	NZ 18606 91651	NZ 18699 91636	Medium sized watercourse with an average width of 3m and average water depth of 20cm. Heavily shaded (>50%) as it runs through broadleaved woodland. Seasonal algal film Pebbles (40%), gravel (35%), cobbles (20%), silt/clay (10%). Overlying silt deposits (50%) Run, riffle and slack flow types	
Floodgate Burn	NZ18591 91253	NZ 18764 91291	Small channel running through pasture fields. Average width of 40cm and depth of 15cm.  Cattle poaching evident.  No macrophytes  Gravel (60%), pebbles (25%) silt/clay (10%), cobbles (5%)  Light shading (<25%)  Run and ditch flow types	

#### Aquatic Ecology Survey Report

Watercourse	Upstream	Downstream	Description	Photograph
Shieldhill Burn	NZ 18554 89399	NZ 18588 89329	Small channel 1m wide with approximately 3cm water depth and mixed substrates. Watercourse culverted under arable fields for much of its length with small section less than 100m in length open in a patch of coniferous woodland.  Non filamentous algae (5%) Silt/clay (35%), gravel (30%), pebbles (25%) cobbles (8%), boulders (2%) Low flows, Heavy shading (>50%) Run and ditch flow types	
Shieldhill Burn Tributary	NZ 18312 88440	NZ 1838288446	Ditch at bottom of residential garden.  1m wide and 35cm deep with evidence of septic input.  No macrophytes Silt/clay (50%), gravel (40%), cobbles (5%), pebbles (5%) Heavy shading (>50%) Ditch flow types	

A1 in Northumberland	
Aquatic Ecology Survey Report	

#### **APPENDIX C: RIVER HABITAT SURVEY SHEETS**

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### Aquatic Ecology Survey Report

Site Number¹:	Site Ref. US FELTON	River Name: RIVER		04/08/17.
Grid References/Co-ordinates:	Spot 12:N2.1+17+ 95820	Mid-site: 112 17437 95795		site2: N2 17619 9987
Surveyor Name:		Accredited Surveyor Cod	le: F	4023
Leave blank if new size,		<sup>2</sup> Optional		
Weather Conditions: OVERC	AST WITH SUNN	4 SPECLS		
Flow Conditions: NOR	LMAL			
Site details: (enter comments	or circle if applicable and	give details)		Risk Level (Low/Mod/High
Access and Parking: Ark in a (entry & exit)	hurch corpork + .	cions we vie pro	W	LOW.
Conditions: comment on groun	nd stability, footing, expo	sure/remoteness		Low
Obstacles/Hazards: fencing, &	es dense vegetation, ste	n hants		MOD
Occupied Unoccupied people	livestock, animals			Low
Activities/Land-use: agriculture,	woodland, residential, ind	ustrial, construction, ecrea	Donal	Low
Risk if lone-working NA				LOW
IF THERE ARE A	NY HIGH RISKS OR MO DO NOT CONTINUE V	RE THAN THREE MODER/ VITH THE SURVEY.	ATE RIS	KS
Weil's Disease (Leptospirosis)				
Instructions to card holders				
As infection may enter throughly cleansed and co     Avoid rubbing your eyes, no     Clean protective clothing, fo     After work, and particularly     Report all accidents and/or     Keep your card with you at	overed with a waterproof pose and mouth during wo botwear and equipment of before taking food or drift injuries, however slight.	plaster. ork. etc. after use		ion is
Lyme Disease				R-111 H-
Dress appropriately with ski     Regularly inspect for ticks w     Check for, and remove, any	hen in the field.	after leaving the site		

			RIVER HAB	ITAT SUI	RVEY 2003 V	ersion (		Page 1 of 4
Ā	FIELD SU	RVEY D	TAILS					
Site Re Spot-c Spot-c End of Reach River n Date Survey	theck 1 Grid Ref.  Site Grid Ref.  Reference:  A / 8 /2017  For name: S M	FELTON FELTON FILL PAIS FILL 1745 FI	54 810 54 97795 5 99877 me: 09: 20	Are adver If yes, states Is bed of Is health of Number of Photo ref Site surve	river visible? ba and safety assess of photographs to erences: (C)	rely or not ment form at aken:	partially 2 stached? Yes 2	No C
Accred	Sited Surveyor o	ode: Fr	1023	LEFT	banks determ	ined by faci	ng downstream	n RIGH
-	Distinct flat v	valley botto	deep vee	Yes 🔲	Natur	al terraces?	asymmetrical U-shape valley no obvious va	,
C	NUMBER	OF ROSE	LES, POOLS A	ND POI	NT BARS	(enter tota	I number in bo	nes)
Riffle Pool(	(s) \li			3	Unvegetated p			8
D	ARTIFICIAL	FEATUR	ES (nidicate total	number of	econtences of e	ach category	within the 500m	ste)
If none, tick box	Weirs/sluices Culverts	Major Ø	Intermediate O	Miner	Outtails/ intakes Fords Deflectors/	Major 2	Intermediate	Minar
	Bridges Other + state		0	-	Deflectors/ greynes/creys	ь	,	-
ls e		lously ove	er-deepened?	10 0	Yes, <33% Yes, <33% Yes, <33%	of site	≥33% of ≥33% of ≥33% of	site 🗌

	HABITA							_		ge 2 o	_
Spot-check 1 is at: upstream and	downstre	am end	0	O	site (ti	ck one l	ээх)	_			_
When boxes 'bordered', only one entry allow	red 1 GP	s 2	3	4	5	6 GPS	7	В	g	10	GP
writen boxes barbarea, only one entry allow	60 1 51	100	7	92201	-	lo dr s		-	,	10	ur
Material ov. no. no. co. co. co. pr. co. cc. sp. wr. ca. nr. nr. to	FA BEA	INM	EA	EA.	EA	95	E.A.	FA	E.	EΑ	
Bank modification(s) HE, NR, RS, RE, PC(B), BM, E	_	NE.	NO.	No	N	No	No.	r/o	EK NO	NO	1
Marginal & bank feature(s) HV, HO, EC, SC, PB, VP, SB,	_	NV	NO.	NO	EC	EC	FC	1/3	NO	NO.	1
CHANGE	1410	19.9	10.00	1100	100			100	14.0	100	
Channel substrate NV, SE, SG, CO. CP, SA, SI, CI., PE, SA	M BE	BE	Ĩ3€	8€	RE	BE	(0	NV	W	w	150 A
Flow-type NV, FF, CH, BW, UW, CF, RP, UP, SM, NP, D	-	SM	SM	SM	88	BW	UW	RI	SM	SM	34
Channel modification(1) HK, NO, CV, RS, NJ, DA.		No	1/1	110	No	No	No	1/10	No	Na	1
Channel feature(s) NV, NO, EB, RO, VR, MB, VB, M		-	No	No	No	No	VB.	Na	NO	NO.	sg
For braided rivers only: number of sub-chan				1	14.0	100	1	1.44		1	3
RIGHT BANK			113		10.00				16-		E
Material MV. BE, BO, CO., CE, EA, PE, CL, CC, SP, WP. GA, SR; RE, TO	RFAM NV	NV	BE	3€	NV.	BR.	NV	NV	NV	NV	Par.
Bank modification(s) NK, NO, RS, RI, PC(B), BM, E	IM PJO	No	No	ND	No	RS/RI	No	No	No	MI	press
Marginal & bank feature(s) NV, NO, EC, SC, PR, VP, SR,	VINB EC	EC	No	No	NO.	NO	No	WO	EC	EC	1 2
E PANET DE LAND ILLE AND VEGET	ATION 5	1	10.73	1000						-	1 ×
Land-use: choose one from BL BP. CW. CP.	SH. OR. V			ow. RE	. IG. 7	H. RD.	SU. T	LILP	G NV	_	96 of
Land-use: choose one from BL, BP, CW, CP,		/L, MH	, AW,	-	_	H, RD,	SU, TI	L, IL, P	G, NV	1.1/	% of who
LAND-USE WITHIN 5m OF LEFT BANKTOP	BL	JL, MH	8L	BL	BL	BL	SU, TI	BL	G, NV	ÜL.	% of whole site
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  ByURSICA	BL.	JL, MH	8L C	BL	BL (	BL C	BL	BL	BL C	Č	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  BRUSSICN  BRUSSICN	8L w C	BL C	&L C S	BL C	BL (	BL C 9	BL C	BL C	BL C	<u>ر</u> د	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  Brusscri  LEFT BANK-FACE (structure)  Brusscri  Brusscri  Brusscri  Brusscri	8L w C w 5	JL, MH	&L C S	BL C C	3L ( c	SL C 5	BL	BL	BL C	c 5	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  BYWSICH  LEFT BANK-FACE (structure)  BYWSICH  RIGHT BANK-FACE (structure)  BYWSICH  BYWSICH  BYWSICH	8L	BL C S C	8L C S V	BL C C	() ( ( (	SL S S NV	BL C C	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  Brusscri  LEFT BANK-FACE (structure)  Brusscri  Brusscri  Brusscri  Brusscri	8L w C w 5	JL, MH	&L C S	BL C C	3L ( c	SL C 5	BL C	BL	BL C	c 5	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  BYWSICH  LEFT BANK-FACE (structure)  BYWSICH  RIGHT BANK-FACE (structure)  BYWSICH  BYWSICH  BYWSICH	8L	BL C S C	8L C S V	BL C C	() ( ( (	SL S S NV	BL C C	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  BYWSICH  LEFT BANK-FACE (structure)  BYWSICH  RIGHT BANK-FACE (structure)  BYWSICH  BYWSICH  BYWSICH	BL VV C VV S VV S VV C BL	BL C S C	8L C S V	BL C C	() ( ( (	SL S S NV	BL C C	BL C C	BL C C	ر د خ	spot-checks but present in >1% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  RJUSSCON  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  BIUSSCON  LAND-USE WITHIN 5m OF BIGHT BANKTOP	8L	BL C S C	8L C S V	BL C C	() ( ( (	SL S S NV	BL C C	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  RJUSSCH  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  BIUTSICH  LAND-USE WITHIN 5m OF RIGHT BANKTOP  None (**) or Not Visible (NV)		BL C S C	8L C S V C	C C C C C C C C C C C C C C C C C C C	() ( ( (	SL S S NV	C C 3L	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  R/W5/C/n  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  BILIFICAT  LAND-USE WITHIN 5m OF RIGHT BANKTOP  None ( ) or Not Visible (NV)  Liverworts/mosses/lichens	BL VV C VV S VV S VV C BL	BL C S C	8L C S V C	BL   C   V   C   BL   V   C   BL   V   C   C   C   C   C   C   C   C   C	3L C C BL	SL C S B NV SV	BL C C C 3L	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANK-TOP (structure within 1m)  Brussce  BRIGHT BANK-FACE (structure)  BRIGHT BANK-FACE (structure within 1m)  BRUSSCE  BRIGHT BANK-FACE (structure within 1m)  BRUSSCE  BRUSSCE		BL C S C	8L C S V C	BL   C   V   C   BL   V   C   BL   V   C   C   C   C   C   C   C   C   C	3L C C BL	SL C S B NV SV	BL C C C 3L	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANK-TOP (structure within 1m)  Brusscen  BIGHT BANK-FACE (structure)  BIGHT BANK-FACE (structure)  BIGHT BANK-FACE (structure within 1m)  BIGHT BANKTOP (structure within 1m)  BIGHT BANKTOP  LAND-USE WITHIN 5m OF BIGHT BANKTOP  None (~) or Not Visible (NV)  Liverworts/mosses/lichens  Emergent broad-leaved herbs  Emergent reeds/sedges/nishes/grasses/horsetails		BL C S C	8L C S V C	BL   C   V   C   BL   V   C   BL   V   C   C   C   C   C   C   C   C   C	3L C C BL	SL C S B NV SV	BL C C C 3L	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANK-TOP (structure within 1m)  Brusscer  BIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure within 1m)  Brusscer  RIGHT BANKTOP (structure within 1m)  Brusscer  RIGHT BANKTOP  LAND-USE WITHIN 5m OF RIGHT BANKTOP  LAND-USE WITHIN 5m OF RIGHT BANKTOP  Liverworts/masses/lichens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails  Floating-leaved (rooted)		BL C S C	8L C S V C	BL   C   V   C   BL   V   C   BL   V   C   C   C   C   C   C   C   C   C	3L C C BL	SL C S B NV SV	BL C C C 3L	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANK-TOP (structure within 1m)  Brusscen  BIGHT BANK-FACE (structure)  RICHT BANK-FACE (structure)  RICHT BANK-FACE (structure within 1m)  BIGISTOR  LAND-USE WITHIN 5m OF RIGHT BANKTOP  LAND-USE WITHIN 5m OF RIGHT BANKTOP  Liverworts/mosses/lichens  Emergent broad-leaved herbs  Emergent broad-leaved herbs  Emergent reeds/sedges/nishes/grasses/horsetalls  Fibating-leaved (rooted)  Free-floating		BL C S C	8L C S V C	BL   C   V   C   BL   V   C   BL   V   C   C   C   C   C   C   C   C   C	3L C C BL	SL C S B NV SV	BL C C C 3L	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANK-TOP (structure within 1m)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure within 1m)  BILITICAL  LAND-USE WITHIN 5m OF RIGHT BANKTOP  LAND-USE WITHIN 5m OF RIGHT BANKTOP  Liverworts/mosses/lichens  Emergent broad-leaved herbs  Emergent reeds/sedges/nishes/grasses/horsetails  Floating-leaved (rooted)  Free-floating  Amphibious		BL C S C	8L C S V C	BL   C   V   C   BL   V   C   BL   V   C   C   C   C   C   C   C   C   C	3L C C BL	SL C S B NV SV	BL C C C 3L	BL C C	BL C C	ر د خ	% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANK-TOP (structure within 1m)  R/WSC/N  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure within 1m)  BILLIFON  LAND-USE WITHIN 5m OF RIGHT BANKTOP  WITHIN 5m OF RIGHT BANKTOP  Liverworts/messes/lichens  Emergent broad-leaved herbs  Emergent reeds/sedges/nishes/grasses/horsetails  Floating-leaved (rooted)  Free-floating  Amphibious  Submerged broad-leaved		BL C S C	8L C S V C	BL   C   V   C   BL   V   C   BL   V   C   C   C   C   C   C   C   C   C	3L C C BL	SL C S B NV SV	BL C C C 3L	BL C C	BL C C	ر د خ	% of whole site.

SITE REF.	RIVER HAE	SITAT	SURVE	EY : 500m SWEEP-UP	Page	3 of 4
H LAND-USE WITH	0N 50m OF 845	истор	1340	v' (present) or E (≥ 33% banklength)		
		L	R		L	R
Broadleal/mixed woodland	(serri-natural) (BL)	E	F	Natural open water (OW)		
Broadleaf/mixed plantation	(BP)			Rough/unimproved grassland/pasture (RP)		
Coniferous woodland (sem	i-natural) (CW)			Improved/semi-improved grassland (IG)		
Coniferous plantation (CP)				Tall herb/rank vegetation (TH)		
Scrub & shrubs (SH)	-			Rock, scree or sand dunes (RD)		
Orchard (OR)				Suburban/urban development (SU)	10	-
Wetland (e.g. bog, marsh,	fen) (WL)			Tilled land (TL)		
Moorland/heath (MH)				Irrigated land (IL)		
Artificial open water (AW)				Parkland or gardens (PG)		
				Nut visible (NV)		
T BANK PROFILES	VAZ (presen	0 0 €	(p196.1)	inklingths		
Natural/unmodified		L	R	Artificial/modified	L	R
Vertical/undercut	7 m 7 m	E	E	Resectioned (reprofiled)		1
Vertical with toe	7um			Reinforced - whole		-
Steep (>45")	\		E	Reinforced - top only		
Gentle —				Reinforced - toe only		
Composite	~~~			Artificial two-stage		
Natural berm	~			Poached bank		
				Embanked	-	
				Set-back embankment		
1 PX UNIT OF BUSY	ASSESSED	COLC	VD 1975	Marini para 1 e 196	_	
TREES (tick one	box per bank)			ASSOCIATED FEATURES (Lick one box per lea	ture)	
44		Right		None Prese	nt EG	33%)
None				Shading of channel	- 1	4
Isolated/scattered	_	ч		*Overhanging boughs	Ļ	1
Regularly spaced,		H		*Exposed bankside roots	- 1	1
Occasional clump	, 1	Н.		*Underwater tree roots	- 7	=
Semi-continuous Continuous	i i	7		Large woody debris	/	<b>i</b>
Continuous	ANNE AND EA	T delt	TLAFS	thick one box for each testural. The each resum	-1/5	_
	None P	resent	E(233%)	None Pr	esent E	(>33%)
*Free fall flow	a			Exposed bedrock	Or.	
Chute flow	<b>a</b>			Exposed boulders	a.	
Broken standing waves		3		Vegetated bedrock/boulders	9	0
Unbroken standing waves		9		Unvegetated mid-channel bar(s)	ā.	
Rippled flow		3		Vegetated mid-channel bar(s)	3	
*Upwelling		O	0000	Mature island(s)	0	
Smooth flow	ō	ō	a	Univergetated side bar(s)	ō	ō
No perceptible flow	ā	ñ	ō	Vegetated side bar(s)	ō	ō
No flow (dry)	id.	T	H	Unvegetated point bar(s)	T .	ă -
Marginal deadwater	Ġ.	ō	ŏ	Vegetated point bar(s)	ñ	ō
Eroding cliff(s)	ŏ	ŏ	ā	*Unvegetated silt deposit(s)	ō	ō
Stable cliff(s)	G	ō	ō	*Discrete unvegetated sand deposit(s)	ō	
	_			*Discrete unvenetated gravel dengatifs)		

L CHANNELDIN	RIVE	R HABIT	AT SURV	EY : DI	MENSION	S AND I	INFLUEN	ICES Page	e 4 of
	IENSION:	to te m	express at or	in location	in a Gray	tr undum	i per time to	velocably acro	15 4 11
LEFT BANK			CHANNEL			RIGHT B	ANK		
Banktop height (m) 🖰	TIMATER	30	Bankfull wi	idth (m)	35	Banktop	height (m	) Estimated	30
ls banktop height also height? (Y or N)	bankfull	N	Water wid	th (m)	35.	ls bankte height?	op height (Y or N)	also bankfull	N
Embanked height (m)		/	Water dep	th (m)	0.5	Embank	ed height	(m)	-
If trashline lower than	banktop, ir	dicate: h	eight above	water (m)	= 4	vidth from	bank to b	ank (m) =	
Bed material at site is:		cons	solidated (	unc	onsolidated	(loose)	9	unknov	vn 🗆
Location of measurem	ents is: rif	ile 🖳 ot	her 🔲 (state	e)					
M FEATURES OF	SPECIAL								
None Braided channels Side channel(s) *Natural waterfall(s) > 5i *Natural waterfall(s) < 5i Natural cascade(s)	_	*Debris o *Leafy de	ebris reed-bank(s) bank(s)		Backwater(s Floodplain b Water mean Fen(s) Bog(s) Wet woodla	ooulder dep dow(s)	oosits	Marsh(es) Flush(es) Natural open water Others (stat	(e)
N CHOXED CHA	NOVEL 1	ick one bo	x):				THE PARTY		
ls 33% or more of the	channel ch	oked with	venetation?		No F		Yes		-
O ALOYA DEC AND	A CARDON AND		COIN-					Control in	
*Japane	se knotwee	d 🔲	(Greit s	*01	her (state)	add oth	-1 1/1/2	entagi	]
									hausir
mining - quarying - over Evidence of recent gravel extraction - oth Animals: offe min Other significant o	managem er (please s ik - water vo	ent: dre pecify) ile - kingfisl	her - dipper -	grey wagt	weed cutti ail - sand m	ng - enhar artin - hero	n - dagon	flies/damselflie	5
Evidence of recent gravel extraction - oth Animals: offe min Other significant o	managem er (please s ik - water vo	ent: dre pecify) ile - kingfisl	her - dipper -	grey wagt	weed cutti ail - sand m	ng - enhar artin - hero	n - dagon	flies/damselflie	5
mining - quarrying - ove Evidence of recent gravel extraction - oth Animals: <a href="Title">Title</a> min Other significant o observations	managem er (please s k - water vo bservation	ent: dre pecify) ile - kingfisl	her - dipper - ressary use se	grey wagt eparate sh	weed cutti ail - sand m	ng - enhar artin - hero ibe overall	n - dagon	flies/damselflie istics and rele	s vant

Site Number <sup>1</sup> :	Site Ref: DIS A	River Name NE	Date: 02/01/17-
Grid References/Co-ordinates:	1000	Mid-site: "1817 SILVE	End of site2: 122 12213
Surveyor Name:		Accredited Surveyor Cod	
beave blank if new site.		<sup>2</sup> Optional	
Weather Conditions: 00%	RCAST W/ SHOWE	rs.	
Flow Conditions: North			
Site details: (enter comments	or circle if applicable an	nd give details)	Risk Level (Low/Mod/High
Access and Parking: MAK IN (entry & exit) Land _ G	offer LAYBY -	- 6 femelt from owner	DOD.
Conditions: comment on grou	und stability, footing, exp	posure/remoteness	Low
Obstacles/Hazards: fencing, st	iles, dense vegetation, s	reep bank	Lon
Occupied/Unoccupied: people WALKELS / Dal W			Low
Activities/Land-use: agriculture	, woodland, residential, in	ndustrial, construction, recrea	LOW .
Risk if Ione-working	-	- 41	COL
IF THERE ARE		ORE THAN THREE MODER.	ATE RISKS
Weil's Disease (Leptospirosis	)		- hill-hi-LM W
Instructions to card holders			
As infection may enter throughly cleansed and c     Avoid rubbing your eyes, r     Clean protective clothing,     After work, and particularly     Report all accidents and/or     Keep your card with you ar	overed with a waterproof lose and mouth during water footwear and equipmen water before taking food or do injuries, however slight	of plaster. work. t etc. after use trink, wash hands thoroughly	
Lyme Disease			
Dress appropriately with sk	sin covered up.		
2. Regularly inspect for ticks v			
Check for, and remove, an     Seek medical attention if by		le after leaving the site.	

			RIVER HAB	ITAT SUI	RVEY 2003 V	ersion		Page 1 of 4
A	FIELD SUR	VEY DE	AILS					
Spot-ch End of s Reach R River na Date	mber:	4NE 1844 - 1845 1844 - 1845 1844 - 1845 1845 1845 1845 1845 1845 1845 1845	1115	Are adver  If yes, stal  Is bed of  Is health a  Number of	part of a river or an se conditions affi- te	rely or not ment form atta	No Partially Pached? Yes Pached?	No 🔲
Accredi	ited Surveyor co	de: FA-0	13	LEFT When	banks determ			
B	PREDOMI	NANT V	LLEY FORM	(withle	the horizon	n limit)	(tick one box	only)
	Distinct flat val	0	shallow vee deep vee gorge	Yes 🛄	Natur	al terraces?	asymmetrical U-shape valle no obvious va	valley
Riffle(s	s)	OF RIFFL	bet restu	6	Unvegetated p		number in bo	# 6
	ARTIFICIAL F	EATURES	(indicate total	number of	occurrences of e	ach category v	within the 500m	site)
lf [		Major	Intermediate	Minor		Major	Intermediate	Minor
none, tick	Weirs/sluices	0	c		Outtalls/ intakes	0	0	D
box	Culverts Bridges Other - state	0		,	Fords Deflectors/ groynes/crays	0	0	5
ls c	hannel obvio hannel obvio vater impoun	usly over	deepened?	No O	Yes, <33% Yes, <33% Yes, <33%	of site	≥33% of ≥33% of ≥33% of	site 🔲

SITE REF. RIVER HA	ABITAT	SURVI	EY : 500m SWEEP-UP	Page 3	3 of
H LAND-USE WITHIN 50m OF E	BANKTOP	Use	✓ (present) or E (≥ 33% banklength)	DIFFE	
	L	R		L	R
Broadleaf/mixed woodland (semi-natural) (	BL) &	fa.	Natural open water (OW)		
Broadleaf/mixed plantation (BP)			Rough/unimproved grassland/pasture (RP)		
Coniferous woodland (semi-natural) (CW)			Improved/semi-improved grassland (IG)		
Coniferous plantation (CP)			Tall herb/rank vegetation (TH)		
Scrub & shrubs (SH)			Rock, scree or sand dunes (RD)		
Orchard (OR)			Suburban/urban development (SU)	/	1
Wetland (e.g. bog, marsh, fen) (WL)			Tilled land (TL)		
Moorland/heath (MH)			Irrigated land (IL)		_
Artificial open water (AW)		3	Parkland or gardens (PG)		
			Not visible (NV)		
I BANK PROFILES Use ✓ (pre	sent) or E	(p.33% b	anklength)		
Natural/unmodified	L	R	Artificial/modified	L	R
Vertical/undercut	E	18	Resectioned (reprofiled)		
Vertical with toe			Reinforced - whole		
Steep (>45")	/	1	Reinforced - top only		
Gentle	1		Reinforced - toe only	1	
Composite			Artificial two-stage		
Natural berm			Posched bank		
			Embanked		
			Set-back embankment		
EXTENT OF TREES AND ASSOC	ATED FEA	TURES	Procord even if <1%		
TREES (tick one box per bank) Left	Right		ASSOCIATED FEATURES (tick one box per feat None Preser		200
None	Right		Shading of channel	IL E (35	
Isolated/scattered	ă.		*Overhanging boughs		í
Regularly spaced, single	ă		*Exposed bankside roots	- Ĕ	i
Occasional clumps	ŏ		*Underwater tree roots	- 7	î .
Semi-continuous	ŏ		Fallen trees		í .
Continuous	- G		Large woody debris	- 6	i
K EXTENT OF CHANNEL AND I	BANK FEA	TURES	(tick one box for each feature)	<1%	
None	Present E	(≽33%)		sent E()	33%
*Free fall flow			Exposed bedrock	<u> </u>	Ţ
Chute flow	Щ		Exposed boulders	4 [	_
Broken standing waves	ш		Vegetated bedrock/boulders		_
Unbroken standing waves		_	Unvegetated mid-channel bar(s)		
Rippled flow .			Vegetated mid-channel bar(s)		
*Upwelling			Mature island(s)		
Smooth flow			Unvegetated side bar(s)	3 . 0	
No perceptible flow			Vegetated side bar(s)	3 (	
	ō	<u> </u>	Univergetated point bar(s)	J i	5
No flow (dry)	=		Vegetated point bar(s)	5 6	5
Marginal deadwater	Н	ă.		5 6	5
			*Univegetated silt deposit(s)  *Discrete univegetated sand deposit(s)	1	5

	BITA	r sui	RVEY	: TEI	N SP	OT-CI	IECK	S	Pag	ge 2 o	f 4
Spot-check 1 is at: upstream end dow	wnstrea	m end		0	f site (ti	ick one	box}				
E PHYSICAL ATTRIBUTES (to be assessed a	cross c	hanne	with	n lm s	vide tr	ansect					
When boxes 'bordered', only one entry allowed	1 GPS	2	3	4	5	6 GPS	7	8	9	10	GP
LEFT BANK		Rim	) EC o	r SC if	comp	osed of	sandy	/ subst	rate		
Material NV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, BI	NV	MA	EA	EΑ	EA	GA	ΕiΑ	92	55	EA	
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EM	NK	NK	W	No	No	No	N/o	NO	NO	NO	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	NV	₩V	EC	PB	EC	No	EC	PB	SB	No	
CHANNEL			GP-r	ing eitl	her G	or P if p	oredon	ninant			
Channel substrate NV, BE, BO, CO, GP, SA, SI, CL, PE, EA, AR	AR.	N۸	51	60	@ p	0)	Co	CO	CO	Co	90 : CL G
Flow-type NV, FF, CH, BW, UW, CF, RP, UP, SM, NP, DR	NV	NV	SM	SM	SM	DVQ.	SM	94	RP	SM	١.
Channel modification(s) NK, NO, CV, RS, RI, DA, FO	CV	NK	No	No	No	No	No	No	No	M	
Channel feature(s) NV, NO, EB, RO, VR, MB, VB, ML TR	NV	W	No	No	No	W	NO	NO	ND	No	spot-checks b
For braided rivers only: number of sub-channels	1										1
RIGHT BANK		Rin	g EC d	xr ŞC if	comp	ased a	f sand	y sabsi	rate		18
Material MV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, III	NV.	W	EA	EΑ	95	EA	EA-	EA	EA	EAT	Ę
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EM	NE	MK	WO	Ma	No	No	No	N	NO	MB	but present
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	NV	NV	EC	GC	VS	EC	53	SC	EC	BC	1
F BANKTOP LAND USE AND VEGETATIO	N ST	RUCT	URE	(to be a	ssessed	over a	T0m v	ride tra	nsect)	-110	1 %
Land-use: choose one from BL, BP, CW, CP, SH,	OR, WI	L, MH,	AW,	DW, RE	, IG, 1	H, RD,	SU, T	L, EL, P	G, NV		9
Land-use: choose one from BL, BP, CW, CP, SH, LAND-USE WITHIN Sm OF LEFT BANKTOP	_	RL	AW, G	B/L	, IG, 1		-		G, NV	3/	of whole
LAND-USE WITHIN 5m OF LEFT BANKTOP	SU				_	BL.	BL	BL.	_	BL C	1% of whole site
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSICAN	SU	BL NV			_	BL.	-	BL	_	<u>\$</u> L	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSICAN  LEFT BANK-FACE (structure) BAUSICAN	SU B NV	BL NV	鬼		_	BL.	8L V	BL C	BL C	5	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) Brussicanv  LEFT BANK-FACE (structure) Brussicanv  RIGHT BANK-FACE (structure) Brussicanv	3 NV NV	BL NV NV	製 ( )	BL C S	BL C S	BL.	BL V V	8L C S	SL C	C.	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) brussicing  LEFT BANK-FACE (structure) brussicing  RIGHT BANK-FACE (structure) brussicing  RIGHT BANK-FACE (structure within 1m) brussicing	SU B	8L NV NV NV	& し ひ て	3L 5 U	BL C	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSICAW  LEFT BANK-FACE (structure) BAUSICAW  RIGHT BANK-FACE (structure) BAUSICAW  RIGHT BANKTOP (structure within 1m) BAUSICAW  LAND-USE WITHIN 5m OF RIGHT BANKTOP	3 NV NV	BL NV NV	製 ( )	BL C S	BL C S	BL.	BL V V	8L C S	SL C	5	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure within 1m)  MUSICAN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G. CHANNEL VEGETATION TYPES RODERS	SV B SV	8L NV NV NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSICAW  LEFT BANK-FACE (structure) BAUSICAW  RIGHT BANK-FACE (structure) BAUSICAW  RIGHT BANKTOP (structure within 1m) BAUSICAW  LAND-USE WITHIN 5m OF RIGHT BANKTOP	SU B	8L NV NV NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure within 1m)  MUSICAN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES RODERS	SV B SV	BL NV NV NV BL NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  LAND-USE WITHIN 5m OF RIGHT BANKTOP  CHANNEL VEGETATION TYPES BOTTOM  None ( // ) or Not Visible (NV)	SV B SV	8L NV NV NV BL	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSICAN  LEFT BANK-FACE (structure) BAUSICAN  RIGHT BANK-FACE (structure) BAUSICAN  RIGHT BANKTOP (structure within 1m) BAUSICAN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES to be and the structure within 1m of the structure w	SV B SV NV B	BL NV NV NV BL NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSCAW  LEFT BANK-FACE (structure) BAUSCAW  RIGHT BANK-FACE (structure) BAUSCAW  RIGHT BANKTOP (structure within 1m) BAUSCAW  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G. CHANNEL VEGETATION TYPES dobrate  None ( // ) or Not Visible (NV)  Liverworts/mosses/lichens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails	3 14 14 14 14 14 14 14 14 14 14 14 14 14	BL NV NV NV BL NV NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSCAW  LEFT BANK-FACE (structure) BAUSCAW  RIGHT BANK-FACE (structure) BAUSCAW  RIGHT BANKTOP (structure within 1m) BAUSCAW  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G. CHANNEL VEGETATION TYPES dobrate  None ( // ) or Not Visible (NV)  Liverworts/mosses/lichens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails	SV B SV NV NV NV	BL NV NV NV BL NV NV NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSICAN  LEFT BANK-FACE (structure) BAUSICAN  RIGHT BANK-FACE (structure) BAUSICAN  RIGHT BANKTOP (structure within 1m) BAUSICAN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES do be as  None ( ) or Not Visible (NV)  Liverworts/mosses/lichens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails  Floating-leaved (rooted)	NV NV NV NV NV	8L NV NV NV BL 8L NV NV NV NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure within 1m)  MUSICAN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES do be about the structure within 1m or Right Banktop  G CHANNEL VEGETATION TYPES do be about the structure within 1m or Right Banktop  Emergent broad-leaved herbs  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails  Filoating-leaved (rooted)  Free-floating	SU   SU   SU   SU   SU   SU   SU   SU	8L NV NV NV BL 60110 NV NV NV NV NV NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure within 1m)  RIGHT BANKTOP (structure within 1m)  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G GHANNEL VEGETATION TYPES ROBERS  None ( ) or Not Visible (NV)  Liverworts/mosses/lichens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails  Floating-leaved (rooted)  Free-floating  Amphiblious	SU   SU   NV   NV   NV   NV   NV   NV   NV   N	8L NV NV NV BL NV NV NV NV NV NV NV NV NV NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m) BAUSICANV  LEFT BANK-FACE (structure) BAUSICANV  RIGHT BANK-FACE (structure within 1m) BAUSICANV  RIGHT BANKTOP (structure within 1m) BAUSICANV  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES to be an approximately compared to the	B SU NV NV NV NV NV NV NV	8L NV NV NV NV NV NV NV NV NV NV	& し ひ て	3L 5 U	BL C S	8L C S	8L V S	S S C	S C	2 2	

Unable to Guess Spot deck 2. Ive to occur isves.

SITE REF.	RIVER HAE	SITAT SURVEY : D	IMENSION	S AND INFLUENCE	ES Page 4	of 4
L CHANNEL DIME	ENSIONS (to be	measured at one location	on on a straig	ght uniform section, pref	erably across	a riffle
LEFT BANK		CHANNEL		RIGHT BANK		
Banktop height (m)	075	Bankfull width (m)	5	Banktop height (m)		1.5
Is banktop height also b height? (Y or N)		Water width (m)	2	Is banktop height also height? (Y or N)	bankfull	N
Embanked height (m)		Water depth (m)	0.15	Embanked height (m)	) .	_
If trashline lower than b	anktop, indicate:	height above water (n	1) =	width from bank to bank	k (m) =	_
Bed material at site is:	co	onsolidated 📮 ur	consolidated	d (loose)	unknown	
Location of measureme	nts is: riffle 🖵	other (state) (	C G3J880	ECTION.		
M FEATURES OF	SPECIAL INTER	EST Use√orE(js	3% length)	record even it <1%	Water to	
None Braided channels Side channel(s) *Natural waterfall(s) > 5m *Natural waterfall(s) < 5m Natural cascade(s)	"Debi	arge boulders (>1m)  is dam(s)  r debris  mg reed-bank(s)  ing bank(s)  hote(s)	Backwater( Floodplain I Water mea Fen(s) Bog(s) Wet woodl	boulder deposits   dow(s)	Marsh(es) Flush(es) Natural open water Others (state)	
N CHOKED CHAN	JNEL (tick one					
Is 33% or more of the c	hannel choked wi	th vegetation?	No 📑	Yes		
None *Giant ho	grammy.		timalayan ba Other (state).	alsam	panktop to 50	m
mining - quarrying - over Evidence of recent m gravel extraction - other Animals: Guer - mink	deepening - affore: nanagement: d r (please specify) - water vole - king	itation - fisheries manage Iredging - bank mowing fisher - dipper - grey wa	ment - silting g - weed cutt gtail - sand m	n - mili - dam - mili - rail - waterlogging - hydroele ing - enhancement - rive artin - heron - dragonflie ribe overall characteristi - 6 - 4:	ctric power er rehabilitatio s/damselflies	n -
Q ALDERS (tick or	ne box in each	of the two categori	es ) "rec	ord even if <1 %		
*Alders? None 🔲 Pro	esent 🖵 Exte	nsive 🔲 *Diseas	ed Alders? N	lone Present	Extensive	
R FIELD SURVEY	QUALITY CON	TROL ( / boxes to	onfirm ch	ecks)		
and major/intermediate st Have you completed all te Have you completed colu Have you recorded in sect Have you given an accura Have you stated whether:	ructures across the en spot-checks and i mn 11 of section G don C the number of te (alphanumeric) g spot-check 1 is at the	rate the general character channel? made entries in all boxes i (and E if appropriate) on of riffles, pools and point k rid reference for spot-che	of the site and in E & F on pa page 2? hars (even if 0) cks 1, 6 and e in end of the	on page 1? end of site (page 1)? site (top of page 2)?	weirs/ sluices	

Site Number¹:	Site Ref: LDB_S1	River Name:	Date: 02/08/17
Grid References/Co-ordinates:	Spot 12: NZ 19818 97169		End of site2: HIL TO DE 19361
Surveyor Name: SMCGROKAN		Accredited Surveyor Code	: FAD23.
Leave blank if new site.		<sup>2</sup> Optional	
	AST WITH. SUNN	1 INTERVALS / SHO	owers
Flow Conditions: NORM	AL.		
Site details: (enter comments	or circle if applicable and	d give details)	Risk Level (Low/Mod/High
Access and Parking: PARKING (entry & exit) FIELD ( ACC	ON LAMBY ON ROA	THEY THEY	LOW
Conditions: comment on grou	nd stability, footing, exp	osure/remoteness	Low
Obstacles/Hazards: dencing sti			MOD.
Occupied/Unoccupied: people			Lon
Activities/Land-use: agriculture,	woodland, residential, in	dustrial, construction, recreat	Low
Risk if Ione-working			Low
IF THERE ARE	NY HIGH RISKS OR MO DO NOT CONTINUE	ORE THAN THREE MODERA WITH THE SURVEY.	TE RISKS
Weil's Disease (Leptospirosis)		- 11 - 11 -	MILE FILE M
Instructions to card holders			
As infection may enter thro thoroughly cleansed and co	overed with a waterproof ose and mouth during w	plaster. ork. etc. after use	
Avoid rubbing your eyes, n.     Clean protective clothing, f.     After work, and particularly     Report all accidents and/or     Keep your card with you at	before taking food or dr injuries, however slight.	ink, wash hands thoroughly.	
<ol> <li>Clean protective clothing, f</li> <li>After work, and particularly</li> <li>Report all accidents and/or</li> </ol>	before taking food or dr injuries, however slight.	ink, wash hands thoroughly.	
Clean protective clothing, f     After work, and particularly     Report all accidents and/or     Keep your card with you at	before taking food or dr injuries, however slight.	ink, wash hands thoroughly.	
Clean protective clothing, f     After work, and particularly     Report all accidents and/or     Keep your card with you at	before taking food or dr injuries, however slight. all times.	ink, wash hands thoroughly.	
Clean protective clothing, f     After work, and particularly     Report all accidents and/or     Keep your card with you at	before taking food or dr injuries, however slight. all times.	ink, wash hands thoroughly.	

ite Numbe ite Referend ipot-check ipot-check ind of site ( Reach Refer	leave blant:  ite: Log  I Grid Ref: N  ence:  Lord Ref: N	NZ 17840 NZ 17840 12 18051 - IKE BURF TIN GRAGAN	9732 <b>6</b> 17412	Are adver	part of a river or a river visible? be and safety assess of photographs to erences: LOB- ryed from: lef	ment form atta	No partially partially cached? Yes	±entirely No
ite Reference ipot-check ind of site of Reach Refer River name: Date <sup>0</sup> 1./ Surveyor na	The second secon	-51 NZ 178387: NZ 17840 Tim GROGN	97326 17412	Are adver	river visible? be and safety assess of photographs terences: LOB-	ment form atta	No partially partially cached? Yes	Yes
ite Reference ipot-check ind of site of Reach Refer River name: Date <sup>0</sup> 1./ Surveyor na	Torid Ref: None Condition of the Conditi	NZ 17840 NZ 17840 12 18051 - IKE BURF TIN GRAGAN	97326 17412	Are adver	river visible? be and safety assess of photographs terences: LOB-	ment form atta	No partially partially cached? Yes	Yes
ipot-check ipot-check and of site ( Reach Refer tiver name: Date 01 /	1 Grid Ref: 6 Grid Ref: Grid Ref: N ence: Lant D 0 / /20 17 me: S NC	NZ 17840 NZ 17840 12 18051 - IKE BURF TIN GRAGAN	97326 17412	If yes, sta Is bed of Is health Number Photo rel	river visible? ba and safety assess of photographs to erences: LOB_	ment form atta	partially Fached? Yes	±entirely 🔲
ipot-check and of site of Reach Refer River name: Date 01 / Surveyor na	6 Grid Ref: N Grid Ref: N ence: Land D 08/2017- me: SHC	NZ 17840 72 18051 TIM GRAGAN	97326 17412	Is bed of Is health Number Photo rel	river visible? ba and safety assess of photographs i erences: LOB_	ment form atta	partially F	±entirely No
ind of site ( Reach Refer River name: Date OL/ Surveyor name	Crid Ref: N ence: Larac D 28/2017- me: SHC	12 18051 . Tim GRAGAN	17412	Is health Number Photo ref	and safety assess of photographs t erences: LOB-	ment form atta	ached? Yes	No 🔲
Reach Refer River name: Date OL/ Surveyor na	ence: Lance D 08/2017 me: SHC	Tim GRAGAN	J	Is health Number Photo ref	and safety assess of photographs t erences: LOB-	ment form atta	ached? Yes	No 🔲
Reach Refer River name: Date OL/ Surveyor na	ence: Lance D 08/2017 me: SHC	Tim GRAGAN	J	Number Photo rel	of photographs references: LD3-	taken:	0 = 2	
River name: Date 01_/ Surveyor na	Lark D 08/2017 me: SHC	Tim		Photo rel	erences: LOB.	SI _ 001 _	_	
Date 0]_/ Surveyor na	08/2017- me: SHC	Tim					_	11
Surveyor na	me: Sңс	GRAGAN	e: 11:00 .				_	_
				2ste surve	yed from: lef	t bank r	ight bank 🔼	above and
								channel [2
Accredited	Surveyor co	orden in the MAN	0.0	☐ When	options show	n with 'shado	w boxes', tick o	one box only
		ue, Fall	123	LEFT	banks determ	ined by facir	ng downstream	n RIGH
B .	REDOM	INANT V	ALLEY FOR	M (within	the horizo	n limit)	(tick one box	only)
ftick	one box or	lv)						
		. Dr	ć	`		/ n		
		2	shallow vee		., \		concave/bow	
					7:	- 0		
			deep vee		- W		asymmetrical	valley
	$\vee$	_	ocep vee				1	
-						/ "	U-shape valle	y
	$\vee$	_	gorge			_	no obvious va	illey sides
Di	tinct flat ve	lley bottom	7 No [	Yes 🔲	Natur	al terraces?	No	Yes
C 1	UMBER	OF RIFFL	ES, POOLS	AND POL	NT BARS	(enter total	number in bo	oxes)
Riffle(s) **				3	Unvegetated p	point bar(s)		[0
Pool(s) · ·				4	Vegetated poin			0
1001(3)					- egaletee pan		-	
D ART	IFICIAL I	EATURE	(indicate tot	al number of	occurrences of o	each category v	within the 500m	site)
lf		Major	Intermediate	Minor		Major	Intermediate	Minor
none, Wei	rs/sluices	0	0	0	Outtalls/ intakes	0	0	0
box Cul	verts •	_!			Fords Deflectors/	0	0	0
_	ges er - state	0	0	2	Deflectors/ groynes/croys	ø	0	0
Oth	er - state							

SITE REF. RIVER	HABITA									ge 2 o	1 *
Spot-check 1 is at: upstream end	downstrea	ım end	0	0	site (t	ick one l	box)				
E PHYSICAL ATTRIBUTES (to be assess	ed across o	hanne	with	n 1m s	vide tr	ansect)				7/1	
When baxes 'bordered', only one entry allowe	1 GP:	2	3	4	5	6 GPS	7	8	9	10	GP:
LEFT BANK		Rin	g EC o	r SC if	comp	osed of	sandy	substi	ate		
$\textbf{Material} \ \text{nv}, \ \text{ne}, \ \text{no}, \ \text{co}, \ \text{cs}, \ \text{ta}, \ \text{pe}, \ \text{cu}, \ \text{cc}, \ \text{sp}, \ \text{wp}, \ \text{ca}, \ \text{ne}, \ \text{ne}, \ \text{td}, \\$	FA BI EA	EA	ΕA	EΑ	EΑ	ΝV	EA	EA	EA	EA.	
Bank modification(s) MK, NO, RS, RI, PC(B), BM, ER	N No	No	No	No	RS	NK	RS	RS	RS	RS/R1	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, V	S, NB EC	V5.	EC	EC	Νo	NV	NO.	No	VS	N0	
CHANNEL			GP- r	ing eitl	ier C	or P if p	redon	ninant			
Channel substrate HV, BE, BO, CO, GP, SA, SI, CI, PE, EA,	AR CO	Co	SA	4(P)	(0	ΝV	CO	6)	GO)	60	5A 30 54 GP
Flow-type NV, FF, CH, BW, UW, CF, RP, UP, SM, NP, DR	SM	RP	SM	RP	ŞΜ	ΝV	SM	RP	RP	SM	١
Channel modification(s) NK, NO, CV, RS, RI, DA, F	0 1/0	No	Na	No	RS	CV	RS	RS	54	RS	1
Channel feature(s) NV, NO, EB, RO, VR, MB, VB, MI,	TR NO	No	No	NO	NO	N۷	NO	No	No	No.	spot-
For braided rivers only: number of sub-chann	nels									TH	Chec
RIGHT BANK		Rin	g EC o	or SC if	forms	ased of	sand	y Subst	rale		iks b
Material NV, BE, 80, CO, GS, EA, PE, GL, CC, SP, WP, GA, BR, RR, TD,	FAB EA	EA	EΑ	EΑ	EΑ	NV	EA	EA	€Ą.	EΑ	ut p
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EA	M No	No	c ig	No.	RS	NK	No	No	NO	No	reser
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, V	S. NB NO	EC	EC	EC	No	NV	N0	NO	NO	No	28
F BANKTOP LAND-USE AND VEGETA Land-use: choose one from BL, BP, CW, CP,			URE	(to be a	ssesses	rH, RD,	SU, TI	ide tra	G, NV		>1% of w
F BANKTOP LAND-USE AND VEGETA			URE	(to be a	ssesses	rH, RD,	SU, TI	ide tras	G, NV		>1% of w
F BANKTOP LAND-USE AND VEGETA			URE	(to be a	, 1 <b>G</b> , 1	Sυ	SU, TI	L, IL, P	s, NV	Uz	>1% of whole s
F BANKTOP LAND-USE AND VEGETA Land-use: choose one from BL, BP, CW, CP,	SH, OR, W	L, MH,	URE AW,	(to bee	, IG, 1	_				U2 U	spot-checks but present in >1% of whole site.
E BANKTOP LAND-USE AND VEGETA  Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP	SH, OR, W	L, MH,	AW,	(to be a	, 1 <b>G</b> , 1	Sυ	Su	SU	ΣV		>1% of whole site.
F BANKTOP LAND-USE AND VEGETA  Land-use: choose one from BL, RP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  BAUSSCIN	SH, OR, W	SH S	SM C	ow, Ri	SH 5	ŞV	Su	SU	S	Ŭ	>1% of whole site.
F BANKTOP LAND-USE AND VEGETA  Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  BAUSICIN  LEFT BANK-FACE (structure)  BAUSICIN	SH, OR, W SH. V S V S	SH S	SH C	SH S	SH S	Sν Β	Su S	SU S	2 2 2	U S	. COURSEGUE
F RANKTOP LAND-USE AND VEGETA  Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  BANSSON  RIGHT BANK-FACE (structure)  BANSSON	SH, OR, W SH. V S V S	SH S S	SM C S	OW, RI	SH S	SV β NV	Su S S	SU S S	2 2 2	υ 5 c	. COURSEGUE
LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANKTOP (structure)  RIGHT BANK-FACE (structure)  BANSICIN	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	SH S S S S	8 NV SV	Su S S C	SU S S	2 C	V 5 c	spot-checks but present in >1% of whole site.
E BANKTOP LAND-USE AND VEGETA  Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  BANSICIN  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  BANSICIN  RIGHT BANKTOP (structure within 1m)  BANSICIN  BANSICIN  RIGHT BANKTOP (structure within 1m)	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	SH S S S S	β ων β ων	Su S S C	SU S S	2 C	V 5 c	. COURSEGUE
EANKTOP LAND-USE AND VEGETA  Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  BAUSICIN  RIGHT BANK-FACE (structure)  BAUSICIN  RIGHT BANKTOP (structure within 1m)  BAUSICIN  RIGHT BANKTOP (structure within 1m)  BAUSICIN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  C CHANNEL VEGETATION TYPES (co.)	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	SH S S S S	B NV NV S SU	Su S S C	SU S S	2 C	V 5 c	. COURSEGUE
F RANKTOP LAND-USE AND VEGETA  Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  BAUSSICN  RIGHT BANK-FACE (structure)  BAUSSICN  RIGHT BANKTOP (structure within 1m)  BAUSSICN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES (to  None (~) or Not Visible (NV)	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	SH S S S S	β ων β ων	Su S S C	SU S S	2 C	V 5 c	. COURSEGUE
F RANKTOP LAND-USE AND VEGETA  Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  BAUSSICN  RIGHT BANKTOP (structure within 1m)  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES (co.)  None ( ) or Not Visible (NV)  Liverworts/mosses/Echens	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	SH S S S S	N/ N/ N/ N/ N/ N/ N/	Su S S C	SU S S	2 C	V 5 c	COOLINGIA
Emergent broad-leaved herbs	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	5 S S S S S S S S S S S S S S S S S S S	β NV NV NV NV	Su S S C	SU S S	2 C	V 5 c	COOLINGIA
Land-use: choose one from BL, RP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  BAUSYCN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES (to  None (✓) or Not Visible (NV)  Liverworts/mosses/Echens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	5 S S S S S S S S S S S S S S S S S S S	β NV NV NV NV NV	Su S S C	SU S S	2 C	V 5 c	. Colonian min
Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  BAUSYCAN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  C CHANNEL VEGETATION TYPES (to)  None ( ) or Not Visible (NV)  Liverworts/mosses/Echens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails  Floating-leaved (rooted)	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	5 S S S S S S S S S S S S S S S S S S S	β NV NV NV NV NV	Su S S C	SU S S	2 C	V 5 c	COOLINGIA
End-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  BAJ/S/CN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  G CHANNEL VEGETATION TYPES (c)  None ( ) or Not Visible (NV)  Liverworts/mosses/Echens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails  Floating-leaved (rooted)  Free-floating	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S S	OW, RI	5 S S S S S S S S S S S S S S S S S S S	SU   B   NV   NV   NV   NV   NV   NV   NV	Su S S C	SU S S	2 C	V 5 c	. Colonian min
Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  BAUSSICN  RIGHT BANKTOP (structure within 1m)  BAUSSICN  LAND-USE WITHIN 5m OF RIGHT BANKTOP  CHANNEL VEGETATION TYPES (col  None ( ) or Not Visible (NV)  Liverworts/mosses/Eichens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetalls  Floating-leaved (rooted)  Free-floating  Amphibious	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S	OW, RI	5 S S S S S S S S S S S S S S S S S S S	SO   SO   SO   SO   SO   SO   SO   SO	Su S S C	SU S S	2 C	V 5 c	. Colonian min
Land-use: choose one from BL, BP, CW, CP,  LAND-USE WITHIN 5m OF LEFT BANKTOP  LEFT BANKTOP (structure within 1m)  LEFT BANK-FACE (structure)  RIGHT BANK-FACE (structure)  RIGHT BANKTOP (structure within 1m)  LAND-USE WITHIN 5m OF RIGHT BANKTOP  C CHANNEL VEGETATION TYPES (to  None ( ) or Not Visible (NV)  Liverworts/mosses/Echens  Emergent broad-leaved herbs  Emergent reeds/sedges/rushes/grasses/horsetails  Floating-leaved (rooted)  Free-floating  Amphibious  Submerged broad-leaved	SH, OR, W SH.  V S V S V S V S	SH S S S	SM C S	OW, RI	5 S S S S S S S S S S S S S S S S S S S	SU   B   NV   NV   NV   NV   NV   NV   NV	Su S S C	SU S S	2 C	V 5 c	COOLINGIA

SITE REF. RIV	ER HA	BITAT	SURVE	EY : 500m SWEEP-UP	Page	3 of 4
H LAND-USE WITHIN 50	m OF BA	NKTOP	Use	✓ (present) or E. (∠ \$3% banklength)		
		L	R		L	R
Broadleaf/mixed woodland (semi-n	atural) (BL	1.	E	Natural open water (OW)		T
Broadleaf/mixed plantation (BP)				Rough/unimproved grassland/pasture (RP)	E	E
Coniferous woodland (semi-natura	I) (CW)		-	Improved/semi-improved grassland (IG)		
Coniferous plantation (CP)				Tall herb/rank vegetation (TH)		
Scrub & shrubs (SH)			1	Rock, scree or sand dunes (RD)		
Orchard (OR)				Suburban/urban development (SU)	3	-
Wetland (e.g. bog, marsh, fen) (W	/L)			Tilled land (TL)		
Moorland/heath (MH)				Irrigated land (IL)		
Artificial open water (AW)				Parkland or gardens (PG)		-
				Not visible (NV)		-
I BANK PROFILES Use	∠ (prese	or) s. E.	b i thinks	arthus night)		agioustess.
Natural/unmodified		L	R	Artificial/modified	t	R
Vertical/undercut	Z	P	1	Resectioned (reprofiled)	E	1
Vertical with toe				Reinforced - whole		
Steep (>45°)			·····'	Reinforced - top only		
C	w.		-	Reinforced - toe only		
Composite				Artificial two-stage	1	
Natural berm	~~~	+			-	-
Natural Defin				Poached bank www.		
				Embanked	-	-
				Set-back embankment		
I EXTENT OF TREES AND	ASSOCIA	TED FEAT	TURES	"rycond even il <1 %		
TREES (tick one box pe			- Andrews	ASSOCIATED FEATURES (lick one box per feat	ture)	
None	Left	Right		Shading of channel Preser	nt E(3:	33%)
Isolated/scattered	H	H		*Overhanging boughs		1
Regularly spaced, single	ŏ	ŏ		*Exposed bankside roots	- [	i
Occasional clumps	ō	ŏ		*Underwater tree roots	- [	5
Semi-continuous	er	ē		Fallen trees		1
Continuous				Large woody debris		)
K EXTENT OF CHANNEL	AND BA	UNK FEAT	TURES	(tick one box for each feature) - "record even if	< 1%	2415
	None	Present E	(≥33%)		esent E (	>33%)
*Free fall flow		4		Exposed bedrock	=	_
Chute flow		H		Exposed boulders		7
Broken standing waves		H	H	Vegetated bedrock/boulders	_	7
Unbroken standing waves	0	1	8	Unvegetated mid-channel bar(s)	7	7
Rippled flow ****	4		7	Vegetated mid-channel bar(s)	2	4
*Upwelling	2	H	7	Mature island(s)	-	4
	7	H	No.	Univergetated side bar(s)	-	4
Smooth flow *****			1 1		-	
No perceptible flow	1	8	8	Vegetated side bar(s)	=	=
No perceptible flow No flow (dry)	100	ğ	ğ	Unvegetated point bar(s)	ğ	ğ
No perceptible flow No flow (dry) Marginal deadwater	Opopopo	3000	ood)	Unvegetated point bar(s)  Vegetated point bar(s)		
No perceptible flow No flow (dry)	podde	30000	oobo	Unvegetated point bar(s)		

SITE REF.	RIVE	R HABI	TAT SURVEY : DI	MENSION	IS AND	INFLUENC	CES Pag	e 4 of 4
L CHANNEL D	IMENSIONS	(to be n	neasured at one location	n on a straig	ght unifor	n section, pr	eferably acro	ss a riffle
LEFT BANK			CHANNEL		RIGHT	BANK		
Banktop height (m)		1.5	Bankfull width (m)	7	Bankto	p height (m)		2.
Is banktop height al height? (Y or N)	lso bankfull	Y	Water width (m)	375	ls bank height:	top height al ? (Y or N)	so bankfull	N
Embanked height (r	m)	_	Water depth (m)	005	Emban	ked height (r	n)	_
If trashline lower the	an banktop, in	dicate:	height above water (m)	)=	width fron	n bank to ba	nk (m) = _	
Bed material at site	is:	cor	solidated 🔲 und	consolidated	d (loose)	9	unknov	wn 🔲
Location of measure	ements is: riff	le 🗗 🤆	other 🔲 (state)					
M FEATURES	OF SPECIAL	INTERE	ST Use / or E (≥ 3)	% length)	record e	ven if <196		
None Braided channels Side channel(s) "Natural waterfall(s) = "Natural waterfall(s) < Natural cascade(s)		*Debris *Leafy of Fringing	g reed-bank(s)	Backwater(s Floodplain I Water mea Fen(s) Bog(s) Wet woodl	boulder de	aposits	Marsh(es) Flush(es) Natural open water Others (stat	
N CHOKED C	HANNEL (I	ick one is	(x)	0.0.190		V		
Is 33% or more of t	he channel ch	oked witl	vegetation?	No [-]		Yes		
O MOTABLE N	I HEARICE DI	AND C	DECIES No. 1					100000
"Japa  P OVERALL C  Major Impacts: lar mining - quarrying -  Evidence of recer gravel extraction - c  Animals: Otter - r	overdeepening nt managem other (please s mink - water vo	litter - sew - afforest ent: dr pecify) le - kingli ns: if ne	=	nent - silting - weed cutt レイ _ tail - sand m	add oth n - mill - d - waterlog ting - enh nartin - her ribe overa	lam -road-ra ging - hydroe ancement - ri	electric power iver rehabilita ies/damselflie	ation -
Q ALDERS (tic	k one box i	n each c	of the two categori	2 <b>5</b> ) *rec	ord even if	<14		Ž.
*Alders? None 🔲	Present 🔲	Exten	sive 🔲 *Disease	d Alders? N	lone 身	Present	Exten	sive [
R FIELD SURV	EY QUALITY	CONT	ROL ( / boxes to c	onfirm ch	ecks)			
and major/intermedia Have you completed Have you completed Have you recorded in Have you given an ac Have you stated whe	ate structures ac all ten spot-che column 11 of si section C the r ccurate (alphani ther spot-check	cross the cocks and meetion G (- number of urneric) gr 1 is at the	ste the general character- hannel? ade entries in all boxes in and E if appropriate) on p riffles, pools and point be did reference for spot-che upstream or downstream weep-up responses with	n E & F on pa nage 2? ars (even if 0) ks 1, 6 and e n end of the	ge 2? ) on page and of site site (top o	1? (page 1)? f page 2)?	ny weirs/ sluic	e G
given on page 2 of th	ne spot-check k	ıy?						

Site Number <sup>1</sup> :	Site Ref: LDB_S2_	River Name:	Date:	-1   80   10
Grid References/Co-ordinate	Spot 12,NZ 18956 967 11	Mid-site: N1 18033 44875		of site <sup>2</sup> : M2. 17880 97-00
Surveyor Name: SMCGRO	GAN	Accredited Surveyor Cod		
Leave blank f new site.		<sup>2</sup> Optional	aç. I	71023
Weather Conditions: C.,		N. 12450.161 C		
20		M INTERVALS		
Flow Conditions:	RMAL			
Site details: (enter commen	ts or circle if applicable and	give details)		Risk Level (Low/Mod/High)
Access and Parking: PAPKING (entry & exit) [ + ] (vF	in LAYBY + well-	J 600 3110		. GOM
Conditions: comment on gr	ound stability, footing, expo	osure/remoteness		LOW.
Obstacles/Hazards: fencing,	stiles, dense vegetation, ste	ep bank		LON
Occupied/Unoccupied: peop	ole, livestock, animals			LOW
Activities/Land-use; agricultu	e, woodland, residential, inc	dustrial, construction, recrea	ational	Low
Risk if Ione-working NA	1			Low
IF THERE AR	E ANY HIGH RISKS OR MO DO NOT CONTINUE V		ATE RI	SKS
Weil's Disease (Leptospiros	(s)	Deline D- D-144	and the	
Instructions to card holders  1. As infection may enter th thoroughly cleansed and 2. Avoid rubbing your eyes, 3. Clean protective clothing 4. After work, and particula 5. Report all accidents and/ 6. Keep your card with you	covered with a waterproof nose and mouth during wo , footwear and equipment rly before taking food or dri or injuries, however slight.	plaster. ork. etc. after use		ision is
Lyme Disease  1. Dress appropriately with 2. Regularly inspect for ticks 3. Check for, and remove, a 4. Seek medical attention if	when in the field. ny ticks as soon as possible	after leaving the site.		

RIVER HAB	STAT SURVEY 2003 Version Page 1 of 4
A FIELD SURVEY DETAILS	
Site Number:  Site Number:  Site Reference: LDB_S 1  Spot-check 1 Grid Ref: N2 K033 94775  End of site Grid Ref: N2 I7870 67024  Reach Reference: River name: LONG DIKE BURN  Date 01 /04 /2012 Time: 14-100  Surveyor name: S MC CRIAGN  Accredited Surveyor code: FAO23.  B PREDOMINANT VALLEY FORM  (tick one box only)	Is the site part of a river or an artificial channel? River Artificial Are adverse conditions affecting survey? No Yes If yes, state
shallow vee	asymmetrical valley  U-shape valley
gorge  Distinct flat valley bottom? No	no obvious valley sides  Yes Natural terraces? No Yes No
C NUMBER OF RIFFLES, POOLS /	AND POINT BARS (enter total number in boxes)
Riffle(s) Paol(s)	3 Univergetated point bar(s) · · 2  5 Vegetated point bar(s)
D ARTIFICIAL FEATURES (indicate total	number of occurrences of each category within the 500m site)
If none, tick weirs/sluices D 0 0 Culverts I Bridges O Other - state	Minor Major Intermediate Minor O Outlels/ D C C Insides Fords Deflectors' Groynes/croys D. C C
Is channel obviously realigned? Is channel obviously over-deepened?	No

	RIVER HA	BITA	r sui	RVEY	: TE	N SPO	OT-CI	IECK	S	Pag	ge 2 o	f 4
Spot-check 1 is at: upstream end	dov	vnstrear	m end		0	site (ti	ck one l	оах)				
E PHYSICAL ATTRIBUTES (lot	be assessed a	cross cl	namite	l withi	e 1 m y	vide tr	ansect)			*X1 T T		
When baxes 'bordered', only one entry allowed			2	3	4	5	6 GPS	7	8	9	10	GPS
LEFT BANK		1000	Ring	g EC o	r SC if	compo	sed of	sandy	subst	ate		
Material NV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA	A, GR, RR, TD, FA, BI	EA	EA	EΑ	EΑ	ĒΑ	ŧд	EA	EA	EA	EA	
Bank modification(s) NK, NO, RS, RI, PC	(B), BM, EM	NO	Nb	No	No	No	Νþ	RS	No	No	No	1
Marginal & bank feature(s) NV, NO, EC, SC, F	PB, VP, SB, VS, NB	NO	SB	No	EC	EC	έÇ	1/3	EC	VS	FC	1
CHANNEL				GP- n	ng elti	ner-G o	e P if p	redon	ninant			
Channel substrate NV, BE, BO, CO, GP, SA, SI	I, CL. PE, EA, AR	(a)	W	(0	40	(o	ĽĐ	CO	6	4(1)	CO	BO SA
Flow-type NV, FF, CH, BW, UW, CF, RP, UP,	SM, NP, DR	MZ	ŞΜ	υw	SM	SM	SM	SM	SM	SM	VW	
Channel modification(s) NK, NO, CV, R	S, RI, DA, FO	No	Ŋη	ΝŁ	NI	NI.	MO.	RS	No	No	NO	] [
Channel feature(s) NV, NO, EB, RO, VR, N	MB, VB, MI, TR	No	Ro-	No	Na	No	1/0	Νħ	No	MB	NO	spot
For braided rivers only: number of se	ub-channels						7.5					45
RICHT BANK			Rin	g EC c	r SC if	comp	osed of	sand	y subst	rate		] K = 1
Material wv. BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA	A. BR. RR. TD, FA. BI	EΑ	ΕA	ŧΑ	EΑ	EA	EA-	EA	EA	EΑ	EΑ	l the
Bank modification(s) NK, NO. RS, RI, PC	(B), BM, EM	No	No	No	No	No	N/a	R S	N o	1/10	NO	strat
Marginal & bank feature(s) NV, NO, EC, SC, F	PB, VP, SB, VS, NB	SB.	EC	No	No	EC	64	No	No	EC	PB	1 in (S)
F BANKTOP LAND-USE AND	VEGETATIO	N ST	RUCT	URE	to be a	ssessed	over a	10m w	ide tra	sect)	33000	1 × 2
Land-use: choose one from BL, BP,	CW, CP, SH,	or, WI	, мн,	AW,	DW, RI	P, IG, T	H, RD,	SU, T	L, IL, P	G, NV		of v
LAND-USE WITHIN 5m OF LEFT BANKTO		OR, WI	, MH,	AW,	ow, RI	, IG, T	H, RD,	su, ti	L, IL, P	G, NV Sh	M	occurring of whole
				_		_		Sh	BL	_	M	Enter channel substrate(s) not occurring as pri spot-checks but present in >1% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m)	)P	BL	BL	BC	BL	BL		SH	BL C	Sh	_	occurring as predor
LAND-USE WITHIN 5m OF LEFT BANKTO	BAUSICINV	BL C	BL C	g(	BL	BL.	8L C	Sh	BL	Sh C	c	occurring as predomina of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure)	B/U/S/C/NV	BL ( (	BL C	8( C	3L C	3 U	8L C	Sh C	BL C	Sh C	c c	occurring as predominant in 6 of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m)	BAUSICINV BAUSICINV BAUSICINV BAUSICINV	BL C	8L C C	8L C C	BL C C	8L C 3 V	8L U U	Sh C C	BL C S	Sh C	c S C	occurring as predominant in 6 of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT	BAUSICINV BAUSICINV BAUSICINV	&L	BL C C	8( C	3L C C	3 U	8L C U	Sh C C ∪ C	BL C S	Sh c c	c c	occurring as predominant in 6 of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKTOP CHANNEL VEGETIATION TY	BAUSICINV BAUSICINV BAUSICINV	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C ∪ C	BL C S	Sh c c	c S C	occurring as predominant in 6 of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT G CHANNEL VEGETATION TV None ( ) or Not Visible (NV)	BAUSICINV BAUSICINV BAUSICINV	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C ∪ C	BL C S	Sh c c	c S C	spot-checks but present in > 1% of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT G CHANNEL VEGETATION TY None ( ) or Not Visible (NV) Liverworts/mosses/lichens	BAUSICINV BAUSICINV BAUSICINV	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C ∪ C	BL C S	Sh c c	c S C	occurring as predominant in 6 of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT  C CHANNEL VEGETATION TY  None ( ) or Not Visible (NV) Liverworts/mosses/lichens Emergent broad-leaved herbs	BAUSICINV BAUSICINV BAUSICINV COP	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C ∪ C	BL C S	Sh c c	c S C	occurring as predominant in
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT  G CHANNEL VEGEVATION TY  None (~) or Not Visible (NV) Liverworts/mosses/lichens Emergent broad-leaved herbs Emergent reeds/sedges/rushes/grasses/he	BAUSICINV BAUSICINV BAUSICINV COP	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C ∪ C	BL C S	Sh c c	c S C	occurring as predominant in
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANK-FACE (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT G CHANNEL VEGS VATION TY None ( ) or Not Visible (NV) Liverworts/mosses/lichens Emergent broad-leaved herbs Emergent reeds/sedges/rushes/grasses/hx Floating-leaved (rooted)	BAUSICINV BAUSICINV BAUSICINV COP	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C U C Sh	BL C S	Sh c c	c S C	occurring as predominant in
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT G CHANNEL VEGETATION TY None ( ) or Not Visible (NV) Liverworts/mosses/lichens Emergent broad-leaved herbs Emergent reeds/sedges/rushes/grasses/he Floating-leaved (rooted) Free-floating	BAUSICINV BAUSICINV BAUSICINV COP	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C U C Sh	BL C S	Sh c c	c S C	occurring as predominant in 6 of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT G CHANNEL VEGETATION TY  None ( ) or Not Visible (NV) Liverworts/mosses/lichens Emergent broad-leaved herbs Emergent reeds/sedges/rushes/grasses/hv Floating-leaved (rooted) Free-floating Amphibious	BAUSICINV BAUSICINV BAUSICINV COP	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C U C Sh	BL C S	Sh c c	c S C	occurring as pregominant in 6 of whole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT  C CHANNEL VEGETATION TY  None ( ) or Not Visible (NV) Liverworts/mosses/lichens Emergent broad-leaved herbs Emergent reeds/sedges/rushes/grasses/he Floating-leaved (rooted) Free-floating Amphibious Submerged broad-leaved	BAUSICINV BAUSICINV BAUSICINV COP	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C U C Sh	BL C S	Sh c c	c S C	occurring as pregominant in
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT G CHANNEL VEGETATION TY  None ( ) or Not Visible (NV) Liverworts/mosses/lichens Emergent broad-leaved herbs Emergent reeds/sedges/rushes/grasses/hv Floating-leaved (rooted) Free-floating Amphibious	BAUSICINV BAUSICINV BAUSICINV COP	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C U C Sh	BL C S	Sh c c	c S C	occurring as predominant in softwhole site.
LAND-USE WITHIN 5m OF LEFT BANKTO LEFT BANKTOP (structure within 1m) LEFT BANK-FACE (structure) RIGHT BANK-FACE (structure) RIGHT BANKTOP (structure within 1m) LAND-USE WITHIN 5m OF RIGHT BANKT  C CHANNEL VEGETATION TY  None ( ) or Not Visible (NV) Liverworts/mosses/lichens Emergent broad-leaved herbs Emergent reeds/sedges/rushes/grasses/he Floating-leaved (rooted) Free-floating Amphibious Submerged broad-leaved	BAUSICINV BAUSICINV BAUSICINV COP	&L	8L C C	8L C C	3L C C	8L C 3 V	8L U U	Sh C C U C Sh	BL C S	Sh c c	c S C	occurring as presummant in

SITE REF.	RIVER HAE	BITAT	Page 3 o			
H LAND-USE W	THIN 50m OF BAN	VIKTOP	Use	/ (present) or E (≥ 33% banklength)		
		L	R		L	R
Broadleaf/mixed woodla	nd (semi-natural) (BL)	E	E	Natural open water (OW)		$\neg$
Broadleaf/mixed plantat	ion (BP)			Rough/unimproved grassland/pasture (RP)	E	. 5
Coniferous woodland (se	emi-natural) (CW)			Improved/semi-improved grassland (IG)		
Coniferous plantation (C	(P)			, Tall herb/rank vegetation (TH)		
Scrub & shrubs (SH)		-1-	-	Rock, scree or sand dunes (RD)		
Orchard (OR)		211	I I	Suburban/urban development (SU)		Т
Wetland (e.g. bog, mars	ih, fen) (WL)		1	Tilled land (TL)		
Moorland/heath (MH)			1	Irrigated land (IL)		Т
Artificial open water (AV	V)			Parkland or gardens (PG)		
				Not visible (NV)		
BANK PROFILE	S Use ✓ (preser	il) or E	(> 33% ba	nklenethy		
Natural/unmodified	1. 6	L	R	Artificial/modified	L	R
Vertical/undercut	J Z			Resectioned (reprofiled)		
Vertical with toe	hun	-		Reinforced - whole		
Steep (>45°)	11111	Ë	`E	Reinforced - top only		
Gentle -				Reinforced - toe only		$\perp$
Composite				Artificial two-stage		1
Natural berm				Poached bank howww		
				Embanked	-	
				Set-back embankment		+
INone Isolated/scatter Regularly space Occasional clut Semi-continuo	red cad, single capps	Right 0000000		ASSOCIATED FEATURES (lick one box per features) Shading of channel "Overhanging boughs "Exposed bankside roots "Underwater tree roots Fallen trees Large woody debris		33%
K EXTENT OF C	THANNEL AND BA	NK FEA	TURES	(tick one box for each feature) *record even i	f <1%	
*Free fall flow Chute flow Broken standing waves Unbroken standing war Rippled flow *Upwelling Smooth flow ***** No perceptible flow No flow (dry) Marginal deadwater Eroding cliff(s)		000000000000000000000000000000000000000	();;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;	Exposed bedrock Exposed boulders Vegetated bedrock/boulders Unwegetated mid-channel bar(s) Vegetated mid-channel bar(s) Mature island(s) Unwegetated side bar(s) Unwegetated side bar(s) Unwegetated point bar(s) Vegetated point bar(s) Unwegetated point bar(s) Unwegetated point bar(s) Unwegetated point bar(s) Unwegetated side bar(s) Unwegetated point bar(s)		300000000000

SITE REF. RIVER HABITAT SURVEY: DIMENSIONS AND INFLUENCES Page 4 of								
L CHANNEL DIM	ENSIONS (to	be measured at o	ne location	on a straigh	t uniform :	ection, p	referably acr	oss a niffl
LEFT BANK		CHANNEL			RIGHT BA	NK		
Banktop height (m)	height (m) [ 2.5   Bankfull widt			12_	Banktop h	)	2	
1 2		Water wid	ith (m)	3	Is banktop height? (Y		lso bankfull	И.
Embanked height (m)	Water dep	oth (m)	0 15 .	. Embanked height (m)				
If trashline lower than b	anktop, indica	te: height above	water (m)	= / w	dth from b	ank to ba	ank (m) =	/
Bed material at site is:		consolidated		onsolidated	loose) 📮		unkno	wn 🛄
Location of measureme	nts is: riffle 🛭	other 🔲 (stat	e)					
M FEATURES OF	SPECIAL INT	EREST Use v	or E (≥ 33°	k length) *r	ecord ever	if <1%		
None Braided channels Side channel(s) *Natural waterfall(s) > Sm *Natural waterfall(s) < Sm Natural cascade(s)	hhigh Q	ery large boulders (: Debris dam(s) eafy debris inging reed-bank(s) uaking bank(s) iink hole(s)		Backwater(s) Floodplain bo Water meadi Fen(s) Bog(s) Wet woodlar	(s)wc	sits	Marsh(es) Flush(es) Natural open wate Others (sta	_
N CHOKED CHA	JNFL (tick o	ine box)		570 00-5				7/7
Is 33% or more of the o	bannal chakas	Luith montation		No Fall	_	Yes		
is 3370 or more or the c	THAT HE CHOKEC	with vegetation:		140		1 63	<u>ч</u>	
None Gant ho	e knotweed	G (Circle a)		nalayan bals ner (state)		s as nec	essary)	
Major impacts: landfill mining - quarrying - over Evidence of recent in gravel extraction - othe Animals: Other - mink Other significant ob observations	rdeepening - aff nanagement: r (please specif - water vole - k	orestation - fisherie dredging - ban y) ogfiner - dipper	s manageme k mowing - - grey wagta	ent - silting - weed cuttin	vaterloggir g - enhand tín - heron	ement - r - dragonf	electric powe iver rehabilit lies/damselfli	ation -
Q ALDERS (tick o	ne box in ea	ch of the two	categories	) *recor	d even if <1		222	
*Alders? None 🔲 Pr	esent 🗗 E	xtensive 🔲	*Diseased	Alders? No	ne 🖭	Present	Exter	sive [
Have you taken at least to	QUALITY CO	IN:IROL ( / bo	elebasester of	nhrm che	cks)	hotas at -	munim ( a b.i.	
and major/intermediate s Have you completed all te Have you completed colu Have you given an accura Have you stated whether Have you stated whether	tructures across en spot-checks a imn 11 of section tion C the numb ite (alphanumeri spot-check 1 is a	the channel? nd made entries in n G (and E if approj er of nifles, pools a ic) grid reference fo at the upstream or	all boxes in t priate) on pa nd point bar r spot-check downstream	E & F on page ge 2? s (even if 0) o s 1, 6 and en end of the sit	n page 1? I of site (page (top of page)	ge 1)? ge 2)?	ny wensy siuk	.es E

A1 in Northumberland	
Aquatic Ecology Survey Report	

### APPENDIX D: MACROPHYTES RAW DATA AND LEAFPACS OUTPUTS



### Aquatic Ecology Survey Report

#### Macrophyte Field Sheet

River	MAJTOS DEAN	Site:	U/S AT
Surveyor	SMC+ EM		ols vi
NGR top	100 17249 04969	Date	21/2/10
NGR bottom	890 16 417 10 541.		31/7/17
Start time		Finish Time	
% Wadeable	25 %	Total % cover of macrophytes	75.

Width (m) %	<1	100	1-5	
5-10	10-20		>20	
Depth (m) %	<0.25	35	0.25-0.5	50 -
	0.5-1	15	>1	

#### Record the estimated percentage for each of the following:

Substrate %	Peat		Sill/clay	30
	Sand	- 5	Pebbles/gravel	30
	Boulder/cobble	15	Bedrook	
Habitats %	Pool		Run	35
	Riffle	10	Slack	60.
Shading %	Left Bank		Right Bank	
	None	l-a	None	20
	Broken	20	Broken	80.
	Dense	20	Dense	

Clarity %	Clear	90
	Turbid	10
	Cloudy	

<b>Bed Stability</b>	Solid/firm		Stable	
%	Unstable	25	Softisinking	75.

Photo Nor	Urs	Dhi
Ref		

#### % Cover of Filamentous Algae

Notes/C	omments:						
Homb	owsram	b	especim	regulation	+	irees.	
(NV5	- Himol	η.	å-been	· pront			

#### Macrophyte taxa

You must record ALL mecrophytes you encounter in the 100m stretch and identify them to species level.

#### Notes / actions

Suffix sp" - Make every effort to identify these taxa to species level, either in the field or using specimens back in the lab. You may need to confirm the identification with colleagues or Nigel Holmes, Make a record for each unknown species and label them "Species x. 1", "Species x. 2" etc. You will need to enter each different species you find as a separate record (with a species cover value) on BIOSYS.

Specimen required - these taxa are particularly difficult to identify to species level and you must be certain of a correct identification to record them. Record the site, date, recorder, possible identify and supporting notes. You may need to have it verified by an independent expert and preserve it in your reference collection.

Rare - taxa which are likely to be found in <1% of surveys.

Taxa which appear in the original MTR manual are shown in bold. BIOSYS can be used to extract an MTR score in the interim and information for the WFD, as we move to one method and an extended taxa list for all survey purposes.

#### The Species Cover Value (SCV) cleases are:

1	<0.1%		6	10-25%
2	0.1 -1%		7	25 -50%
3	1 - 2.5%		8	50 - 75%
4	2.5 - 5%		9	> 75%
5	5 - 10%			

#### MACROALBAE

Taxa (Synonym)	Species Cover Value - 9 pt scale	Notes / action
Batrachospermum sp(p.)		7.10
Chana sp* e.g. vulgaris		Specimen (s) required
Cladophora aegagropila		
Cladophora glomerata/ Rhizoolonium hieroglyphicum Stanketweed agg.	5	
Uridentified unbranched filamentous non-allmy green algae (i.e. unbranched, non-allmy green sigae excl. Cladophora i Vausheria/ Hydrodictyon fil Ideobrandia, rhydiaris	-	
Hydrodictyon reticulature		
Lemanea sp(p.) e.g. fluvistilis		
Nitela so*		specimen(s) required
Nostoc sp*		specimen(s) required
Blue-green sigel film.) pells (Phornidium.) Lyngbys so (p)		
Enteromorpha intestina (a (Ulva fiexuosa ) intestinalis)		
Vaucheria sp(p.)		
Zygnematalean (Slimy, unbranched, fil alique)		

Taxa (Synonym)	SCV	Notes / action
Amblystegium fluviatile (Hygroamblystegium fluviatile)		ний поиссонов М
Amblystegium (Hygroamblystegium) tenax		
Blindia acuta		
Brachythecium plumosum		
Brachythecium rivulare		
Brachythecium rutabulum	100000	// 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10
Bryum pseudotriquetrum		
Calliergon cuspidatum		
Chiloscyphus polyanthos		
Cinclidotus fontinaloides	1 1 80	
Cratoneuron filicinum		
Dichodontium flavescens/pellucidum		
Dichodontium palustris (Dicranella palustris)		
Fissidens sp* e.g. rufulus/ crassipes	HITCH III	specimen (s) required
Fontinalis antipyretica		
Fontinalis squamosa		
Hygrohypnum luridum		
Hygrohypnum ochraceum		
Hyocomium armoricum		
Jungermannia sp* e.g. atrovirens		specimen (s) required
Leptodyctium riparium (Amblystegium riparium)		
Marsupella sp* emarginata		specimen (s) required
Nardia sp* compressa		specimen (s) required
Octodiceras fontanum		
Orthotrichum rivulare		
Palustriella commutata (Cratoneuron commutatum)		
Pellia endiviifolia 🔹	4	
Pellia epiphylla		
Philonotis sp.* e.g. fontana		specimen (s) required
Platyhypnidium riparioides (Rhynchostegium riparioides)		
Polytrichum commune		
Racomitrium aciculare		
Riccardía sp* chamaedryfolia / multifida		specimen (s) required
Riccia fluitans		
Scapania sp* e.g. undulata		specimen (s) required
Schistidium rivulare		
Sphagnum sp* e.g. denticulatum		specimen (s) required
Thamnobryum alopecurum		
	_	

Version: 2

Issued: March 2017

Taxa (Bynonym)	8CV	Notes I action
Dormalocarpon sp(p)*		specimen(s) required

Taxa (Synonym)	SCV	Notes / action
Azolla filiculoides		-
Equisetum fluviatile		
Equisetum palustre #	2	
Aconus calarrus	_	
Alisma lanceolatum		
Alterna plantago-aquatica		
Apium Inundatum	_	
Agium nodiflorum	6	+
Berula erecta	-	
Bidens cemua	_	_
Sidens tripartits	_	
Bolboschoenus maritimus	_	Rare
Butomus umbellatus		Trans.
Calitriche hamulata	_	
Calibriche hermaphroditica/bruncata		specimen(s) required
Callitriche oblussingula	_	MARKET MARKET LEMTING
Calitriche stagnalis-plotycarpa/oblusanguis	_	specimen(s) required
Celtra palustris	_	apecin engly required
Carex acuta	_	_
Carex acutiformis	_	
Corex aquatilis	_	
Carex signams	_	
Carex easts	_	
Carex pancuses Carex riparia	_	
Cares riparia Cares rostrata	_	
	_	
Carex vesicaria	_	
Catabresa aquatica	_	
Cenatophyllum demeraum	_	-
Cicula virosa	_	Rare
Eleocharis palustris	_	
Eleogiton fluitans	_	
Elodea cenadensis	_	
Elodea nuttalili		
Giyoeria fluitans agg		i.e. any SMALL Glyceria (NO) maxima)
Glyceria maxima	. 2	
Groenlandia densa		
Hippuris vulgaris		
Hottonia palustris		Rare
Hydrocharis moraus-ranse		Rare
Hydrocotyle ranunculoides		Rare
Typericum elodes		Rare
Iris pseudacorus		

Така (Буполуті)	scv	Notes / action
Junous articulatus		HITTIN I
Juneus bulbosus		
Lenna gibbe		
Lemna minor		
Lemna minuta		
amna trisuica		
Littorella uniffora		
obelia dortmanna		
Letus pedunculatus		
ythrum salicaria		
Mendra sp*		specimen(s) required
Mentha acuatica		
Menyanthes trifoliata		
Mimulus sp./hybrid		specimen(s) required
Montile fontana		- Annual Control
Mycsolis sp(p).		acceptable if non-flowering
1	_	and the same of th
Myosotis Iana		
Vyasotis scorpoides	_	
Myasalon squalloum		
Myriophyllum alterniflorum	_	
Myriophyllum spicatum		
Nuphar lutes	_	
lymphaea alba		
lymphoides peltata	_	
Denanthe aquatica		
Dener/the crocets		
Denandra flatukssa	_	
Denanthe fluviatilis		
Pensicaria amphibia		
Persicaria hydropiper	-	
halaris srundinacea		
Phragmites austrelis -	2-	
Potamogeton alpinus		
Potamogeton berchtoldii		
Potamogeton crispus		
*otamogaton filiformis		Rare
Potamogeton friesti		Rare
otamogeton gramineus		
Potamogeton lucens		
Potamogeton natans		
Potamogeton nodosus		to the same of the
otamogeton obtusifolius		Rare
Potamogeton pectinatus		
Potamogeton perfoliatus		
Potamogeton polygonifolius		
Potamogeton praelongus		
Potamogeton pusitus		
Potamogaton tricholdes		Pare
Palamagetan x aliveosus		1
Potamogeton x salicifolius		
Potentilla palustris		
Petentilla erecta		

moliuting elicinatus, onliophylius, rederaceus Record only if classic characteristics Record only if classic characteristics Record only if classic characteristics Rare Record only if classic characteristics Racerd only if classic characteristics Racerd only if classic characteristics
Record only if classic characteristics  Flaccard only if classic characteristics
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Record only if classic characteristics Paire Record only if classic characteristics Record only if classic characteristics
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Record only if classic characteristics Paire Record only if classic characteristics Record only if classic characteristics
Record only if classic characteristics Paire Record only if classic characteristics Record only if classic characteristics
Pare Record only if classic characteristics Record only if classic characteristics
Pare Record only if classic characteristics Record only if classic characteristics
Pare Record only if classic characteristics Record only if classic characteristics
Record only if classic characteristics
Record only if classic characteristics
Record only if classic characteristics
Plane, though common W.Insland & fer WFD waterbodies
Pare - specimen(s) required
pare apparently require
1
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kil above e.g. Spirogyra, on BIOSYS ye smatalean.
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### Aquatic Ecology Survey Report

#### Macrophyte Field Sheet

River	LANK BAKE BURN	Site:	SITE 2
Surveyor	SMC 4 EM		
NGR top	M2 1845 44891	Date	112 112
NGR bottom	WZ 17924 759 43		11114
Start time		Finish Time	
% Wadeable	60 1/.	Total % cover of macrophytes	

Width (n	0.%	<1		1-5	6.5
5-10	30	10-20	6	>20	
Depth (n	0%	<0.25		0.25-0.5	80.
		0.5-1	15	>1	5

#### Record the estimated percentage for each of the following:

Substrate %	Peat		Silt/play	F
	Sand	9.0	Pebbles/gravel	45
	Boulderfcobble	3.5	Bedrock	
Habitate %	Pool	25	Run	60
	Riffe	10	Slack	5
Shading %	Left Bank		Right Bank	
	None	10	None	
	Broken	20	Broken	35
	Dense	10	Dense	15

Clarity %	Clear	5
	Turbid	7.5
	Cloudy	

Bed Stability	Salid/firm		Stable	10.
%	Unstable	30	Soft/sinking	10-

Photo No/	Uls	D/s
Ref		

#### % Cover of Filamentous Algae

Kighterbirty + wery shoty they		
, ,	L	1

#### Macrophyte taxa

You must record ALL mecrophytes you encounter in the 100m stretch and identify them to species level.

#### Notes / actions

Suffix sp\* - Make every effort to identify these taxa to species level, either in the field or using specimens back in the lab. You may need to confirm the identification with colleagues or Nigel Holmas. Make a record for each unknown species and label them "Species x: 1", "Species x: 2" effect you will need to enter each different species you find as a separate record (with a species cover value) on BIOSYS.

Specimen required — these taxe are particularly difficult to identify to species level and you must be certain of a convect identification to record them. Record the site, date, recorder, possible identity and supporting notes. You may need to have it verified by an independent expert and preserve it in your reference collection.

#### Rare - taxa which are likely to be found in <1% of surveys.

#### MTR taxa

Taxos which appear in the original MTR manual are shown in bold. BIOSYS can be used to extract an MTR score in the interim and information for the WFD, as we move to one method and an extended taxa list for all survey purposes.

#### The Species Cover Value (SCV) classes are:

1	<0.1%	6	10-25%
2	0.1 -1%	7	25 -50%
3	1 - 2.5%	8	50 - 751
4	2.5-5%	9	> 75%
5	5 - 10%		

#### MACROALGAE

Taxa (Synemym)	Species Cover Value - 9 pt scale	Motes I action
Betrachospermum sp(p.)		
Chara sp* e.g. vulgaris		Specimen (s) required
Cladophora aegagropila		
Cladophoro glomerata/ Rhizodonium hieroglyphicum Blanketweed agg.	-1	
Unidentified unbranched filamentous non-slimy green algae (i.e. unbranched, non-slimy green algae end, Gladophora / Vaucherla/ Hydrodictyon		
Hildenbrandia rivularis		
Hydrodictyon reticulatum		
Lemanes sp(p.) e.g. fluvistilis		
Nitella sp*		specimen(s) required
Nostoc sp*		specimen(s) required
Blue-green algat film / pa(ts (Phormidium / Lyngbys sp (p)		
Enteremorpha intestinulis (Ulxa flerucea / Intestinulis)		
Vaucheria sp(p.)		
Zypnematalean (Slimy, unbranched, fil algae)		

#### BRYOPHYTES

Taxa (Synonym)	SCV	Notes / action
Amblystegium fluviatile (Hygroamblystegium fluviatile)		
Amblystegium (Hygroamblystegium) tenax		
Blindia acuta		
Brachythecium plumosum		
Brachythecium rivulare		
Brachythecium rutabulum	DV-0 II	
Bryum pseudotriquetrum	10	
Calliergon cuspidatum		
Chiloscyphus polyanthos		
Cinclidotus fontinaloides		
Cratoneuron filicinum		
Dichodontium flavescens/pellucidum		
Dichodontium palustris (Dicranella palustris)		
Fissidens sp* e.g. rufulus/ crassipes		specimen (s) required
Fontinalis antipyretica		
Fontinalis squamosa		
Hygrohypnum luridum		
Hygrohypnum ochraceum		
Hyocomium armoricum		
Jungermannia sp* e.g. atrovirens		specimen (s) required
Leptodyctium riparium (Amblystegium riparium)		
Marsupella sp* emarginata		specimen (s) required
Nardia sp* compressa		specimen (s) required
Octodiceras fontanum		
Orthotrichum rivulare		
Palustriella commutata (Cratoneuron commutatum)		
Pellia endiviifolia	1	
Pellia epiphylla		
Philonotis sp.* e.g. fontana		specimen (s) required
Platyhypnidium riparioides (Rhynchostegium riparioides)		
Polytrichum commune		
Racomitrium aciculare		
Riccardia sp* chamaedryfolia / multifida		specimen (s) required
Riccia fluitans	1	
Scapania sp* e.g. undulata	İ	specimen (s) required
Schistidium rivulare	71111	
Sphagnum sp* e.g. denticulatum		specimen (s) required
Thamnobryum alopecurum		

Taxa (Synonym)	BCV	Notes / action
Dermatocarpon sp(p)*		apecimen(s) required
VASCULAR PLANTS		
Taxa (Synonym)	Iscv	Notes / action
Applia filipuloides	001	110000 7.000000
Equisetum fluviatile		
Equisetum palustre	_	
Acorus calamus		
Alisma lanceolatum		
Alisma plantago-aquatica		
Apium Inundatum	_	
Apium nodifierum		
Berula erecta	_	
Bidens cernus		
Edens Inpartits		
Bolboechoenus maritimus		Bare
Butomus umbeliatus		
Calitriche hamulata	_	
Cellitriche herrephroditica/truncata	_	specimen(s) required
Califriche obtusangula	_	Observated (1) settings
Cellitriche stagnalls/platycarps/oblusanguls		specimen(s) required
Celha palustra	_	special color infrares
Carex acuta	_	
Carex acutiformis	_	
Carex aquatis	_	
Corex stata		
Cares panioulais		
Carex rigaria	_	
Carex restrata	_	
Carex vesicaria		
Catabresa aquatica	_	
Ceratophyllum demensum		
Cicuta virosa		Rare
Eleocharis palustris	_	Port
Eleogiton fluitans	_	
Elodea canadensis		
Elodes nuttallii	-	
Glyceria fluitans agg	_	a nov Shiff I Observe Shift
		i.e. any SMALL Glyceria (NO1 maxima)
Giyceria maxima		
Groenlandia densa		
Hippuris vulgaris		
Hotionia palustris		Rare
Hydrocharis morsus-ranae		Rare
Hadrocotyle ranunculoides		Rore
Hypericum elodes		Rare
Iris pseudacorus		

Texa (Synonym)	8CV	Notes / action
Juncus articulatus		
Junous belbosus		
Lemna gibba		
Lemna minor		
Lemna minuta		
Lemna trisulca		
Littorella uniflora		
Lobella dortmanna		
Lotus pedunculatus		
Lythrum salicaria		
Monthe sp*		specimen(s) required
Menthe aquatics		
Meryanthes trifolists		
Mirrulus sp./hybrid		specimen(s) required
Montia fontana		
Myosofis sp(z).		acceptable if non-flowering
Myceolis Issa	_	
Myosolis scorpoides	_	_
Myosolon aquaticum		
Myriophyllum alterniflorum	_	
Myriophyllum spicetum	_	
Nuphar lutea	_	
Nymphaea alba	_	
Nymphoides peltata	_	
Oenanthe aquatica	_	
Oenanthe orocata		
Denantre orocata Denantre fistulosa	_	
Denanthe fluviatilis	_	
Persicaria amphibia	_	
	_	
Persicaria hydropiper	-	
Phalaris arundmacea	2	
Phragmites australia	_	
Potamogoton alpinus	_	
Potamogaton berchtoldii		
Potamogeton crispus		-
Potamogelan filiformis		Rare
Potamogeton friesii		Rare
Petamogeton gramineus		
Potamogeton lucens		
Potamogeton natana		
Potemogeton rodosus		-
Potamogeton obtusifolius		Rare
Potamogeton pectinatus		
Potamogeton perfoliatus		
Potamogaton polygonifolius		
Potamogeton praelongus		
Potamogeton pusitius		
Potamogeton trichoides		Rare
Potamogeton x ofivaceus		
Potamogeton x salicifolius		
Potentilla palustris		
Potentilia erecta		1

Така (Бугопуп)	SCV	Notes / action
Ranunculus sp. (R. sect Batrachian sp. or		excluding circinatus, omiophyllus,
hybrid indet)		hederaceus
Ranunculus aquatifis		Record only if classic characteristic
Panunculus aquatila var. diffusus		
(R.trichophyllus)		
Ramunoulus circinatus		
Ranunculus flammula		
Ranunculus fluitans		Record only if classic characteristics
Ranunculus hederaceus		
Ranunculus omiephyllus		
Ranunculus peltatus		Record only if classic characteristics
riante trade per anne		Rare
Renunculus penicifletus subsp. penicifletus		Record only if classic characteristics
Ranunculus penicillatus subsp.		Record only if classic characteristics
Pseudofluitans var pseudofluitans		
Ranunculus penicillatus subsp pseudofiultans		Record only if classic characteristics
var vertumnus		
Ranunculus sceleratus		
Rorippe amphibia		
Rorippe nesturtium-equaticum agg.		
Rorippa palustris		
Rumes hydrolapathum	-	
Sagittario sagittifolio		
Schoenoglectus lacustris	_	
Scingus sylvaticus		
Sium brifolium		Rare, though common W.ireland & f
		WFD waterbodies
Spergenium angustifolium		
Sparganium omersum		
Spanganium erectum		
Spirodela polyrhiza		
Triglochin palusiris		
Typha angustifolia		
Typha latifolia		
Utrigularia sp(p.)		Rare - specimen(s) required
Veronica anagalits-aquatica	_	
Veronica baccabunga	_	
Veronica catenata	_	
Veronica catenata x anagallis-aquatica (or		
parents indet)		
Veronica scutellata		
Viola palustris	-	
Zannichel lia palustris		
Additional species	Commen	
Additional apecias	Commen	ha let share a a Colombia an GANOVIII
" I' you go further in your identification than the car must enter the category on the list that it comes to	ve a n Zve	ne nai acove e.g. oprogyra, on orue ro-
Epilhon, hour from	are gregg	THE PERSON L
Carried A. Arrest		
Garage Concern		
potentition sp		
barberia consiste	_	
* 1451		
Additional comments on the survey		

#### Macrophyte Field Sheet

River	LOKE SHEN	Site:	211¢ 1
Surveyor	SHL + EM	1	
NGR top	III. 13255 9930	Date	2/8/17
NGR bottom	H2 17 961_ 12/20	1	200111
Start time		Finish Time	
% Wadeable	100 -	Total % cover of macrophytes	

Width (m) %	<1		1-5	100 :
5-10	10-20		>20	
Depth (m) %	< 0.25	65	0.25-0.5	38
	0.5-1		>1	

#### Record the estimated percentage for each of the following:

Substrate %	Peat		Siticby	10.
	Sand		Pebbles/gravel	30
	Boulder/cobble	60	Bedrock	
Habitats %	Pool	10 :	Run	65.
	Riffe	2.0	Slack	5.
Shading %	Left Bank		Right Bank	
	None	25	None	
	Broken	65	Broken	10
	Dense	10	Dense	2,

Clarity %	Clear	
	Turbid	100
	Cloudy	

<b>Bed Stability</b>	Solid/firm		Stable	
%	Unstable	760.	Soft/sinking	

Photo No/	U/s	Dris
Ref		

#### % Cover of Filamentous Algae /o

#### Notes/Comments:

#### Macrophyte taxa

You must record ALL macrophytes you encounter in the 100m shelch and identify them to species level.

#### Notes / actions

Suffix sp\* - Make every effort to identify these taxa to species level, either in the field or using apecimens back in the lab. You may need to confirm the identification with colleagues or Nigel Holmes. Make a record for each unknown species and label them "Species x. 1". Species x. 2" asts. You will need to enter such different species you find as a separate record (with a species cover value) on BIOSYS.

Specimen required — these toos are particularly difficult to identify to species level and you must be certain of a consuct identification to record them. Record the site, date, recorder, possible identify and supporting notes. You may need to have it verified by an independent expert and preserve it in your reference collection.

Rare - taxa which are likely to be found in <1% of surveys.

#### MTR taxa

Taxa which appear in the original MTR manual are shown in bold. BIOSYS can be used to extract an MTR score in the interim and information for the WFD, as we move to one method and an extended taxa list for all survey purposes.

#### The Species Cover Value (SCV) classes are:

1	<0.1%	6	10-25%
2	0.1 -1%	7	25 -50%
3	1 - 2.5%	8	50 - 75%
4	2.5 - 5%	9	> 75%
5	5 - 10%		

#### MACROALGAE

Taxa (Synonym)	Species Cover Value - 9 pt scale	Notes / action
Betrachospermum sp(p.)		
Chara sp* e.g. vulgaris		Specimen (s) required
Cladophora aegagropila		
Cladophora glomerata/ Rhizoclonium hieroglyphicum Blanketweed ago.	1	
Unidentified unbranched filomentous non-sismy green aligae (i.e. unbranched, non-sismy green aligae end, Claidophona / Vaucherta/ Hydrodictyon	- =	
Hildenbrandia rivularis		
Hydrodictyon reticulatum		
Lemanes sp(p.) e.g. fluvistille		
Nilella sp*		specimen(s) required
Nostoc sp*		specimen(s) required
Blue-green algar fam / pelts (Phomislium / Lyngbys ap (p)		
Enteromorpha intestinalis (Ulva flexuosa / Intestinalis)		
Vaucheria sp(p.)		
Zygnematelean (Silmy, unbranched, fil algae)		

#### BRYOPHYTES

Taxa (Synonym)	SCV	Notes / action
Amblystegium fluviatile (Hygroamblystegium fluviatile)		Maccondylamon a
Amblystegium (Hygroamblystegium) tenax		
Blindia acuta		
Brachythecium plumosum		
Brachythecium rivulare		
Brachythecium rutabulum		
Bryum pseudotriquetrum		
Calliergon cuspidatum		
Chiloscyphus polyanthos		
Cinclidotus fontinaloides		
Cratoneuron filicinum		
Dichodontium flavescens/pellucidum		
Dichodontium palustris (Dicranella palustris)		
Fissidens sp* e.g. rufulus/ crassipes		specimen (s) required
Fontinalis antipyretica		
Fontinalis squamosa		
Hygrohypnum luridum		
Hygrohypnum ochraceum		
Hyocomium armoricum		
Jungermannia sp* e.g. atrovirens		specimen (s) required
Leptodyctium riparium (Amblystegium riparium)		
Marsupella sp* emarginata		specimen (s) required
Nardia sp* compressa		specimen (s) required
Octodiceras fontanum		
Orthotrichum rivulare		
Palustriella commutata (Cratoneuron commutatum)		
Pellia endiviifolia		
Pellia epiphylla		
Philonotis sp.* e.g. fontana		specimen (s) required
Platyhypnidium riparioides (Rhynchostegium riparioides)		
Polytrichum commune		
Racomitrium aciculare		
Riccardia sp* chamaedryfolia / multifida		specimen (s) required
Riccia fluitans		
Scapania sp* e.g. undulata		specimen (s) required
Schistidium rivulare		
Sphagnum sp* e.g. denticulatum		specimen (s) required
Thamnobryum alopecurum		

LICHENS			
Taxa (Synonym)	SCV	Notes / action	
Dermatocarpon sp(p)*		specimen(s) required	

Dermatocarpon sp(p)		specimen(s) required
VASCULAR PLANTS		
Taxa (Synonym)	SCV	Notes / action
Azolla filiculoides		
Equisetum fluviatile	_	
Equisetum palustre		
Acorus calamus		
Alisma lanceolatum		
Alisma plantago-aquatica	$\overline{}$	
Apium inundatum		
Apium nodiflorum	_	
Berula erecta		
Bidens cernua		
Bidens tripartita	_	
Bolboschoenus maritimus		Rare
Butomus umbellatus		
Callitriche hamulata		
Callitriche hermaphroditica/truncata		specimen(s) required
Callitriche obtusangula		specimen(s) required
Callitriche stagnalis/platycarpa/obtusangula	-	specimen(s) required
Caltha palustris		speciments/requires
Carex acuta		
Carex acutiformis		
Carex aquatilis	_	
Carex elata	_	
Carex panicula ta		
Carex riparia		
Carex rostrata		
Carex vesicaria		
Catabrosa aquatica		
Ceratophyllum demersum	_	
Cicuta virosa	_	Rare
Eleocharis palustris	_	Nate
Eleogiton fluitans	_	
Elodea canadensis	_	
Elodea nuttallii		
Glyceria fluitans agg		i.e. any SMALL Glyceria (NOT
		maxima)
Glyceria maxima		
Groenlandia densa		
Hippuris vulgaris		
Hottonia palustris		Rare
Hydrocharis morsus-ranae		Rare
Hydrocotyle ranunculoides		Rare
Hypericum elodes		Rare
Iris pseudacorus		

faxa (Byrronym)	BCV	Notes / action
lunous articulatus		
funcus bulbosus		
emna gibba		
emna minor		
emna minuta		01-11-11-11-11-11-11-11-11-11-11-11-11-1
omna trisuloa		
ittorella uniflora		
chella dortmanna		
otus pedunculatus		
ythrum salicaria		
dentha sp*		specimen(s) required
fertha aquelica		
Senyenthes trifoliate		
Birnulus ap /hybrid		specimen(s) required
Sontia fontana		
ilyosotis sp(p).		acceptable if non-flowering
dyonotis laxa		- Indiana - Indi
dyosotis soorgoides ,	- 6	
dyosotan aquaticum	2	
tyriophyllum atterniflorum		
Vyriophyllum spicatum	_	
Ryriophyllum spicetum Rupher lutes		
	_	
lýmphaea alba lýmphoides peltata	_	
Denanthe aquatico		
Denenthe crocata		
Donarthe fatulose		-
Denanthe fluviatilis		
Pereicaria amphibia		
Persicaria hydropiper		
Phaloris arundinacea -	3	
Phragmites austrelis		
otamogeton alpinus		
Potamogeton berchtoldii		
Potamogeton crispus		
Potamogelan filiformis		Rare
Potamogeton friesit		Rare
Poternogeton gramineus		
Potamogelon lucens		
Potamogelon natans		
Polamogeton nodosus		
Potamogeton obtusifolius		Rare
Potamogeton pectinatus		
Potamogeton perfoliatus		
Potamogeton polygonifolius		
Potamogeton praelongus		
Potamogeton pusitius		
Potamogeton trichoides		Rare
Potamogeton s olivacaus		
Polamogeton z salicifolius		
Polentilla palustris		
Potentiila erecta		

Taxa (Synonym)	8CV	Notes / action
Ranunculus sp. (R. sect Batrachian sp. or		excluding circinatus, omiophytlus,
hybrid indet)		hedenaceus
Ranunculus aquatilis		Record only if classic characteristics
Ranunculus aquatilis var. diffusus		
(R.trichophyllus)		
Ranunculus circinatus		
Ranunculus flammula		
Ranunculus fluitans		Record only if classic characteristics
Ranunculus hederaceus		
Ranunculus omiophyllus		
Ranunculus peltatus		Record only if classic characteristics flare
Ranunculus peniciflatus subsp. peniciflatus		Record only if classic characteristics
Ranunculus peniciflatus subsp.		Record only if classic characteristics
Pseudofluitans var pseudofluitans		
Ranunculus peniciflatus subsp pseudofluitans		Precord only if classic characteristics
ver vertumnus		
Ranunculus sceleratus		
Rorippa amphibia		
Rorippe nesturtium-equatioum agg.		
Rorippe palustris		
Rumex hydrolapethum		
Segitteria segittifolia		
Schoenopiectus lacustris		
Scirpus sylvatious		
Sun latfolium		Plane, though common W.Ireland & fan WFD waterbodies
Sparganium angusäfolium		
Sperganium emersum		
Sperganium erectum -	1	
Spirodela polyrhiza		
Triglochin palustris		
Typha angustifolia		
Typhe letifolia	_	
Utricularia ap(p.)	_	Rare - specimen(s) required
Veronica anagallis-aquatica	_	y date - agreem no day responses
Veronica beccabunga	-	
Veronica catenata	_	
Veronica catenata x anagallis-aquatica (or		
parents indet)		
Varonica scutsflata	_	
Viola palustris	-	
Zannichellia palustris	_	
Additional species	M	
	Commen	
If you go further in your identification then the cat must enter the category on the list that it comes for		
	es espaya	remounted.
Petesites se	_	
Coopera arresta	_	
Commercia arichte	-	
1100		
Additional comments on the survey		

VASCULAR PLANTS ......continued

\_\_\_\_\_ Version: 2
68 Issued: March 2017

Water Body	Minto's Dean	Long Dike Burn (site 1)	Long Dike Burn (site 2)
SAMPLE DATE	31-Jul-17	02-Aug-17	01-Aug-17
RMNI	8.06	7.60	7.55
NTAXA	2	1	1
NFG	2	1	1
ALG	7.5	0.05	0.05
Slope (m/km)	9.345794393	3.7	3.7
Distance to source (km)	0.79	8.3	8
Source_altitude (m)	67	131	131
Alkalinity (CaCO3 mg/L)	93.4124	117.0998	110.6978
country	GB	GB	GB
method	1	1	1
log_slope1	1.014763843	0.672097858	0.672097858
log dist1	0.252853031	0.968482949	0.954242509
log_source_alt	1.832508913	2.120573931	2.120573931
log_alk	1.975029038	2.072249162	2.048044619
Expected RMNI score	5.494	6.061	6.017
Expected Number Taxa	6.51	7.53	7.53
Expected Number Functional Groups	4.30	4.89	4.89
raw RMNI EQR	0.431	0.609	0.616
raw NTAXA EQR	0.307	0.133	0.133
raw NFG EQR	0.465	0.204	0.204
raw ALG EQR	0.925	1.000	1.000
adjusted RMNI EQR	0.301	0.499	0.506
minimum diversity EQR	0.307	0.133	0.133
adjusted diversity EQR	0.185	-0.020	-0.020
adjusted ALG EQR	0.602	1.000	1.000
interimEQR	0.262	0.326	0.331
weight alg	0.822	0.979	0.975
final_EQR	0.262	0.326	0.331
CLASS	Poor	Poor	Poor
final_ EQR capped	0.262	0.326	0.331
n	1	1	1
SE	0.088485706	0.089105033	0.08906907
trsfd mean	-1.033639516	-0.727732548	-0.704243856
trasfd error	0.457204665	0.405729406	0.40230711
	0.220447023	0.052355684	0.045074126
	0.915428548	0.786820591	0.771507146
	0.999174092	0.997379556	0.997085126
	0.99999994	0.99999905	0.99999898
Bad	22.0	5.2	4.5
Poor	69.5	73.4	72.6
Mod	8.4	21.1	22.6
Good	0.1	0.3	0.3
High	0.0	0.0	0.0

### Aquatic Ecology Survey Report

### **APPENDIX E: MACROINVERTEBRATE TAXA LIST**

Таха	i	River Coquet	-	KIVET LYTTE		Longaixe bum 1	Longdike Burn 2	(sample 1)	Longdike Burn 2 (2nd sample)		Earsdon burn	a despera	Tioodgate Dail	Fenrother Burn		Minto's Dean	Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	H. C.		Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Agabus sp.	0	3	0	0	0	0	0	0	0	0	0	3	0	9	0	0	0	0	0	0	0	0
Agapetus fuscipes	0	0	0	0	0	7	0	2	0	11	0	0	0	0	0	1	0	0	0	40	0	0
Agapetus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alainites muticus	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anabolia nervosa	0	0	0	0	7	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Anacaena globulus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Ancylus fluviatilis	2	3	0	1	0	20	3	3	2	2	0	0	0	0	0	1	0	0	0	0	0	0
Asellidae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asellus aquaticus	0	0	3	1	6	2	0	2	1	0	0	42	5	0	0	0	0	0	2	0	0	0
Atherix ibis	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Athripsodes albifrons	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Athripsodes bilineatus	0	0	0	0	2	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Athripsodes sp.	5	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetidae	56	0	0	0	0	0	255	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
Baetis buceratus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Baetis rhodani	4	6	0	5	0	13	0	21	0	2	23	0	1	0	1	2	0	0	0	3	0	0
Baetis scambus/fuscatus	29	0	0	0	1	0	7	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0
Baetis sp.	0	3	0	0	0	2	21	0	0	31	0	3	0	0	1	0	0	0	0	0	0	0

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Таха	i	River Coquet				Longaike bum 1	Lonadike Burn 2	<del>1</del>	Longdike Burn 2		Earsdon burn	Floodrate Rum		Fenrother Burn		Minio's Dean	Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	# 	Dack built	Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Baetis vernus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Beraea pullata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Beraeodes minutus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Caenis rivulorum	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centroptilum luteolum	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae	1	0	0	0	1	0	0	0	1	0	1	2	0	0	6	1	2	0	0	0	0	10
Chaetopteryx villosa	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	13	4	788	21	79	21	52	41	23	530	128	1052	15	6116	18	8	483	495	740	16	1	81
Crangonyx pseudogracilis	0	0	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Culicidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Curculionidae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
Cyrnus trimaculatus	0	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicranota sp.	0	0	0	0	9	14	0	4	0	0	23	0	2	0	5	0	7	0	0	0	0	0
Dinocras cephalotes	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	5	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	0	0	0
Dixa submaculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
Drusus annulatus	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Dugesia lugubris/polychroa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Dytiscidae	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	0	2	0	0	0	0	0
Ecdyonurus dispar	0	6	0	1	0	3	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecdyonurus insignis	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

### Aquatic Ecology Survey Report

Таха		Kiver Coquet	i	Kiver Lyne	=	Longaike bum 1	Lonadike Burn 2	<del>-</del>	Longdike Burn 2		Earloadii Daii			Fenrother Burn		Minto's Dean	Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	; ;	Back burn I no	Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Ecdyonurus sp.	48	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Ecdyonurus torrentis	0	0	0	0	2	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecdyonurus venosus	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elmidae	0	0	0	0	0	0	26	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Elmis aenea	1	0	0	0	25	33	40	56	4	22	1	2	3	0	26	39	0	0	0	2	1	0
Elodes sp.	0	0	0	2	1	0	0	0	0	0	4	0	33	0	28	38	0	0	0	0	0	0
Eloeophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Empididae	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Ephemera danica	0	0	0	0	9	0	7	0	7	0	0	0	0	0	0	1	0	0	0	0	0	0
Ephemera sp.	0	1	0	0	5	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Erpobdella octoculata	0	2	0	0	0	0	0	0	0	0	0	3	1	1	0	0	0	0	0	0	0	0
Erpobdellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
Gammarus pulex	11	25	0	5	27	125	56	118	2	136	142	16	10	2	39	61	0	0	0	214	96	0
Glossiphonia complanata	0	1	0	1	3	1	2	1	2	2	0	9	4	1	0	1	0	0	0	0	0	0
Goera pilosa	0	0	0	0	4	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gyrinidae	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Habrophlebia fusca	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
Halesus radiatus	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Haliplus sp.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Helobdella stagnalis	0	0	0	0	1	0	0	0	1	0	10	0	0	0	0	1	1	0	0	0	0	4
Helophorus aequalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2

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Таха	i	Kiver Coquet		Niver Lyne	-	Longaike bum 1	Lonadike Burn 2	(sample 1)	Longdike Burn 2 (2nd sample)				Tioodgate buil	Fenrother Burn		Minio's Dean	Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	# 	Dack Dull TIID	Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Helophorus brevipalpis	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	0	0	0
Helophorus grandis	0	0	0	0	0	0	0	0	0	1	2	0	2	1	0	0	0	0	1	0	0	0
Helophorus sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0
Heptageniidae	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydracarina	0	0	0	0	1	0	0	2	3	5	2	41	0	2	0	2	0	0	0	0	0	0
Hydraena gracilis	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Hydrobius fuscipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Hydropsyche angustipennis	0	0	0	10	0	0	0	0	0	0	12	1	6	0	0	0	0	0	0	0	0	0
Hydropsyche instabilis	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche pellucidula	1	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche siltalai	25	6	0	0	0	10	5	22	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ibisia marginata	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
llybius fuliginosus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ilybius sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Isoperla grammatica	10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Lepidostoma hirtum	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptophlebiidae	0	1	11	2	13	0	0	1	44	12	0	0	0	0	13	0	0	0	0	4	0	0
Leuctra fusca	0	2	0	0	0	2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctra geniculata	4	0	0	0	7	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctra nigra	6	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0

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Taxa	i	Kiver Coquet		KIVET LYTTE	=	Longaike Bum 1	Longdike Burn 2	(sample 1)	Longdike Burn 2 (2nd sample)			Elocate Burn	Tiooglasia Discontinuo	Fenrother Burn		Minto's Dean	Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	: 	Dack built 1110	Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Leuctra sp.	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Limnephilidae	0	2	1	0	0	0	0	0	0	10	0	1	0	0	0	1	0	0	0	11	1	0
Limnephilus lunatus	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1
Limnius volckmari	34	19	0	0	10	18	22	6	2	19	2	0	0	1	0	0	0	0	0	0	1	0
Limoniidae	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	1	0	0
Lumbricidae	0	4	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0
Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Lype reducta	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Melampophylax mucoreus	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropterna lateralis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Micropterna sequax	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	2	0	0
Muscidae	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mystacides azurea	0	0	0	0	15	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Nebrioporus elegans	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematomorpha	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nemoura cambrica/erratica	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nemouridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
Nemurella pictetii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	12	0	0
Neolimnophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Nigrobaetis niger	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontocerum albicorne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Oligochaeta	9	18	75	17	1	9	32	8	11	65	157	206	3	562	10	25	5	206	152	1	26	105

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Taxa	i	Kiver Coquet	-	Niver Lyrie		Longaike burn 1	Lonadike Burn 2	(sample 1)	Longdike Burn 2		Earsdon burn	Elocate Burn	Tioongale Duil	Fenrother Burn		Minio s Dean	Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	# -	Dack Dum TIID	Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Oreodytes sanmarkii	2	0	0	0	7	2	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribati	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Oulimnius sp.	0	3	0	0	3	5	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Oulimnius tuberculatus	0	0	0	0	1	3	19	7	1	3	0	0	0	0	0	0	0	0	0	0	0	0
Pacifastacus leniusculus	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia sp.	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pediciidae	0	0	0	0	0	0	18	0	0	33	0	48	0	0	0	0	0	0	0	2	1	0
Perla bipunctata	6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium sp.	0	0	12	1	4	1	2	2	2	39	0	3	2	317	4	2	1	64	6	11	3	61
Platambus maculatus	0	1	0	0	0	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectrocnemia conspersa	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	1	0	0	0	2	0	0
Polycelis felina	0	0	0	0	0	8	0	2	0	0	0	0	0	0	1	0	0	0	0	455	95	0
Polycelis nigra/tenuis	0	0	0	0	0	0	0	0	0	0	0	12	3	0	0	0	0	0	0	0	0	7
Polycelis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Polycentropodidae	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0
Polycentropus flavomaculatus	6	0	0	1	13	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Potamophylax cingulatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	5	0	0
Potamophylax latipennis	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Potamopyrgus antipodarum	6	3	34	0	15	24	28	25	3	19	0	539	51	185	575	65	2	1	30	720	139	2150
Prosimulium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Psychodidae	0	0	0	0	1	0	0	0	0	1	12	4	2	0	1	0	3	14	38	0	0	0

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### Aquatic Ecology Survey Report

Таха	i	Kiver Coquet	-	RIVEI LYNE		Longdike Bum 1	Longdike Burn 2	(sample 1)	Longdike Burn 2 (2nd sample)					Fenrother Burn		Minto's Dean	Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib		Back Burn I ND	Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Ptychoptera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Ptychopteridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0
Radix balthica	1	0	0	0	0	0	1	3	0	4	2	2	1	32	0	0	0	1	0	0	0	32
Rhithrogena semicolorata	34	17	0	0	0	0	30	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Rhyacophila dorsalis	6	2	0	1	1	4	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila sp.	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scirtidae	0	0	0	0	0	0	0	0	0	4	0	2	0	0	0	0	0	0	0	2	6	0
Sericostoma personatum	2	0	0	0	6	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Serratella ignita	69	0	4	0	88	0	229	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara dorsalis	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silo pallipes	1	0	0	0	0	1	12	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Simuliidae	0	0	0	0	0	0	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0
Simulium sp.	0	2	0	0	0	7	9	117	0	0	0	0	0	0	6	0	0	0	0	0	0	0
Simulium vernum	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	1	0
Stratiomyiidae	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0
Succineidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	158	0	0	0
Tinodes waeneri	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Tipula sp.	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
Tipulidae	0	0	0	0	0	0	0	1	0	1	3	0	10	0	0	0	1	0	0	0	1	4
Velia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Veliidae	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	2	0	0

Aquatic Ecology Survey Report

A1 in Northumberland	
Aquatic Ecology Survey Report	

**APPENDIX F: PSYM FIELD SHEETS** 

			e	2000	Plant recording sheet (se				R.S = Rority	Tare I w	W. S. Subsector & character
		÷	ML 1-703	1 34.700.	BS TRS Energent plants  Achilles promites	RS TRS	pilofrium kirsutura	085 33	N Phragonius australis		RS Submerged plants  3 Agreen spenderion
ond PSYM Field	lsheet				1 Acons calanas	11 (3203)	pilohian ebscaran	4 5	5 Pilisteria globalifota	1.58	Aposegrios distachyee
	isheet				) Sign Agricols Gallan		pilohian palastre	12-500	Sec Louis incide distances	1.00	Cabomba carolinaria
e and sample details					1 LP Agrartis eluluralera 32 (1998) Alama grantmeuri		pilohian parviflorini pilohian tangonan	1 890	Penguictala vulgarii Petentalia meeta	1 6	3 Calitriche bratis 3 Calitriche hatralata
	C-4-N-	C-: 4	ref. (NZ) 1870	Q 97212	2 March Aliena Innocolatan	2,000	pepacite pulsatric	1 5	Dotopulla galantria	2 8	15 Calăniche hermophredinea
ename Porto AS	Code No.	Grid	ret. (192) 1070	D 12-7-0	1 9 Aliseus plantago-oquatica	1 LP	quisetam Buviatile	1 1000	Pulscaria dysertierica 5	1 2 5	Calktriche obtantequale
			Recording format: (SU)3-	45 678 ar (41)345 678	2 Alopeourus enquelis A lopeourus borculu	1 6 4 1	ignisetum polastry Iriga tetralix	1 11 133	Pulicaria vulgaris Barranculus ficaria	14.19	Callitriche platycarpa  3 Callitriche stagnalia
cation					1 PSSS Alopeners periodatus	1 25 1	nophorum angestafolitem	1 1	Barrarculus flanestrala	1 4 (8)	Callitriche trannata
e access details ///	ised with conda	saurie r			2 Anagallis tandla	1 14 533554	riophorum gracila	2 1	Baranculus hoderaccus	1 33	C sugnalis playcagu agg
	Surveyor MC	+ EM			Andromeda politicia     Angelica acchargelica	2 BUSSEL	Sriophorum Milifelium Singberum vaginatum	27 10000	Barunculas (togas Barunculas omophytha	2 1 PLS	C. hintalata bentia agg. Calitriche ap. nædet >
rvey date 14 5 7 17	Staveyor JPIC.	_T_E/\_			I Angolica rybadiis		epakerent camatines	12 300	Baranculus opiting to offices	13 17	III Cerahaphyllium demoreum
tes					2 See Aparta graveol cas		rifigendala olesaris.	32 (7%)	Hartaveulus reptana	1 2 162	Cera topri silium submereum
*****	0 % %	a - 5-m - 1		·	1 10 Apian ardiforum		calizen bounde	1 1444	Harungulus sesierarus	1447	Chara sp. Eporiu denia
leonly choked will	- Atanost-			***************************************	2 Baldelin orangaloides		Solitors convenience Solitors polantry	4 888	Rityricho sporu a ba Rityricho sporu fusos.	4	7 Elatine bewander
					2 10 Harutasansia		iolium oliginesum	2 555	Rotigga amphibia	4 88	Elatine bydropiper
vironmental data	·		Sketch o	1 pond	2 Bildens cernus		learn in ale	A 25%	Bompa islandica	2 50	Eleugiton fluiture
Altitude (m)	10 2	pH   5.4			1 Bidens corputa 1 Bidens Bunlosa		Byceria declinata Byceria fluttura	112+4	Bergga nicrogitalla Bergga nastartina agustoun	14.59	Elodes colleticheides  7.3 Elodes carauletuis
			~		2 Bakmi inpurits		Oyogni sustana		Boriges (sentet).		10 Elodas monathi
Shade: % pond overhung	% emergent pla	ent cover 5			2 Blystess compenses	2 3 3 3 5 5 6	alyceria potata	11 15 15 15 15	Sc Bungpa palesme	F 1833	Eriocaulos againicam
Statue. A pond overnung	/a emergent pa	an cover 3	1		2 2 2 Belle whomas marries a	1 2355	impledium aliginosum	2 1	Bastres, hydrodepo featr;	2 6	3 Fertinals ontrpostica
		. 1.00	-		2* Batoriai unicellatas 2 Calana grestis connecess	2 7 2 2 2 2 2 3	łydzatotyle valgáris łyporicum glades	7 500	Rumen maritimus Rumen palastris	2 100	Grueslardia densa 7 Hippans vulgaris
low (absent = 0, present = 1)	Pond :	area (m²)   300			2 Catagoggiests converses		hypericam telespicaum	1 17	Sagma procambens	1 100	Holtorea parastro
					8 Calantogrestis purpures	4 (666)	typer com undistaure	1 888	Segritaria subalista	4 900	fauctes others pera
% of pond margin grazed	0				8 Calanagrestis aneta	2 (980)1	reputions capeusis	1 239	Samotas valerandi	2	5 Insertes factureis
22 ponta mini gini graceo					Calamagnatis straiga	1 1 2 2 2 2 2	ropulione glandadifora	12 7	7 Schoenoplectan lacustris	1 50	Lastannicphon pajor
					1 7 Call to palestris		roputions ruli-tung out ris pacialiscorus	1 7 100	School effectio paragras School effection (abconscious)	15+3	i 7 Leterella unillera 5 Lehella deritturca
d base: categorise into one o	of three groups: 1=0%-32%	6, 2-33%-66%	3~67%-100%		L SCORE Conferencements	1 (823)	selepts settinen	32 333	Schoensplactus triqueter	1 50	Exchanges palaters
			ed rock		L Cathenine pestensis	1 5260	laguus acutifle res	16 158	Schoenes ferroginess	1 4	<ol> <li>Myelophyllion alternift con</li> </ol>
,	Sand, gravel, cobbles		ed FOCK		2 Control Carex sents		d ticze seti culstan	16 33	Schoens regricary	1 150	Myniquis/formaquaticum
t	Other				Carex aestifornia     Carex appropriequata	1 33 1	lencus before to app. lancus bellecus	1 1500	Seoriumera hterelia Seoriumera hterelia	4 1000	<ol> <li>Myticphyllom spiratum</li> <li>Myticphyllom spiratum</li> <li>Myticphyllom spiratum</li> </ol>
		~			2 Vol. Copes aspendis		вкои отпростни	1 7 73	Socialisto galericulate	1 18	Name (leading
					2 SESSE Carex certa	1 382	anous conglomentus	1. 35	Sesectio aggraticus	2 6	7 Nitellasp
CROINVERTEBRATE LIST	r				2 Cares dendra	1 45 1	ancorpffuse-	8 555	Senecies fluviatiles	2 300	Corporte flaviatila
CALLED TO THE LEGISTER OF LEGISTER	•				1 Carex districts 1 Carex celusors		lencus foliosita Innos inflesus	4 300	Senecia paladoum Siam brachiem	10 300	Potamogeton actificing  5.5 Potamogeton alpinus
p f taxa (BMWP: (6) ASPT OM Cold	Group 3 taxa (BMWP.7)	ASPT OM Cole.	Group 6 taxa (BMWP:4)	ASPT OM Cole.	2 10 Carry clain		THEORY PARENCES	1 11 11	Solzene dulczena	213	7.3 Potamogerer beechinks
erreridac Section	Cannidae	ESSENDED	Bactidac		4 Carex elements	2 2 2 2 3 3	Report School of the Control	4 133	Sorichus poliuresi	4 32	22 Poternoget re colorates
genidae	Nertseunidae	1333332	Sinlinke	7 7	I Sent Burn	A 00000 I	atheres pobestrie	1 8		4 53	200 Metamopdon compressus
phlebiidae	Rhyacephilidae (Glossomatidae)		Piscicolidae		1 Care hotizra. 2 Care larvipta		Leersia negonisles Lipanis loeselsi	1 7 1000	Stadiye pulurina Stallaria pulurinis	16 223	Petamogeres eniques  Petamogeres epilydes
merellidae	Polycentropodidae	-			2 4 Cares lasocama		Letter pedancularus	11 8	Stellaria officiares	4	10 Potamoperer fildomis
narthidac	Linnephilidae	12475553	No. of taxa	2-11	2 4  Cures limesa	1 68691	turala l'acade ides	1 176	Symphytum officinale	2	D) Polamogeten friesii
meridae					1 5 Cares nigra	2 38	Lumla sylvotica	16 32	Токпит жийли	1.2	7. Potamogeten graninetsi
iopicrygidae	No. of taxa	Name and Address of the Owner, where the Owner, which is	Greep 7 taxe (BMWP3) Valvatidae		Carrs orderape     Carrs orientes		yehns flor-cursts	1 7 888 7 888	Theherium flavors	2 2	Relations to the Relations
trialaci iblas	Group 4 taxa (BMWP:68		Hydrobiidae (Hifbyniidae)		1 Cares purces	9 Signal	yergus enropacini yermodua nemarelacia	1 1 100	Thelyptens galasteis Tofiel ilia punilla	1 2	Folumogetee unineus  8 Folumogetee ebusifolius
diulac	Noribidae	F2365565200	Lymnoidae		2 10 Caret puniculate	1 82381	yahnachia temestris	111 88	Teichaphamra coquitorum		10 Fetamogeton pectinatus
dac	Viviparidae		Physidae		1 [2000] Caren pendula	4 3383 1	Syrnichia fiyosiffera	1 38	Trig lochin pulmate		7.3   Fotomogeton perfoliates
roperlidae	Ancylidae (Acreloxidae)		Planorhidae		2 14 Cares propducyperas 1 Cares publicaris		yernacha valgans yihnen hyssapafahan	2 3		1	K.5 Fetamogeton prackingus
tochrinder	Hydroptilidae		Sphaeriidae		1 14 Cares riputa	2 000	lythrum gentals	2 505	Valentene directe	8 33	Fotomygeten penillus     Fotomogeten reidus
ganteidue	Unionidae		Görsiphoniidae	V	1 5.5 Cares restrata	1 (0.88)	Athrum salicaria	1 100	SValisaeria spiralis	4	10 Potamogeron tricheides
midse	Corephildse		Histollendae		2 Cares opicata		Menthu aquatica	1 588	Venetica aragallo-aquetica	2	10 Rammoulus aquatris.
ridae	Generalidae (Crangonyvidae)	2777.00	Erpobdellidae		2 Care vestions	16 23231	Months pulcaism	1 14 12	Veronica lucushanga	-4-	19 Kananocke byokmi.
toerfilad	Platyonemididae		Ascilidae	Contract of the Contract of th	1 Cares which a	11111111	Menyantus inteliaia Mimalus gatistus	1 1 5	Vennica cateriala  Vennica scriellala	11	60 Karanculus circinatus Karanculus (hatens
dau	Coenapriidae		No. of sava	5	S Cares sp.	1 3320	Milerates Suturis	1 (88)	SSYchminasp (tride)	2	7 Ramanoulus pellajus
Hinteridae	No. of terra	1 1	INC. OF LINE	- Baseline Company	2 SSSSCCatabious aquatics	16 2023 5	Menuelta decla	1 35	Viola palacina	2 1	K5 Ranunculus perceillatus
ycentridae			Group 8 taxa (BMWP:2)		4 Cicato varess	1 3 3 3 3 3	Molinza catrolea	32 68	Viola pericafelia	Z   F	8.5 Rammeulus trickophyllus
somatidae	Group 5 taxa (BMWP:5)		Chirenomidae	~	2 Circian disectors 3 Circian palaste	1 77	Moreja dispuesa Mycusetta Lana	1 1-1-122	Unknown santic	1	Ramanculus miparninas Ramanculus sp. (undet.)
	Planariidae (Diageoidae)	<b>CONTRACT</b>			2 Cladron matrices	11198	Myoseta sospiuido.	Floating	deased plants	118	Segistana latifikia
DATE C	Dendyacoefálae		No. of toxa	1 2000	1 Signal Contan rescalatan	1 (8.991)	Myosotii szczada	1 188	Azolia filiculoidas	18	Sagirtana rigida
	Mesoveliñae				1 Cranval a lactures	4 3283	Myosetis stolomifera	Y (33	Hydrocharis textrius-ration	1 2 2	Sagritzera sopiteri dea
2 taxa (RMWP S)	Hydrometridae		Group 9 taxa (BMWP:1)		1 Crepis poludoso		Microsophic str. (stander, ):		Hydrocorde ranarculoides	1-6	4 Sporcanium ampostilicitum
doe	Certifac		Oligochaeta		4* Cyperus fugas	11 1	Myrica pale	1 1 4	Lenga gitto Lenga gitto	12 2	10 Spargani ara emerenza Spargani ara matara
ae	Nepidite		No. of one	COLUMN TO THE PARTY OF THE PART	2 Decaylerhaze up (sender )	1.0000	Northeelum assistagum	1 1350	III common amounta	1. 3	2.5 Sphiggson.qu
(crygidae (Agnidae)	Noucoeidae Notomonidae		No. of una		32 Dumacutum alterno	2 555536	Denanthe aquatica	1 10	Lenna triesfes	4" 55	Strativitus alendes
legasteridae	Notonoctique Pleidae	-1	TOTAL NO. OF TAXA	( ) DOMESTICAL	Deschammia odsprkma		Denomble stockto	4 (5)	Literature nature	2	4 Subularia egustica
idae	Corividae		The state of the s	l-hall-or	2 Dresco anglica 1 Dresco benda		Denarche fistalosa Denarche fluviatilo	1 1 28	Monyanthes middiata Nuplac adversa	2 33	Telypella sp. Utricularia apritults
liidse	Holiphiae		TOTAL BMWP SCORE		1 Dresco copenso		Ocnarabe Jadagnafii	2 1 8 3	Number lettes	2	4 Unicaloria intermedia
nládaz	Hygrobiidae				2 Color Drosen internadio	2 355559	Denorable proping Hoiston		Cital the Internal	2	4 Unicularia minor
ortamidae	Dytiscidae (Noteridae)		ASPT	200000000000000000000000000000000000000	1 Drukens rotandi felia	4 39969	Oepanihe silaifetia	2" 6.1	Nymphaca alka	2	5 Útricularia vulgoria
omytidae	Cyrinidae				16 Divoperis criggia 2 Significant secularis		Osmunda regalis	1 14 18	Nyrightes of (exits)	1 52	Valliseera spirals
	Hydrophilidae (Hydraenidae)		NO. OF OM TAXA	. 2	S Elescharts antifrace		Pertusia pulatiris Pedicularis polatiris	1 0	Nyrephindes politica (Persicurio anglidria	سيليكينا	10 Zaretschefbä golasien.
fina O O	Dryopidae				2 Electric multicadie	1 10	Persicuria hydrog iper	1 1 11	Prii Stropping realway		Number of emergent A
	Elmidae		NO. COLEOPT. TAXA	3	i LP Eleucharis palustra	1 (0.95)	Persicaria maculosa	1 13	Potamogetian polypomistica		submerged species
	Hydropsychidae Tipolidae				2 Elevelaris quinquellota		Persicuria minor	2 100	ERecta Bultans		Number of inconsessor spec
	Tiputidae Simuliidae		Cladocera	Southidae	2 Effectuaris unighans 2 Emiloteura aletatfolium		Persidada minis Petasidas Inflantas	2 100	Ricci ocurpus patans Spirodela polyritou		Trophic Banking Score
	SHIMBEC			were control &	2 Epilobian angalb@felian		Potasites juponices	4 5796	ESperodeta potyrtusa EWolffia ambiza		Lichar expend sent
			Dixidee		1 Epilobium brungets cas		Реперация раборы	* = 50000	menon species often introduced to after	LP = un	ceaes exhibiting little patrices
	No. of taxa	6 20 1	Mary Control of the								
	No of taxa				1 SSSS Epitebiam ciliatum	1 83	Piodatis grandinaces	(see Pres	ton et ul. 2002 for details), if so some	prefeter	
	No. of taxa	6 2 1	Culicidae		1 Septebium ciliatum	1 1 83	Plateris grandinaces	(see Pres species a	ton et ul. 2002 for details), if so some		

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### Aquatic Ecology Survey Report

rong roxN	I Fieldsheet	t		-1.72461318		ž.	RS. TRS. Emergent plants.	RS TRS		HS TRS		HS TRS	Submerged plants
	r riciusnee	ι					Ly VIII Admiles platerics		Egzielsvan-karodate		Phogratzi mitritia	1.2 63 .1	Aprile modulati
							J. L. C. Mostes calettes	1	Epilibum-shoatum		Palefatta glebylifeta	المختبا	Apopugeon distacky
Site and sample deta	iils						Agentic contra	- 412	Epitelman palastic		Penguscula finatahan	. I [322]	Cabanbi casiisiara
Site name Post?		ode No.	Cold	tref (AD) 12/-	98184	1	1 LP Agtosto stolerifeta kii Abema grammorn	- 1- 1	Egoldstein partoffention Egoldstein betragenism		Prigraciila vichpuro Prisonii Ila orocta		Calliferiche bestes Calliferiche basealuss
THE HALLE POPPE		oue Ivo.	CIFIG	ref. (NZ) 1760L Recording format: (SU)34	15 0 70	-	2 Alsem tencelmen	2 7	Etyptoithi mikuteri	53	PoicEITE-Pela-ter-		Californio la laboraçõe o
				Recording format: (SU)32	12 BYR W1441)345 678		1 0 About playing country	1 12	Equipment of the contra	. 11	Policina diversiona		California obsessed
Location							2 Akpenira acquiri		Equieten polestre	16)	Palacana volgana	- 2     0	Callatriche plativosepa
Site access details	der beschilter						4 . · · · Alopeourus barealis	i. U	Enca govies	Library	Baetronin-ficana	1 73 3	Cathrocky stages to
							Alopecures generalate	1 23	Frogboum argustrichen		Managaratha (Sammula	+	Callunche (1) (16,364 C. stagitalis platje, irgo
Survey date 15/07	Sur Sur	rveyor Suc	+ 5 11				2 Augustis tenella		Entegherom gracile	2 10	Batterise of us healers cours		stageaby platycago
	<del></del>						2 Auftrenda politicia.		Enighrum latifolium	. II	Ratericulus impaa		C. Barrichta Diore, 202.
Notes							1 Aspeka adamptan		Emighaum caprotum Engalerion catedenies		Romanicalisa i ette-phyllina		Calletoche op isandet p Ceratopholloni demena
0	Woodland burel	1 See 1	0.06-14				Angelica is hierarin		Primarini i maranini Primarini admini	37	Batterialus refereglerativitus Batterialus reptaes	2 1 10 1	Corporation are control
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		due (Disperiodne)	/				2 Cestan desectan		Monto fortani	- 11	Varia permentria: Unitario en escrito		Kananculus spekispin i Rananculus sispartitias
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Group Z tuta (BMWP 8)	H <sub>3</sub> decent			Group 9 taxa (SMMR-5)			L Consentaciones		Myasaks spreeds		Audta Blackorks		Sacutatia repolit
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Conhibitative	Hilght			TOTAL BMWP SCORE	Charles and the		Description countries  Description description		Octatine encies		Skirgaritas tidelada		Saftalana oguanya Totspella op
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171 101 1813	Elmide	."		NO. COLEOPT. TAXA			2   Pandans assistans	2.1	Persona palaren	. 4	"Vanghedes pelute	2 14	Zamoločka priovac
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ione wertesta				0.10			2 Sept Eleveltatu produttu	<u>+</u>	Persienta mins	انتندنگ ر	Rate identify an existing		twelfa a runty sound of .
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heleylii	X			Hydrocorina		-	Cyslobrary ciliada w     Dyalobrary ciliada w	1 10	(Resture areasing on	(san Prastra	nn et al. 2007 the desirt of all so some	h III - speciel	evine mag hille maint

### Aquatic Ecology Survey Report

### Pond PSYM Fieldsheet

Site and sample Site name		Code No.	Grid	ref. (NZ) 1858 S Recording format (SU)34	5 95Z40
ocation				recording (ormat (SO))	en en me lankaan usa
site access detail	S POT - DA A PO	44. b			
Survey date 15.		Surveyor SMC			
Votes					
Herry Closed	with Pro	strutus of A act			
nvironmental		1		Sketch o	fd
anvironmentar	Altitude (m)	22	pH 6.3	Sketen o	poad
	Attitude (111)	.7.7,	her "#. \\	·	
Shade: %	pond overhung	% emergent pl	lant cover 30	[ P ]	
nflow (absent	0. present ~ 1)	Pond	area (m²) 250	1 (Y	A = I
% of pond	margin grazed	75			il and the second
Pond base: catee	orise into one o	f three groups: 1=0%-32%	% 2-33%,66%	3 - 67% - 100%	
-					
Clay/silt Peat		Sand, gravel, cobbles	і В	ed rack	
reat		Other			
JACROINVERT	TEBRATE LIST				
iroup Ltrva (B349, P. 18	ASPT OM Cote	Group 3 take (HNSWF Tr	ASST OM Cole	Group 6 tata (SMWF-4)	ASPT OM Cole
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aytophlahishaa		Bityanghilulaa (Gibramusti dari)		Procubiae	
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-stonday	· · · · ·	Co of tags	SECURIOR SERVICE	Group Trava (HMWF3) Volvanda:	MACCON 100
apoutdac		Groupe & targe (\$1500). Pro-		ffydrobudae (Birlis nudae)	
Schlidalat		Nerthdae	500000000000000000000000000000000000000	Lymmeridae	
tefalar		Vivipandae		Physala:	
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.episseendso Incratae		Coonsgradue	V V	No of taxs	CONTRACTOR OF THE PARTY OF THE
endostemandae		No of ties	2000	NO TRIBLE	
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vo ocura	Total Control of the	Planorialac (Disposedoc) Dendrocecida:		No offices	TOWN BOOK OF
40 Oct 11 111	· · · · · · · · · · · · · · · · · · ·	Mosmelsdae		300 111 1200	
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Assodie		Gerridae		Olgochacia	
cstaltae		Nopidie Namentar		Se offices	· · · · · · below · · · · · ·
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'ordologaworelan		Plentin		TOTAL NO. OF TAXA	100000000000000000000000000000000000000
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nychemyadae		Gynnday		-201	mentioned vis
ni offasa		Hjoforphilolae (Hjodrueridae) Disopidae		NO. OF OSUTAXA	No.
40 14 28/3		Elmidac		NO COLEOPT, TAXA	
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		Tipulidaz Sitraliidac		adicides	Charled del
		No of take		DIXING	
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	Eurorgent plants	RN TRN			THES		102	110.5	Submerged plants
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	Aloma lancarlatus		Epipacii palatea	ri-	51	Potentials paluring	14	K.A.	Caltimote termaphroditica
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2	Alopeatris acquain	. 1	Esperachem polistre	16	1.1	Palicana calgaria	- 3	1	Calleriche platicages
4	A logues agrae, bereoft s.		Eparkuda			Raepricoles ricana	: 1	7.3	Caltitude viignalis
1	Alopecura genucifatos	1 23	Paraphonan angustalchem		1.0	Ratianicolas (Satismo)s	4.	-	Caltinche trincata
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- jameterie	Angelica-sphesius		Eupmorean cansolonen Felgundala almena			Rationicality (phrophotostericity)	-		Cerotophyllum demuosum
11.10	Agram gus zeles : Agram nochfloten		Cializan Iversila	- 4	10	Raparunius sofarms		7.7	Ceratophyllem teheseverie China qu
80	Agram regens		Galuss constrain			Rhynch/riponi sicha	Ť		Egena densa
75	But de Burnatum, askedes		Galerie palvetre			Rionsbuggets (i.e.)			Hanchesinia
1 14	Berol a creata		Calcute alegate ours			Kongra amphibna			(Takne hydropyc)
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1	Biolone connuts	2	Ghuma dedinata		361	Romppe mu-rophy/fa			Historicality shorter
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- E company	Wales treets		Allystis sixtess		(0)	Reapps-amict (	1	279	Přielica nottaříu
	Blymui varrpronei		Libreria Balabh	!.		Romppa gabutus			Terricanter against 600
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	Cafaragento carevers		Bigarann clodes	1.00		Runes palastra.			Algunus ratgaes
- Comment	Celenagouts (page)		Hipports hits Labriphenian			Seginal procambos:		-	distinguished
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7	t althu palesinis	1.10	ling-chalantin	- 3		School agreement to the montain	- 5	- 13	Libratia dortinana
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and the second	Cons agrants		National solution and the			Senteliona paletreulata		-	Napa fleaths
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-	Carry dianka	1.0	Januar Hilmin Januar Pelmota			Service Discipline	- 3		thrustroffe celo
- Journal	Carco disector. Carco arbento	n joji jemes	January Balleria	~ 4.	-	Sentro grandeno: Suan lantrane	- 10	1 55	Potamogeton avatations
2 10	Carry clair	· Italy francos	jencire kramencas		Til	Solation discances	1 7	77	Potamogaton algura- Potamogaton basebadda
11	Caro, sleeyea	1 3	Jereus tehred Heier			Somethus poliustrus	-5		Potamogaton cotoratas
7	Carr flaca	4	Lafigras palatrie	- 7	N.S.	Spergusterstrange		_	Potanogaton compressors
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2	Coto-Izoupita	1925	Lipani fociclii		-	Stelland palatters	in		Potamorganus appliyation
	Cason Intercorpts		Lorus potariculpus			Stellatu alignoru	4		Possible grove Bioforms
24	Cartimas		1 soula lineticules			Sargheton officient:	- 2	10	Estamagation (trass)
1.5.5	Carengo	F	lante phatea	46	-	Tenetrata sundrani			Potatilogichim gramoneus
	Caren realizança		Lychne flevensnis			Theliciners (Le sur	-3	111	Potamogenen lacence
	Carex medius	!	Lyospes computers			Chickeytons palaries			Potamogeton mulous:
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2 10	с авек рынковыя С эвек рынковыя	-:3	Lyomadan salgani		14	Typica angrendelja	-	- H 5	Potentingsom pentingsis Dotentingsom preclangue
	Cares pulseages	- 55	Lythner In your flatters		9.5	Typisa laufolio		- 12	Potamogentos positles
1.110	Caree ripana	- 31	Lythrangerials		T	Valerana donce	12		Potantegria parles
	Cares nettata	1	Lythmesabass	··· - T	† ·	Vallonene spetale	1	111	Patamagan tichenia
2.5	Carec spicata	1 71	Mortin agrance			Venorum aragallos reportes	- 3	[11	Rassaciole: aquasitic
4 22	Citecycskain	36	Months pulcarent		te	Vetetrou bet érfézegő	1	jii	Report sinc busilets
- Landard	Catos von dala		Magasheciplekas			Veporeos catesens	2	111	Bassascolor discreates
16-1100	Caux sulpris.		Microba portation	1.	3.5	Vicionica scindiale	. 2	-	Barrancial sy Haptares
13	Casos sp		Mentle bren			Verorenrap (undet )	2	T	Razonanius peliatus
-1	Cambina squatica		Menama meta	- 4	ļ	Viola palesms	1.3	9.5	Barnelolas presoduto
4.00.00	Ciorio serva		Meiner cereles	12	-	Viola presentata	1.7	8.5	Patencolis Indeptable
-†	Lipsano distectori Lipsano palastic		Miesta fortzez Mozsatu fata			Ceknown enoug	!	-	Barrancolas trigorieias Barrancolas sp. pandet a
4	Cladian manage		Myriota acopsodes	200	ofere des	ved plants		+	Sastanu britica
	Consum encalsors	- ir-	Mosetti secunda			veilla filleulerd;s.		·	Santoniongdi
	Cranista heirine	14	My meta stologother	3.15	1	Independent mercus sugas		-	Sapatana septembelo
F1220	Crepus pahadosa	11	Microstia og Handet i			Submonty le tatable (Guide)	- 3	+	Sparganous anggotifeless
16	Cypetini Rustin		Myssieten agtaitution		. [	entra gibbo	-	111	Sparparism специя
48 372	Cyperus Inneus	T	Myrica gale	- 1		edica rescu	- 1		Spagamoneeum
1	Dacielotica (piandei)		North cisters crossing cars			ERROR ERROR A		2.1	Sphagners up
17 1000	Damawourum aliame		Denembe equation			estata tiradica	41		State sex almides
1.1777	Descharps a cogrissa		Occupible epocatu	. +.		EQUIPMENT PATANA	7	. 4	_TETOLOGIACIFOS
A-James Co	Onstan inglica	y of games	Ocnartha fistaluja	1.	1	latjanika infatura		-	Hotopetta sp
1 180.0	Dissora Dissora	- 134-	Desarthe daysalfas			SEPHENDER.		i.	Cacimo astale
1 1	Desicts capeaus		Oendathe Facherialis	- :	85.5	laphar lates	-J		E Montagaza matematika
3 (1000)	Drisera statisticke		Oerzatke paupinelfordes		-1-1	aptor years to		+	Ultrastina mine
la terror	Dresora solandali (ka	1-4-januari	Ownerth edutation	·	-1.7-	ismahasa alka		- 5	Ukwelette telpaci
10 : ^.	Dryoptem enulais Elaschuss appellaru		Osoranda regalis-			Symphaca op Textouri		1-10	Vallonena systelic
3			Pomoso a palusme			Symphonics polisic		??	Patenthelka pakulita
N 1 -00900	filosofionis austriacio Eleocitorio maltinante	1 16	Pecheulana palauras	-:	17.1	stocens employs			No other colleges are pro-
1 10	E-tensponent annual co	111111	Penicana bydropsper Penicana maethra	- ++		etamagaten netare Setamagaten pulygen dakan			Number of energen & state and spaces
	Eleuchato quanquellora		Penicula maser	July	pality!	eranogous putygramosas accia flutura			Number of uncommon species
2 1 15000	Eleschans originass	11 1000	Pasicina mas			(acceptation and any			Number of uncommon special texts a carty-control 2 or m
	The second secon				0.000	expectate or the factors.			Trophic Ranking Sense
2.1-7343	tipelo brane alternifo boste								
	Epolo brane absento hom Epolo brane anago fició frisom Epolo bono bitum coccess		Parastes hybrides Parastes paperaces	-:		prodela právilne kalifio ambra			ingac natatig sens

12 PSYM Manual December 2002 13 PSYM Manual December 2002

### Aquatic Ecology Survey Report

Site and sample Site name	details bub Ais	Code No.	Grid	ref. (NZ) 18059 Recording format (SU)	92368
Location				Recording format (SU)3-	15 678 or 141 1345 fi
Site access detail	p.				
Survey date {		Surveyor Ove			
	21/41/14	Surveyor Swc	- ZM		
Votes					
Environmental o	Altitude (m)	E/-	pH 3.5	Sketch o	fpend N
					T
Shade: % )	pond overhung	10 . % emergent p	lant cover 5		_ /
nflow (absent =	0, present = ()	Pond	area (m²) 3000		<i>\$  </i>
% of pond	margin grazed	0			
Pond base: categ	orise into one o	f three groups: 1>0%-32	%, 2=33%-66%	3=67%=100%	
Clay/silt	~	Sand, gravel, cobbles			
			B	ed rock	
Peat		Other _			
IACROINVERT		Group 3 taxa (BSFWP 7)	ASPT OM Cole.	Group & Gasa (HV/VV) A)	ASPT_RM Cube
ghlouandse epsygendie		Cecnodae Nemousidae		Hactiche Swildur	
eprophile huriae		Rhyncophulofae (Ghoscamatukee)		Percin obtains	THE REAL PROPERTY.
themere Balac		Porty cormo podedac			
otamatik doc		Luxnepluldse		No of sava	100
pitemeralae facmoprotygadae		No of wat.	Control of the Control	Group 7 (avai (BSERP 5)	
znewi dan		SO III LICE	Non-Australian III	Valvatalas	- Exercises
upthidae		Group 4 taxa (1355W)* 65		Hydrobudae (Subyrindae)	
citodidac		Voneto-Ear		Lymnusidae	
Ortråno Blovoparhdae		Visupundaz Asseylidas (Ausolivadac)		Playedac Platestrifac	
ghelochandre	22232	Rydrophidae		Selmende	7
gals Ambaique		Unionidae		Glesophoristic	
deskatrokke Referender		Conqthiline		Hendinsho	
kdurineandre		Generandae (Congorç cudae) Plan coemidalse	- Name	Espolide Solar Ancili das	
eptos cruiae		Chenagriedie		NATH LEAD	
inertdae				Ner of Circa	665.00
apidestonundaa taabisastiidaa		No of task			
enenyeominase ienensumatidae		Group 5 taxa (ISMWP 5)		Group Klasa (BARKP 2) Classeomidic	
	Parameter Control	Plantinisha (Distantisa)		1 POPULATION	- Bearings
in of tasa	100	Dendoscockdaz		No influesa	10000000
roup 2 may 1851% P.St		Mesovelidae Hofmitetriska			
eroup z tava (norse s). eracjdar	THE RESERVE OF THE PERSON	4/cmdae		Group 9 taxa (BMSNP 1) Objections	*** **********************************
retelar		Negridao			
olopterjandse (Agnidae)		Names making		New orliness	CANADA N
omphidsz ordstegadendar		Notoriorisfaz Plendue		TOTAL NO. OF TAXA	
colonizga oznara- colonizac		Convular		DOUGH, SOLOF FAXA	Section 2
sufrinte		Holiphidse		TOTAL BYWY SCORE	000000000
rhetfalutze		Hygiubudae			
ulupitamalar o-chomanthe		D) tescalae (Naturdae) Gerttedaz	Y	ASPT	20000000
G-recolations.		Hydrophilotes (Hydrocreduc)		NO. OF OMETANA	SALES TO BE A SALES OF THE SALE
o offices	10000	Desopidae			
		Elmidae		NO. COLEOPT: TAXA	<b>CONTRACTO</b>
		Hydropsychidae Timolidae		Sec. 1. 1. 1. 1. 1. 1.	
		Tipotistae Sarratodae		Carlyn - 1 -	

No of task

12

	Emergent plants	RS, TRS		, jk:	5 TRS		85	TRS	Submerged plants
1000	Adulaunamen		Epriorean los server	- 1	7.1	Shapeers musie	3	0.3	Apust madeum
ermanion	Acons calaras	11 1 1 2 2	Epitrhum ehoumm		5.5	Filialiana plittukiera	-17	1.00	Apitiogriss (Estach) ()
177.5	Agento casini	1 1 1 1 1 1	Epilobern putestre		10000	Programula lumpress.	- C	1 - 0000	Cabcagha cavel mons
Landard Co.	Agricia dia mina	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Epitabian purufferen			Zargascula vulgaris	1.7	1000	Callitriche brai is
	Afrika mimmilati		Epoloheses scargeones	<del>i</del>	1 1 1 1 1 1	Potentilla etreta.		0.3	Californiche homolara
	Alistes lawred state	15100	Consume on Living	- 11	4.5	Potentlagulatus	1	9.5	Callétriche konnapiosolpica
q	ATDOM BRICKS MAIL	1 75	Equipment polymps Equipment flux to the	네 박				y-25	Caladate anamelalousines
	Aliena plaringo-oquinca	4 - 12"	E CHRACKELL LITA STATES			Palicana dysarienca			Califriche obtoangula
	Alopeitario scipialis		Espesatura policino		1	Palsana valgans		in green	Cellmiche plancago
	Alogengus kotzala		fina teralis	,- <del> </del>		Panesculas ficana		-71	Callitratic stagnatus
	Alopetara gentulais-	1:25	Enophonum augmenichen	11	15	Kimascolus florimola		-	Calkingly: manuta
	Anagalias tracita		Emophonen gracés		. 10	Rannestus holencers	1.3	<u> </u>	C sugnalis ploya apa see
	Androneda polisi ika	. 2	Enoplasium tabletom	2		Foruscular lengus	1.1	1	C Instrubit i brutin agg
	Angelsa echangelsa		Emoplestath saggestores	. 2	1	Ramunoutus cens gelecias	1.1		Calliniche ap tunder i
	Angelica of Lettire	11.	Expansion canalesses			Expension ophoghesisten	7	10	Ceranghyban denerous:
	Aparta gravedens	7	beliperalal autonom		-	Executiva aptara	-7	-	Censuphillian salescation
10	Apaza neithron		Gubun Ferede		10	Rangecelas vedestatas	-5	73	Chora se
	Apres negere		Galacti constructoro	- 19		Exencho quera aftea	-		Chera sp. Egena desca
-	Blaidelina ravanes losden		Giakan palarte			Rhymeline-prova france	1		Elatine besondra
	Batilawiita		Gally pry sleptocoast			Rogingia anaphylica			Flattac backuppes
	Bidayeansa	and the former				Bening (dapile)	in all	4	Eleoption flurians
			Great to the						E longitudi Harwine
	Bakus-odiata		Giscera dichenta		10	Rangga morasphylia		-	Flodes politing better
	Bukes areas	1 2	Glassi Sirem			Emple operation and have	3.		Eleks carakters
	Bidens's gunta	1 13	Glosena munimo	1	bs	Bergger (red. 15	.1.	10	Floketestsitu
	Blyseta i corena su-	3	SHIDONA DUBIA		2000000000	Renges palesto-	. 8		Excountry agreement
	Helbergiooner gentress		Geografiam eligineses		88	Ragnox lyoth slaputhers:		4.5	Frontieral is antique nation
	Hidorenas antividados	1.75	Histocratile suteers			Remote maximum.	1		(Groeniseds) dense
	Calumophodos nário subi-	3	Hypeticum dades	. 9		Presidents.	- 1	77	Hageins sulgaris
	Calamagnosis (payers)	1	Hypers not tetrapteness	. ;	-	Suggest personnelle	T		H-maria paluerra
	Calamagnaha pagunar	4	Hyperican irakiwan			Saystoma voltofata	- 1		Justice celemo-pers
	Califraginya enga		Тарапсия дорожня			Samples valerance			Jesotes I actions
	Calmegores onco		Digition upons  Digition papers		- , -,	Schostopicoto beadre			Lagamophin mapo
!	1-414-FEE 1821-1821-1821-1		DARWING THOUGHTS	- 3		Chargeone (699)			Laborate sections
	Callagadodes		Impeture robstrager		-	Schoenoplecialogatagens	- 5	- 57	Litrocht birther
-4-1	Siliperhop:		Instrument	- 3	·	fichiepedicieseshimsen et en .			Lubylus detteratura
	Carloguez-erras		Technic se hees	*	-	Schnetopfortus imparter	. K		Licht gengalorine
	Catrlastas grateros		Denote acresions	p		Schneeus Entragenous		67	Muniquishin alterniferen
. 0	Cates midia		Seath attraction			Schooling Bigliscoln			Marrighallom agents and
. 10	Carry aconfinera.		Janeta-Buferins app			Sciennaudombia		9	Myssophyllest-quantity-
	Carriggigman	1 8 51	State to destinate		7	Scripfishio-carecolists			Mynaphylkini setterikdom
	Carry agenths	1	Amore compagness			Scinifisma galencidora	- 4		Nasio dissile
	Cares care.	2	Danctis conglumerator			Serences equations	- 13	4.43	Nriella gr
	Cates dended	1.10	Jeans allein			Smouti Buttanky			thoractic Consollis
	Curry degrada		Managara School	- 4		Service reduction	100	-	Fot creation to relief
	Cares deputs		Jancus Ethines	- 4		Serva to pulledouse	- 15	16.4	Potamogeten acuminicas
النين	Cares ochunia		Aminosoftono			Sam Litrolium			Potamogeten altricis-
1.0	Care colors	32	Manus gregations	!	[11	Selenant deleganos)		7.7	Potanogeron benchriids
أحصنا	Cares (Sugara Cares flacta		Agricus safrandalatus	<u>!</u>		Sunches palaritie	- 4	·	Prázmagaton celoratus
1 1 1 1	Cares flacta	4	Leliyez-pata-tra		8.5	Sparjaneaucerien	- 4		Balancepton comproves
	Corey howhatea	3.2	Locus styresdes			Stacky spalestin	- 1	111	Populary prongrames.
	Carea Savigate	5.3	Lipan-foode	-		Sulface patietre	16		Paramagazon apilicano
4	Ciacs locusarya	1	Leta s polenostaria»			Stellass eligneres	- 4	10	Petamopowe filaforets
4	Card inner		Lunda bezeindes		-	Sembraneficials	13		Ризныция втов
	Carry right	a i julijana	Turnia influence		C parrows	Treaters sombass	2.2		Potamogram granerous
ingul.	5.965.994					Thinhonner flarene		10	
	Cates, sedicarpa		Lychres (less cheid)					10	Patamagasa lauras
	Cares, etrobac		Lyotpus currences			The hypothesis publicates			Paramakana najeos
اشيروها	Cases Datence		Lyamadoù nameulana			Totoldio puesta	3.4		Potainni getori obruvelo hus
in	Cases, pure catala		Lyumadria krezimi			Timshopharabase quito can	1-2-	111	Petarsogeters pectracities
الشما	Caret pendula	1.8	Lyamadia finadiau	!		Frigioshin gallaris;	1.2		Estamogeten portiskatus
SD	Catex puralicoperas	121	Lyornachin valganis		16	Typica angro kifelur	- 2	3.5	Patertopolon practorque
	Cares processor	116.	Lythriris in sequiplican-		8.5	. Explor isotroica	: 2	+	Pettrospetra parallas
10	Cars open	12.1	Lythours gertala			Valerana dosca	N		[Priorregard nodes
	Case percia		Lythnire salsana		+	Valtuneru spazio.	- 4	101	Pelamegrou trichando.
	Cases -pauld		Mittheopeter-			-Victoria da delegal bi-lega veca		10	Rangodis agentife
++++	Care convenie	in:	: Months pulcases		. 30	Verrence-becoaltage	- 69	- 60	Banurusk hadra
	CHRESCHOLD				+ 20			100	Bishoricasis reasons Bishoricasis (trintatus
	Cetex versiols		Menyanihat trafida ta			(Vierrental categoria)		107	
1000	faces sulpen		Membry guitatus Memples brion		5.55	Venezua vottellata	-2		Reservation Paterns
أسسة	Carre up	55	CAN EMPLOY THE CO.			Venerus op (model)	12		Carraculus petutas
	Catabarus agrictica	10	Minustra drecia		1	Wipla pularies		5.5	Removator persentanas
	Citaria suteba		Carl Cales Controlled		4	Poda parambla	1.2	8.5	Katomicki inglophyller
	Carsum dissertes		54 span Greens		1.	Litha eva cross	14		Rames use imparters
1183	Uiroum paladre	1 1 1 2	Mymetoriana						Rantzuthrup (ends)
1	Cladron recisors		"Massers scoperday	F		esel plants			Sagonaria landolar
	Conum payalings	11	Monute sgranda			Avatta file atradas			Bagriania ngida
	Craninda belmin	4	Nhosatic delonden		1	Lydrocharia reensus taeuz	- 3		Suprema sepitafolia
	Cropus polisitoso		Museus spounders			lydrocityle rationalistics	- 3	- 5	Spangarann angustrichem
-	Expens faces		Nichoton aprincini		2 7 3	Service Service		10	Sparitment erecture
1	Cyperus froms	177	Myrica gale			errettere.			Sporporare riskato
<del>                                     </del>	Dartylerhan op tender i		Sashanas osafugus			errate autose		77	Spingwen y
	Plante of 1800 1	ara a faloria	Committee of Section 1981			empe mules	- 1		Literary Apple
1	Damestern about		Osparáby aquatica						Strationes alondes
	Deschangua coptina		Generalise surverts		1	sideside isofers			Bultufatio injustro
-	Ducke retul		Ocuative fictalesa			Microardhes Brifelhata			Tehpolia-g
10000	Directa bracia		Generite fluorido			Vagitar adversa		-	Cincolana aurisalia
أنسك	Отокла стетов		Oesartic ligheests		2. 35.3	Registration			Umodani mannaba
1000	Droses memobil		throughe pergraphetheries		4 7 1	Naghar purify		4	Umostava granor
	Omera intendicto	4	(Desprifte wholists	26.	H 67 1	Hermanica tales-		9	Unicities to veligates
552	Dryepteneumitata	. 5.1	Operato regalis	140	E	Martellack of Courbat			(Vallegate spin)a
	Flockans accorden	2 1	Рамания работом		,	Symptosian politica		10	Zamehellu päistis
1.000.00	Eleochams auximuca	10.00	Pediculino palastris		E 14 1	Port-Acces a deepforhis			
C72/000	Element of the control of the contro	1 10	Participant Building		17	Compressed and Compress			Number of emergent &
11,333	Beocharismulusadas	and infrared	Percenta historipe		15	National Company of the Company of t			
-M.	Elecchanogalusius	-1-1-3	Persicana assessiona	}-	1 1 1 1	Naturnogetun polygomifolius	-		submergal species
1.7	Elerchansquinquellera	1 2 2 2	Perfocable increase			Ross on Mantarin			Number of ancestrated specie
	Hesturiongtens	4 300	Potsicatio estas		2 1 22 2	Reconcurper mybers			twith a ranty score of 2 or pa-
	Epilolotan als rididean.	1 1 22	Petrolics bytenius		2 15000	Specificia polyntura			Erophic Ranking Score
1.00									
		J. Pass	Petastics (apparents		4 1 47.41	BLYSELS ARTHUR.			
	Epiloham angalishti iam. Epiloham komescore	- 1	Petas ses japonesos. Pencodorem pubosto		THROTTE	Molificantium sur encurs often urtroduced to stee	72	1 above	is, a stirals dring little materials

### Aquatic Ecology Survey Report

55. 26787159 Plant recording sheet (score through each species present)

### Pond PSYM Fieldsheet

Location				ref. (N2) / 808/ Recording format (SU)3-	15 h75 air (41 1345)
Site access detail					
Survey date	100 17	Surveyor SMC	+ EM		
Notes					
Environmental	Altitude (m)	61	pH 3.5	* Sketch u	pond N
Shade: %	pond overhung		lant cover 75		The second
inflow (absent ~			area (m²) 700		Land Land
	margin grazed		area (m. 7.700).		
Pond base: categ	-0.	of three groups: 1=0%-32	%, 2=33%-66%	$\lambda_i = 3 - 67\% - 100\%$	
Clay/silt	3	Sand, gravel, cobbles	B	led rock	
Peat		Other			
MACROINVERT					
aroup Etaxa (BSSVF-18	ASFT 4351 Cole	Group Stars (BMWF Tr	ASPT OM Cida	Group 6 Iava (\$159.04) 14;	ASPT OM COL
Septidostarodae Roptaporradae		Catrodic Nemoundae		Bactulae Stabilite	
Laptophichodae		Rhyscophifidae (Ghosomandae)		Prancilidae	100
Ephenierellidie		Polycentropedular	20000000		Barris and a second
Peramanihidae		Limnephilidae		No of taxo	1988
Ephementie					
Factorytetygsdae Leostridae		No of taxa	\$600 S 5100 S	Group There (BNWP 3) Valvandae	The state of the s
Capplishe		Group 4 tiess (BMV-2 for		Hydrothidae (Bith) midset	
Perterinte		Sentidae	10000000000000000000000000000000000000	Lymnacidae	
Perhilae		Vivaporidae		Phytodac	
Tidoroperador Aphelichenidae		Ancylidae (Aciniovulae) Bydropolidae		Planorhodae	
Phryganodae		E neuni due		Sphoonelse Glassphouidse	
Motormidae		Compliante		Hundruster	
No andre		Gammandae (Compose cratics)	/	Erpebdeilstag	
(Mintrecenture		Platy encontdy/ac		Aschda	
Lopwoetuko Hoczalan		Contrigitudia		No of taxa	HOUSE HOUSE
Lepidostomistidae		No of taxo		AU 01 1810	- Indiana
Beachycouttidae				Group Stava (BMWP 2)	
Seneral ornatel as	- FEEDERS	Group 5 taxa (BMV/P 5)		Chinocendae	<b>SECRETARY</b>
No ertusii	000000000000000000000000000000000000000	Planametas (Dupametas) Berahococlodas		No refrana	
		Mésosefalae		1411 1414 1414	To the second second
Group 2 tava (BSFSP 4)		Hydromeridae		Group 9 taha (851%P 1)	
Assadie	-	Genelar		Offiguehoeta	- 200
Lestidae Fulopiers griba (Agmilaci	i	Nepidie Nepidie		No of taxa	
Liettyholad		Solarportulac			-
Confologramendae		Planting		TOTAL NO. OF TAXA	
Sestendae		Convidue			
Conduladae Libelisiste		Haliptidao Hygiobiidae		TOTAL BMWP SCORE	No.
Pietopotamolie	2000	Dynacidae (Noncridae)		ASPT	2000
F4) charnyadac	1000000000	Gyandae	1		
		Hydrophitolae (Hydraemitae)	_	NO. OF OMITAXA	1555E
No of texa		Dryopalac Elmalac		NO. COLEOPT, TAXA	Name and Address of the Owner, where
		Hydropsychidae	A Argenta	THE COURSE LAND	
		Tiprodizlac		21.1	
		Similadae	(20)2235	Gladockery	
		No of uses	Total Control	Chaorbidae	
		111 1000-0		UMBOT BITTER.	

Din dae

Alks	Emergent plants	HS THS	iloh-arrytterastas.	R5.	JBS.	Pingrateceptnés	85	5 TRS	Submorged plants
-	Arbelta planenca Aceras celemas	To the Fee	construction		má én	Pileters probetices	··	+44	Aprim mentidam Aprimajan in districts on
17.65	Agrosis carina	1.0000000	Othore maketor	2	110,000	Panguscula Suskanios	· : ††	150000	Calsondry catolineans
1.5	Agrosia defendra	1 Post By	defeate pure florus:	- 1	1000	Paramacula vultrarie	13	1000	Californity brang
1000	Alona patonom	2 335 Eg	delisan puru florasi Kelman karagonian		4.20	Detentalla seriata		6.3	Calibrathy framolata
11512	Alsena lanca olassen	2 1 1 1 1 Es	quactic palvices.	_ : J	51	Poscotilla gologus		. 8.5	Calibrate bassaphroduca
. 4	Abone plantage-equation	1 LF Eq	emetein flavoitide			Palicana dysertenca			California obtava ggd s
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11000		1 10 7	decident galentes magatia lindsopiper		7 1	Criticaria emplichia			Number of emergen &
LP	Eleocharis multi-males		отчени инмерфер	- 1	17 1	Verana getate meters			
1.5"	Fireckana palustro		hicana mucalosa		27.0	hatarrangeten polygon deles			seletargol spices
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-	Eleccheric spraheter.	4 (2) (7)	Discuss dieth.		التنتيا	Extrication materi			Frontier Ranking Score
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تتنت	Epriob statutes gall deficient	- 1 20-5 P	tas ites papoesotes		التننيا	Kolttis arthur	-11		<u> </u>
17.0	Epilohean brannoscens	4 (****)	acodumen pahaste		ancores	on species often spreedig of to se	ici - (7	L. ebosos	s and otherways further requirement
	Endolman obstant	1 R5 P	ulano anendino ca		Worshop	et al. 2000, for detailed all so says	v 79	elemente	

RS - Ranky Score, TRS - Tropfine Ranking Score

12 PSYM Manual December 2002 13 PSYM Manual December 2002

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Aquatic Ecology Survey Report	

**APPENDIX G: FISH SURVEY SHEETS** 

\_\_\_\_\_\_ Version: 2 84 Issued: March 2017

### Aquatic Ecology Survey Report

## **JACOBS**

#### Electric fishing Field Sampling Form

# **JACOBS**

#### Electric fishing Field Sampling Form

PROJECT Name and Description Project Number	A)						
		Site Name		Project Number	82104700	Site Name	mintoss
Reason for sample (i.e. pollution	82104700	Site Name Site Reference	Long Dyke Burr	Reason for sample (i.e. pollution	BASELINE	Site Reference	MD
survey/ monitoring etc.)	Baseline	(subsites etc.)	LB1	survey/ monitoring etc.)	18107117	(subsites etc.) Grid Reference	PID.
Date	20/7/17	Grid Reference		Time	17:10	SPA (any change?)	
Time	09:50	SPA (any change?)	NA	Survey lead		Other Staff (initials)	D 5m.
Survey lead	E.MAXWELL	Other Staff (initials)	SM, LB, AP	Survey Methodology	Single run	Kit type - Number	E-fish WFC
Survey Methodology	Fully quant-	Kit type - Number	E-fish/WFC4	Upstream stop net	Land 15 10011	Downstream stop net	E-IISH WFC
Upstream stop net		Downstream stop net		Crid to force co	Photograph ref:	Grid reference	Photograph ref:
Grid reference NEIZ 89	Photograph ref:	Grid reference	Photograph ref:	2001308000	A	20174570094	5.
47.2-1		GNG 97336		SITE DETAILS		SITE DETAILS	
SITE DETAILS		SITE DETAILS		Voltage (v) / ampere (a)	135V	Overhanging cover	67.40
Voltage (v) / ampere (a) Pulse frequency (Hz)	145v/1.4a	Overhanging cover (%)	15%.	Pulse frequency (Hz)	12	(%)	801.
	5 mall stop nets	Macrophyte species			N 1	Macrophyte species (if known)	Nove
Net Type / Mesh size /	at U/S and	(if known)	None	Net Type / Mesh size /	No.	Submerged	
Length / depth (m)	0/5	Submerged		Length / depth (m)	Nets	Emergent	
	17.5	Emergent				Bankside	
		Bankside		Run length (m)	LOW SA	Flow (m/s)	
Run length (m)	100	Flow (m/s)	1	Truit longer (m)	10000	(Dry/ No flow/ Low/	lan.
Average River Width (m)	1	(Dry/ No flow/ Low/ Normal/ High/ Spate	Normal	Average River Width (m)	0.75	Normal/ High/ Spate	
Average Water Depth (m)	30 cm	Conductivity (ms/cm)	434	Average Water Depth (m)	0.1	Conductivity (ms/cm)	542
Average Bed Depth (m)	0.01	Temperature (°C)	15-4	Average Bed Depth (m)		Temperature (°C)	17.4
Surface area (m2)	200 m2	Weather	cloudy lovered St	Surface area (m²)	75m2	Weather	surry
Dissolved Oxygen (%)		Salinity	210003,780024	Dissolved Oxygen (%)		Salinity	1
		Turbidity (Clear/				Turbidity (Clear/	
pH		Slight/ Moderate/	Modrate	pH		Slight/ Moderate/	Clean
		High)	· .			High)	
Substrate (%)	(creve 25: 5000 3	Shade (None/ Light/		Substrate (%)	1. Busine Lockin ye	Shade (None/ Light/	0
Bedrock/ Boulders/ Cobbles/	Pelables 30% Sitt S	Moderate/ Heavy)	Mobilerate	Bedrock/ Boulders/ Cobbles/ /	MASS ON ASSESSION !	Moderate/ Heavy)	Moderal
Pebbles/ Gravel/ Sand/ Silt/ Clay	(doble) 10%	100		Pebbles/ Gravel/ Sand/ Silt/ Clay	DIUGD (C)		
Channel Details (Rubbish/ Oil Film/		OTHER COMMENTS		Channel Details (Rubbish/ Oil Film/	. /	OTHER COMMENTS	
Oil Deposit/ Depositing/Eroding)				Oil Deposit/ Depositing/Eroding)			
HABITAT (%)	16th 10%	Bank Structure		HABITAT (%)	NI 1 001	Bank Structure	A
(Riffle/ Pool/ Run/ Glide/ Slack/	Rva 4090 blid	(Bare/ Uniform/	Complex	(Riffle/ Pool/ Run/ Glide/ Slack/	Ditah 98%.	(Bare/ Uniform/	Simp
Ditch/ Waterfall/ Cascade/ Rapid)	Pool 20% 30%		Company	Ditch/ Waterfall/ Cascade/ Rapid)	Kun 21.	Simple/ Complex)	
LAND USAGE (woodland type/	woodland W	3		LAND USAGE (woodland type/	woodland.		
urban development/ rough or	(	Photographs		urban development/ rough or	MCCO. ION O.	Photographs	
improved pasture/ roads and	Corava Sik LD			improved pasture/ roads and		the sections	
railways etc)				rallways etc)		- Maria - 1 - 0	
OTHER COMMENTS	other Spran	int tound in	a the middle	OTHER COMMENTS	Himalyan B	alsam.	
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	of the out				INO CISH Ca	right.	

## **JACOBS**

Electric fishing Field Sampling Form

## **JACOBS**

Electric fishing Field Sampling Form

PROJECT Name and Description			PROJECT Name and Description		A		
Project Number	B2104700	Site Name	Back Bon Trib	Project Number	B2104700	Site Name	River Lyna
Reason for sample (i.e. pollution survey/ monitoring etc.)	BASELINE	Site Reference (subsites etc.)	BBT	Reason for sample (i.e. pollution survey/ monitoring etc.)	BASELINE	Site Reference (subsites etc.)	RL
Date	01111.	Grid Reference		Date	18 07/17	Grid Reference	
Time	16:50	SPA (any change?)		Time	14:00	SPA (any change?)	_
Survey lead	em	Other Staff (initials)	18 311 RI	Survey lead	Evonne Maxwell	Other Staff (initials)	B, JMe, f
Survey Methodology	Sout March	Kit type - Number	E-fish/WFC4	Survey Methodology	FULLY QUANT	Kit type - Number	E-fish/WFC
Jpstream stop net	CIII am	Downstream stop net		Upstream stop net		Downstream stop net	
Grid reference	Photograph ref:	Grid reference	- Photograph ref:	Grid reference NZ18652 91665	Photograph ref:	Grid reference	Photograph ref:
SITE DETAILS		SITE DETAILS		SITE DETAILS		SITE DETAILS	
Voltage (v) / ampere (a)	looy	Overhanging cover		Voltage (v) / ampere (a)	ISOV	Overhanging cover	1.0
Pulse frequency (Hz)	0,9 7	(%)	807	Pulse frequency (Hz)	1.5%	(%)	101.
Net Type / Mesh size / Length / depth (m)	None.	Macrophyte species (if known) Submerged Emergent Bankside	None.	Not Type / Mosh size / Length / depth (m)	Longe Steps	Macrophyte species (if known) Submerged Emergent Bankside	NOW -
Run length (m)	100100	Flow (m/s) (Dry/ No flow/ Low/	io	Run length (m)	100	Flow (m/s) (Dry/ No flow/ Low/	Law.
Average River Width (m)	0.5	Normal/ High/ Spate	(ou).	Average River Width (m)	3m	Normal/ High/ Spate	
Average Water Depth (m)	0.1	Conductivity (ms/cm)	694	Average Water Depth (m)	D1 W	Conductivity (ms/cm)	512
Average Bed Depth (m)	05.	Temperature (°C)	12.9	Average Bed Depth (m)	0.02 m	Temperature (°C)	14.6
Surface area (m²)	50m2.	Weather	Course it.	Surface area (m²)	300m2.	Weather	Eright, Sw
Dissolved Oxygen (%)		Salinity		Dissolved Oxygen (%)		Salinity	
pH		Turbidity (Clear/ Slight/ Moderate/ High)	clear.	рН		Turbidity (Clear/ Slight/ Moderate/ High)	clear.
Substrate (%) Bedrock/ Boulders/ Cobbles/ Pebbles/ Gravel/ Sand/ Sitt/ Clay	February.	Shade (None/ Light/ Moderate/ Heavy)	Leony.	Substrate (%) Bedrock/ Boulders/ Cobbles/ Pebbles/ Gravel/ Sand/ Sitt/ Clay	201 - C carole	Shade (None/ Light/ Moderate/ Heavy)	Herry.
Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	NOVE.	OTHER COMMENTS		Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	Godina	OTHER COMMENTS	
					)		
HABITAT (%) (Riffie/ Pool/ Run/ Glide/ Slack/ Ditch/ Waterfall/ Cascade/ Rapid)	SI Cifile.	Bank Structure (Bare/ Uniform/ Simple/ Complex)	Simple.	HABITAT (%) (Riffle/ Pool/ Run/ Gilde/ Slack/ Ditch/ Waterfall/ Cascade/ Rapid)	85-1. Glide.	Bank Structure (Bare/ Uniform/ Simple/ Complex)	simple
LAND USAGE (woodland type/ urban development/ rough or mproved pasture/ roads and rallways etc)	Mondifical.	Photographs		LAND USAGE (woodland type/ urban development/ rough or improved pasture/ roads and railways etc)	Moodland	Photographs	16:1
OTHER COMMENTS	None au			OTHER COMMENTS			
	WALTE OFT	AWE.					

## **JACOBS**

Electric fishing Field Sampling Form

## **JACOBS**

Electric fishing Field Sampling Form

PROJECT Name and Description	ption A			PROJECT Name and Description	AI		
Project Number	B2104700	Site Name	Flood gak burn	Project Number		Site Name	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Reason for sample (i.e. pollution	BASELINE	Site Reference		Reason for sample (i.e. pollution	B2104700	Site Reference	LONGBIKE B
survey/ monitoring etc.) Date		(subsites etc.) Grid Reference	Fas	survey/ monitoring etc.)	BASELINE	(subsites etc.)	LB2
Time	1-11	SPA (any change?)	N/A	Date	19/7/17	Grid Reference	
Survey lead	15 00	Other Staff (initials)		Time	09:45	SPA (any change?)	
Survey Methodology	EM	Kit type - Number	2000	Survey lead	EVENNE MAKWELL	Other Staff (initials)	63, JM. AP
Upstream stop net	Spot chile	Downstream stop net	E-fish/WF@4	Survey Methodology	FULLY QUANT	Kit type - Number	E-fish/WFC4
Grid reference, DMC	Photograph ref:		Photograph ref:	Upstream stop net		Downstream stop net	
VZ 18596 91258	r notograpii rei.	NZ 18756 917 2	8 Priotographires.	Grid reference	Photograph ref:	Grid reference 28 96	Pholograph ref:
SITE DETAILS	,	SITE DETAILS		SITE DETAILS		SITE DETAILS	1
Voltage (v) / ampere (a)	100 v / 13a	Overhanging cover	1A 0	Voltage (v) / ampere (a)	1.6	Overhanging cover	
Pulse frequency (Hz)	50 %	(%)	10 %	Pulse frequency (Hz)	1 Aurp.	(%)	60.
Net Type / Mesh size / Length / depth (m)	No Nets	Macrophyte species (if known) Submerged Emergent Bankside	-	Net Type / Mesh size / Length / depth (m)	Large Stop	Macrophyte species (if known) Submerged Emergent Bankside	None
Run length (m)	100	Flow (m/s)	I/ozeval	Run length (m)	100m	Flow (m/s)	Facili
Average River Width (m)	0.3	(Dry/ No flow/ Low/ Normal/ High/ Spate	1/0/2012	Average River Width (m)	3 m	(Dry/ No flow/ Low/ Normal/ High/ Spate	Low.
Average Water Depth (m)	0.1	Conductivity (ms/cm)	707	Average Water Depth (m)	6.3 (0.1 - 0.8)	Conductivity (ms/cm)	420
Average Bed Depth (m)	. 0.05	Temperature (°C)		Average Bed Depth (m)	0.05	Temperature (°C)	15-4
Surface area (m²)	30m2	Weather	000031 /51-9	Surface area (m²)	300 m2	Weather	Duerzast
Dissolved Oxygen (%)	ypine	Salinity	-	Dissolved Oxygen (%)		Salinity	200298 T
pH		Turbidity (Clear/ Slight/ Moderate/ High)	Modrok	рН		Turbidity (Clear/ Slight/ Moderate/ High)	Slight/Modes
Substrate (%)	514. Sand - 40	Shade (None/ Light/		Substrate (%)	Sand 30 Boulde	Shade (None/ Light/	
Bedrock/ Boulders/ Cobbles/	10% Clay - 40	Moderate/ Heavy)	Modrate	Bedrock/ Boulders/ Cobbles/	Grevel 20 alli	Madarata/ Hamas	Moderate
Pebbles/ Gravel/ Sand/ Silt/ Clay	Sreal-18			Pebbles/ Gravel/ Sand/ Sitt/ Clay	cobble 25 Pesble		
Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	crodine,	OTHER COMMENTS		Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)		OTHER COMMENTS	
on soposit sopositing and ling)	C/OSCINE,			Oil Depositi Depositing/Eroding)			1
HABITAT (%)	5-1. 1-0	Bank Structure		HABITAT (%)	Pool 25 R.H.	Bank Structure	
(Riffle/ Pool/ Run/ Glide/ Slack/	1) 12ch 70%	(Bare/ Uniform/	Unitorn	(Riffle/ Pool/ Run/ Glide/ Slack/	41.de 30	(Bare/ Uniform/	Comples
Ditory Wateriany Cascade/ Rapid)	1001 30%	Simple/ Complex)		Ditch/ Waterfall/ Cascade/ Rapid)	Run 40	Simple/ Complex)	
LAND USAGE (woodland type/ urban development/ rough or	2.4	Photographs		LAND USAGE (woodland type/ urban development/ rough or	Rough.	Photographs	
improved pasture/ roads and railways etc)	Improved Justice			improved pasture/ roads and railways etc)	instore		

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### APPENDIX H: EXPOSED RIVERINE SEDIMENT FIELD SHEET



### Aquatic Ecology Survey Report

APPENDIX D Environmental Variables for the ERS survey  A. Field Survey Details	E. Land use next to ERS (tick if present)  Broadleat/mixed woodland Coniferous plantation Moor/Heath  [ ]		L. Hibernation Potential  Presence of grass tussocks and deadwood high on ERS or on adjacent ba (0=none, 1=Isolated, 2=in some quantity, 3=abundant)	
Site name         River         RIVER         COOVET           Grid Ref         Date Set         03   08   12+           Sampler Name         MC+++         H           Bank (tick one)         Left   Right   Channel   Y	Scrub/Rough Bog, Marsh, Fen Grazed improved/semi-improved grass Ungrazed improved/semi-improved grass Arable land Is land behind grazed by cattle?	[ ] [ ] [ ] [ ]	Grass on ERS Grass on Bank Dead Wood on ERS Dead Wood on Bank Hibernation potential (overall)	[( ] [2 ] [0 ] [3 ]
B. Impoundment for navigation (tick one)  No [ Yes [ ] Don't know [ ]	No [ Yes [ ] I  F. Bank Profile above ERS (tick one)  Natural / unmodified  Artificial / modified	Don't know [ ]	(1=low, 2=medium, 3=high)  M. Bank above ERS dimensions (m) Bankfull height Bank Height (if different) Embanked Height	20.
Impoundment for other purposes (tick one)  No [-] Yes [ ] Don't know [ ]  C. ERS attributes Substrate Estimated % of each subsrtate on the ERS Boulder (>256mm)	G. ERS Profile ERS Profile type (tick if present) F= Flat (nearly) G=Gentle S=Steep (>10 degrees)	[ ] [ ]	N. Evidence of Recent Management (tick bo Banks None Resectioning Bank Mowing Enhancement	
Cobble (64-256)  Pebble (16-64mm)  Gravel (2-16mm)  Sand (0.063-2mm)  Silt (0.004-0.063mm)  Organic matter	H. ERS Topography (Tick one) Simple (no channels) Humped (Back channel present) Complex (braided)  I. ERS Habitat Heterogeneity (1=low, 2=medium, 3=high)	[ ] [ ] [ ] [ ] [ ]	Channel None Resectioning Bank Mowing Enhancement	
Vegetation  Vegetation structure (B=bare, S=Simple, C=complex) on ERS  Estimated vegetation cover on ERS	J. ERS Disturbance  ERS Grazing (1=low, 2=medium, 3=high)	[ ]]	O. Recreation (tick) Evidence of Fishing Presence of boats	14
D. ERS Dimensions (at time of installation)  Lengthmetres	ERS Trampling (1=low, 2=medium, 3=high) ERS extraction (gravel poaching)	[	No pillel traps set.	
Widthmetres	(1=low, 2=medium, 3=high)  K. Extend of Shade Percentage of ERS Shaded			
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