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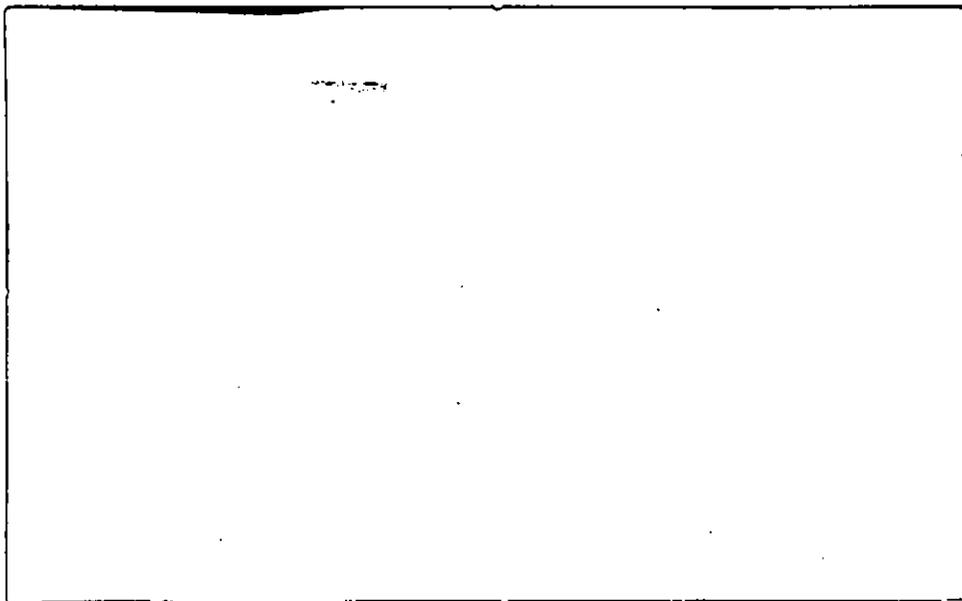
Centre for Ecology & Hydrology



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The *Ranunculus fluitantis* and Callitricho-Batrachion (CB) vegetation of the Gala Water

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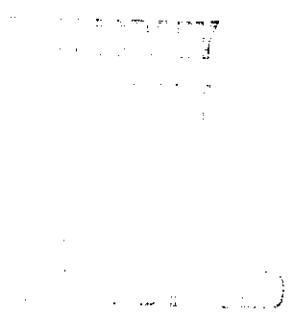
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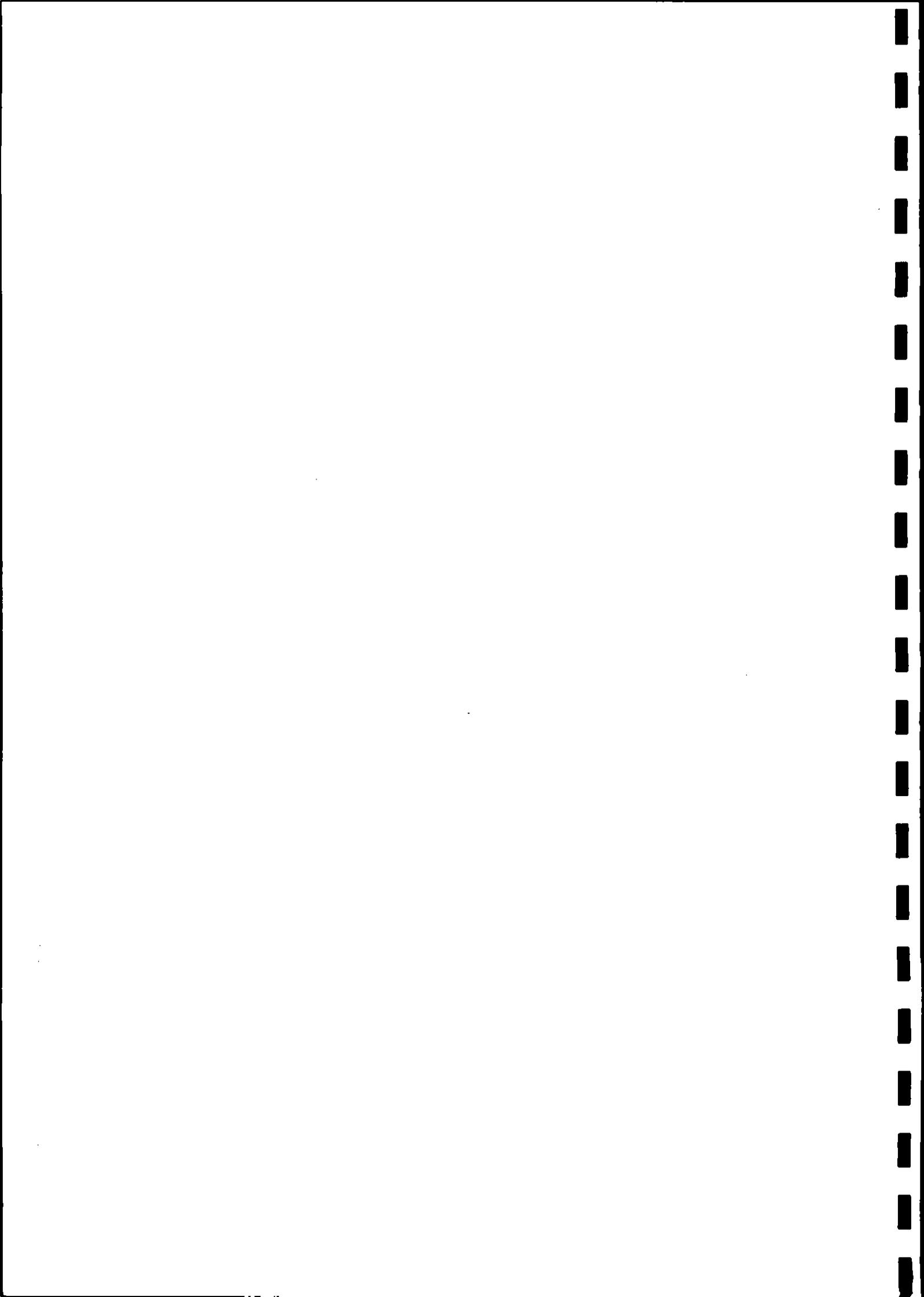
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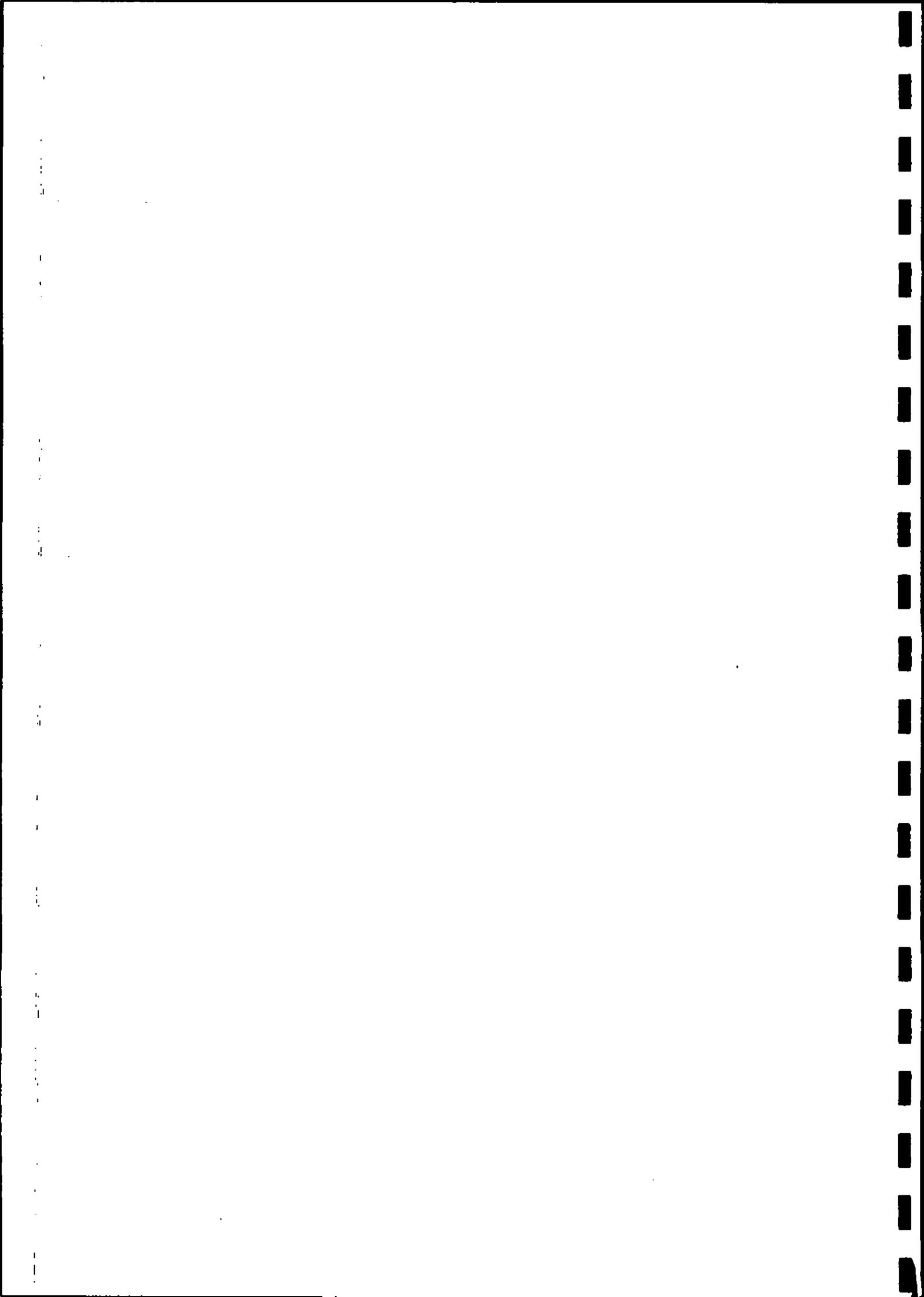




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Executive Summary

- The Centre for Ecology and Hydrology, Dorset (CEH) working in conjunction with Wallingford HydroSolutions Ltd, was commissioned by Environmental Resources Management (ERM) to conduct macrophyte surveys on the Gala Water and River Tweed and to assess potential impacts of the Waverley Railway Project.
- The Gala Water contains aquatic plant communities of conservation interest throughout most of the catchment and they require protection. Sites at the top of the catchment have less diverse aquatic plant communities than those lower down.
- Aquatic vegetation was sparse at all the sites, apparently due to the mobile nature of the substrates.
- The river supports a diverse plant community with significant water crowfoots (Batrachion *Ranunculus*), liverworts and mosses (Bryophytes).
- Marginal vegetation accounted for the majority of species recorded. The bank vegetation was dominated by reed canary-grass (*Phalaris arundinacea*) throughout the catchment.
- The water crowfoot (Batrachion *Ranunculus*) community in the Gala Water as a whole is diverse. Batrachion *Ranunculus* species were recorded in low numbers at 20 of the 38 sites surveyed. *Ranunculus fluitans x aquatilis*, *Ranunculus peltatus*, *Ranunculus penicillatus* ssp. *pseudofluitans* and *Ranunculus hederaceus* were recorded.
- Bryophytes of interest occurred at most sites. Instream aquatic mosses (*Fontinalis* spp., *Rhynchostegium riparioides* and *Brachythecium rivulare*) were limited to sites with suitable habitat. *R. riparioides* was often the most dominant instream macrophyte.
- Many of the sites on the Gala Water have communities which are very similar to the CB4 community type. Comparison with other surveys on tributaries of the Tweed suggest that Batrachion *Ranunculus* and *Potamogeton* species are more widespread on the Gala Water than on the nearby Etrick Water and Yarrow Water.
- The majority of sites were classified as JNCC group B - Meso-eutrophic rivers flowing predominantly over sandstone and hard limestone.

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1. Introduction

The Centre for Ecology and Hydrology, Dorset (CEH) working in conjunction with Wallingford HydroSolutions Ltd, was commissioned by Environmental Resources Management (ERM) to conduct macrophyte surveys on the Gala Water and River Tweed and to assess potential impacts of the Waverley Railway Project.

The Waverley Railway Project is an initiative with the ultimate aim of re-establishing a rail link to provide a passenger transport service from Edinburgh to the central Borders area in Scotland by 2008. The project is seen as the first phase of reinstating the entire rail link between Edinburgh and Carlisle, which was closed in 1969.

The rail line runs alongside the Gala Water for almost the entire length of the river. It bridges the river repeatedly and in many places the riverbank has been reinforced or realigned to facilitate the line. Many of the bridges and areas of bank protection need remedial work.

The Gala Water is part of the Tweed Special Area for Conservation (SAC) and the aquatic vegetation (*Ranunculion fluitantis* and *Callitriche-Batrachion* (CB) Communities) is protected in this area. This report is the first of two. It provides an overview of the macrophyte community. The report is technical but most sections contain a brief introductory paragraph for lay readers which is followed by more detailed supporting information. The second report will assess potential impacts and suggest suitable mitigation measures. Sites were surveyed by CEH, throughout the catchment, in July, August and September 2005.

1.1 Objectives

- To characterise the macrophyte vegetation in and around sites where work is to be undertaken as part of the Waverley Project.
- To provide an assessment of the conservation status of the macrophyte community.
- To provide data in a form suitable for comparison with other macrophyte surveys carried out in the Tweed catchment.
- To identify the physical habitat requirements of macrophytes in the Gala Water. This information is to aid in the assessment of the potential for impact from works which change the river's hydromorphology.

1.2 Background Information

The Gala Water does not suffer from any serious pollution and should support a healthy aquatic plant community. The river is part of the Tweed catchment which has special legislative protection covering the aquatic plant community of the Gala Water.

The Gala Water and its Catchment

The Gala Water is a naturally moderate to highly nutrient-rich river (meso-eutrophic). It has an upland catchment draining from the Moorfoot Hills with an area of approximately 210 km². The solid geology of the catchment is, in the main, impervious llandovery sandstone. Land use is primarily hill grazing, with some arable land in the upper catchment. Close to the river channel, flat land is used for rough grazing or improved grazing/silage. The river passes through a number of small urban centres; Heriot, Fountainhall and Stow. Just above the confluence with the Tweed, the Gala Water passes through the town of Galashiels.

The substrate within the river is mostly comprised of pebbles and cobbles, with lesser amounts of gravel and boulder. Parts of the channel are dynamic, with erosion of the banks and bed and unstable depositional areas. The river has been physically altered in the past. Sections have been straightened and there exists the remains of the old railway line.

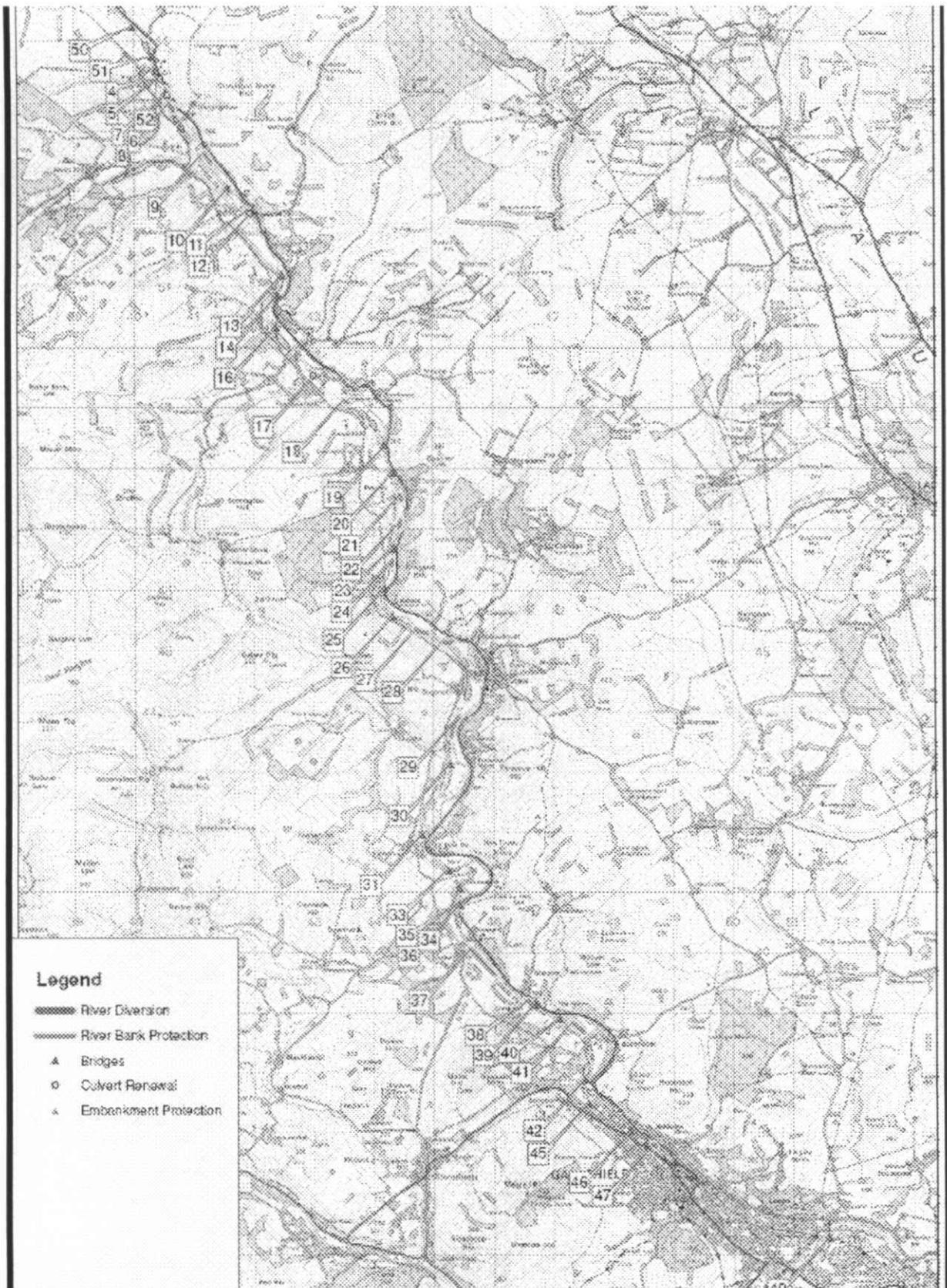


Figure 1 Map of the Gala Water and the confluence with the River Tweed showing site locations and proposed types of works. (C) Crown copyright. All rights reserved NERC (CEH) 100017897 2005.

The Scottish Environment Protection Agency (SEPA) classifies the river, using a combined measure based on the river's ecological health and water chemistry as either A1 or A2, (John Clayton, SEPA, Galashiels *pers comm.*). The classification indicates the river is in excellent condition. There have been no serious pollution incidents in recent years which are likely to have impacted the macrophyte community. The small hamlets of Fountainhall and Heriot are on group septic tanks schemes and the village of Stow has a tertiary treatment plant for sewage. No pollution incidents related to the sewage treatment works or the group schemes have been reported.

Water chemistry data supplied by SEPA confirms their quality assessment (Figure 2). The figure shows the concentration of the two main macro-nutrients, monitored by SEPA, which influence plant growth. Both are at acceptable levels.

The background information suggests the river should support a healthy macrophyte community.

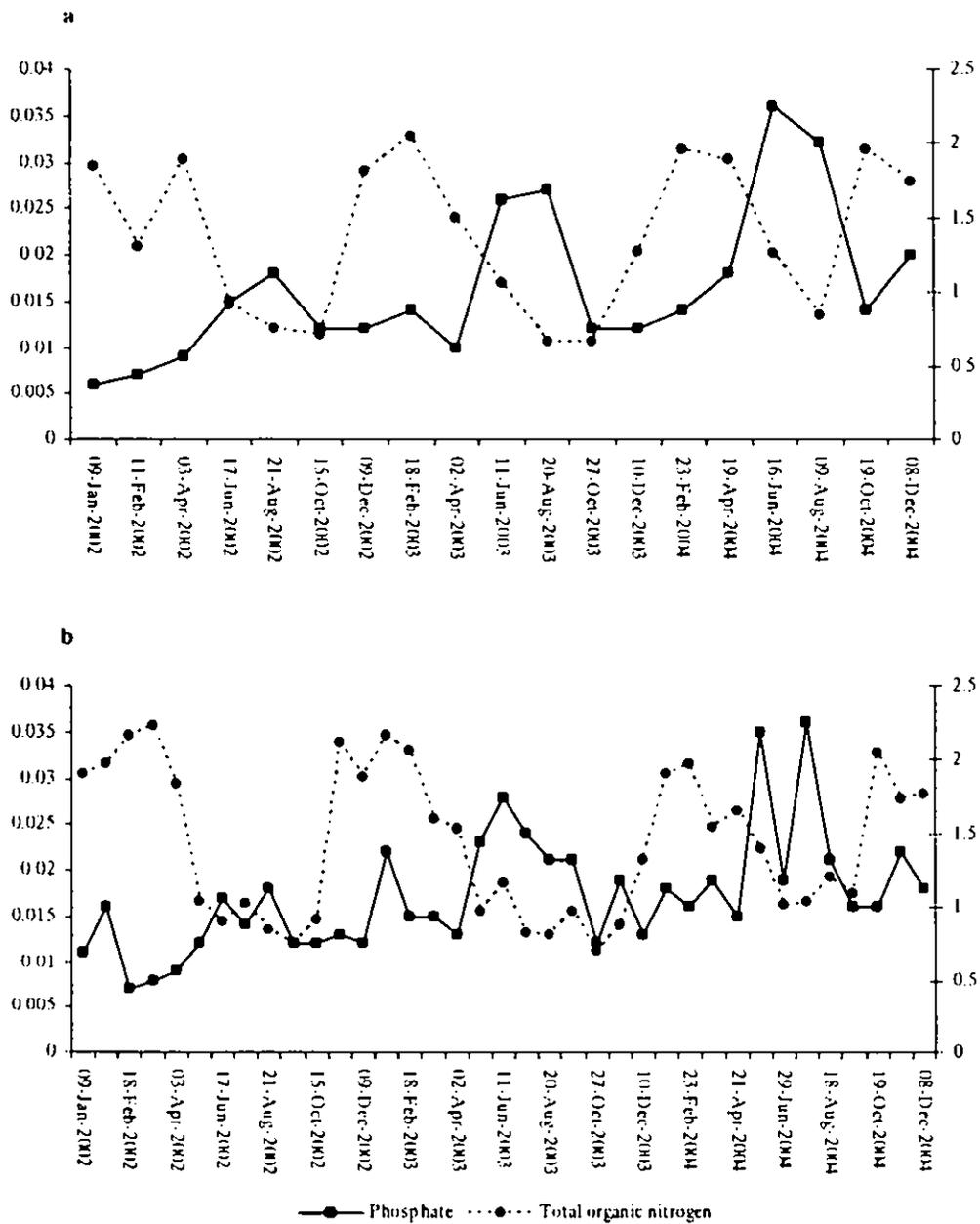


Figure 2 Concentrations of phosphorus as ortho-phosphate (left y axis) and nitrogen as total oxidised nitrogen (right y axis) (mg/l) in the Gala Water Jan 2002 – December 2004, taken from a) immediately upstream of Galashiels and b) the confluence with the River Tweed. Data provided courtesy of SEPA.

Conservation interest of the aquatic vegetation of the Tweed Catchment

The River Tweed is acknowledged by botanists as supporting a diverse array of aquatic plants (e.g. Haslam 1978). It has an especially rich water crowfoot (*Batrachion Ranunculus*) community with by far the greatest number of aquatic plant species of any Scottish river with *Ranunculus*. There are a number of reasons why the system supports so many aquatic plants. Contributing factors include its large size, its mixed geology and its location close to the northerly limits of the UK distribution of some species. The importance of the river for aquatic plants has been recognised and the system is now protected.

The Tweed and its major tributaries form a Special Area for Conservation (SAC) which is part of the network of Natura 2000 sites recently set up under the EU Habitats Directive. The SAC status is underpinned by national legislative protection, i.e. the river is also a Site of Special Scientific Interest (SSSI). Initially, only the main stem of the Tweed was protected but all major tributaries to which salmon have access are now included. The Tweed SAC interests are salmon, otter, all three species of lamprey and the *Ranunculion fluitantis* and *Callitricho-Batrachion* (CB) plant communities.

The aquatic plant interest is designated under Annex I of the Directive and it is a primary interest of the site. Specific mention is made of a number of species in the designation.

'The Tweed represents sub-type 2 in the north-eastern part of its range. It is the most species-rich example, by far, of a river with Ranunculus in Scotland, and is the only site selected for this habitat in Scotland. The river has a high ecological diversity which reflects the mixed geology of the catchment. Stream water-crowfoot Ranunculus penicillatus ssp. pseudofluitans, a species of southern rivers and streams, here occurs at its most northerly location as does fan-leaved water-crowfoot R. circinatus, along with river water-crowfoot R. fluitans, common water-crowfoot R. aquatilis, pond water-crowfoot R. peltatus and a range of hybrids. The Tweed is also the most northerly site for flowering-rush Butomus umbellatus.'

(Source: Joint Nature Conservancy Council website)

Scottish Natural Heritage (SNH) is responsible for running the SAC and will require all potential impacts to the aquatic plant community to be mitigated.

Implications for the Waverley Rail Project

There has not been a previous survey to assess the quality of the macrophyte communities in the Gala Water. Given the protected status of the river, it is essential to the project that the aquatic plant community be assessed. This report provides a base line upon which potential impact from any remedial work to the Waverley line can be evaluated.

In addition to SNH's role, SEPA also have new responsibilities under the EU Water Framework Directive to protect aquatic plants and the natural hydromorphological function of rivers. They will also require suitable mitigation measures and an overview of the current status of macrophytes in the Gala Water.

2. Methods

Thirty-seven sites were surveyed on the Gala Water and one site on the River Tweed. The sites were positioned at locations where engineering work was planned and a standard macrophyte survey technique was used. The original list of engineering works includes 52 sites. Some were not surveyed. They were bridges spanning dry land or sites outwith the catchment. Some surveys incorporated more than one engineering work.

The survey recorded the variety and extent of aquatic and bank vegetation in the area of the proposed work and for a distance upstream and downstream. The macrophyte data recorded were then used to categorise the sites into river types and to gauge their conservation status according to the occurrence of certain key species.

2.1 Field methodology

Surveys were carried out from July to September 2005. Flow conditions were below average during much of the surveying due to a spell of dry weather. The standard Joint Nature Conservation Committee (JNCC) macrophyte survey method was used to record river vegetation at the sites (Holmes et al. 1999). This is the standard survey technique used to type SAC aquatic plant communities (English Nature 2003). Using this technique, separate records are made for aquatic macrophytes that are more or less permanently submerged and bank records for species typically subject to alternate inundation and exposure with variations in river levels.

A 3-point scale was used to indicate the percentage area covered by each species:

1 = < 0.1%

2 = 0.1-5%

3 = >5%

Relative plant cover was also recorded, to provide information on the abundance of one species in comparison with the other species present. The units used were:

1 = Rare

2 = Occasional or Frequent

3 = Abundant

The JNCC checklist of taxa was used. Additional taxa not on the list were recorded separately to provide comprehensive data for the species list of each site.

The river is predominantly shallow and so the macrophytes were recorded whilst wading in the channel. In the few areas of deep water that occurred, the macrophytes were recorded from the bank and sampled using grapnels as necessary.

Representative photographs of the sites were taken in order to illustrate their general character and sketch maps were made in order to provide additional detail on the type, area and location of the habitats and species. These maps were later re-drawn with the addition of species that were not identified in the field.

Where access allowed, the sites comprised 500m long sections; 100m upstream of the engineering works and 400m downstream. In order to include the area of engineering and the upstream and downstream areas, some sites with long stretches of riverbank protection exceeded 500m in length. When access to full 500m long sections was not possible, the longest possible reach was surveyed, e.g. 350m reaches were surveyed at sites 16 and 46.

Separate species lists were made for the 100m upstream and 100m downstream of the engineering works in order to ascertain which species were more likely to be directly impacted by the engineering work. GPS readings were taken to specify the locations of these sections. Habitat preferences were noted, especially those of key species such as water crowfoots (*Ranunculus* spp.), mosses and liverworts. Potential impacts on the vegetation communities such as input from water treatment works were also noted.

Plants were identified in the field as far as possible and samples of bryophytes, algae and some starworts (*Callitriche* spp.) and *Ranunculus* species which could not be identified were collected for later identification. The identities of *Ranunculus* specimens were confirmed by Nigel Holmes. Identification of Bryophytes was confirmed by Jan Kucera of the University of South Bohemia and algal samples by Derek Westlake (*consultant/ex-CEH*). The vegetation identification guides and floras by Stace (1991), Lansdown (1998), Jahns (1983), Hill (1991) and Rose (1989, 1991) were used to identify difficult species.

2.2 Data analysis

The data collected were used to assign types to the river sections as described in Holmes et al. (1999). With this method, the presence and extent of a number of plants are used to classify a site into a specific river type e.g. 'Small, lowland, impoverished mixed sand/clay river'. This enables similar sites to be compared to each other and may be used to indicate which species should be present at a site, especially if the river is in good condition, i.e. not impacted by nutrient enrichment etc.

Sites were also classified by their *Ranunculion fluitantis* and *Callitriche-Batrachion* (CB) communities, according to the abundance and variety of certain key species, especially, though not exclusively, *Batrachion Ranunculus*. As part of their designation, CB communities require high quality physical habitats. The Gala Water is part of the Tweed Special Area of Conservation (SAC) which is part of the network of Natura 2000 sites set up under the EU Habitats Directive. The preservation of sites classified as supporting CB communities is therefore a priority and sites meeting these criteria have national legislative protection.

Species are typed into 7 groups; Crowfoots, Starworts, Pondweeds, Milfoils, Bryophytes, Other Aquatics and Marginal species (Hatton-Ellis et al. 2003).

According to the species present from these groups, rivers are classified into six groups:

CB1 – Lowland, low gradient *Potamogeton / Sagittaria* eutrophic river community

CB2 – Base rich *Ranunculus penicillatus* ssp. *pseudofluitans* – *Callitriche obtusanglia* rivers, including chalk streams

CB3 – Large *Ranunculus* rivers

CB4 – Smaller mesotrophic rivers

CB5 – Atlantic bryophyte *Callitriche hamulata / Ranunculus penicillatus* ssp. *penicillatus* rivers

CB6a – Slow flowing, base-poor rivers

CB6b – Fast flowing, bryophyte dominated rivers

3. Results

The Gala Water contains aquatic plant communities of conservation interest throughout most of the catchment. Sites at the top of the catchment (above site 23) have less diverse aquatic plant communities, but the aquatic plant communities downstream of these sites are very vulnerable and any work upstream must take these sites into consideration.

Conditions during the surveys were excellent. Little rain hampered work and the river level was low. Very few reaches were too deep to wade and at those that were, grapnels were used to retrieve vegetation samples for identification. Only the site on the Tweed had to be surveyed entirely from the bank.

Aquatic vegetation was sparse at all sites, with marginal vegetation accounting for the majority of species recorded. Widespread accumulations of diatoms were recorded at a number of sites where flow was slow during July and August but these had disappeared by September. The reason for the sparse cover of aquatic vegetation was considered to be the mobile nature of the substrates. Such conditions can prevent the establishment of large stands of water crowfoot (*Ranunculus* spp.) and pondweeds (*Potamogeton* spp.). Any vegetation which does accumulate may be subject to partial or complete wash-out in spate flows.

Sites at the top of the catchment had the least diverse habitats and macrophytes, whilst sites lower down in the catchment usually contained a range of habitat types and supported a greater diversity of species. The bank vegetation was dominated by reed canary-grass (*Phalaris arundinacea*) throughout the catchment.

The appendix contains **individual site reports** which provide a site overview, species lists, the CB community and JNCC community types and site maps.

3.1 Macrophyte communities relating to the conservation status of the river

The aquatic plant communities at the majority of sites most closely matched the CB4 community type (Table 1). Sites often did not have all the elements required. The main reasons for failing the criteria were that the sites lacked the correct type of marginal vegetation or *Ranunculus pseudofluitans* was not sufficiently abundant.

The water crowfoot (Batrachion *Ranunculus*) community in the Gala Water as a whole is diverse. *Ranunculus penicillatus* ssp. *pseudofluitans*, *Ranunculus peltatus* and the very rare hybrid *Ranunculus x bachii* were all recorded. *Ranunculus hederaceus* was also present.

Water crowfoots occur at site 12, near Crookston above Fountainhall, but are absent from all other sites above site 22. Downstream of this site water crowfoots are usually present. At all sites they are rare, usually present only as one or a few plants. *R. pseudofluitans* occurs at nine sites, *R. peltatus* at six and *R. x bachii* at two sites, sites 27 and 28.

Bryophytes of interest occurred at most sites (Table 2). Instream aquatic mosses (*Fontinalis* spp., *Rhynchostegium riparioides* and *Brachythecium rivulare*) were limited to sites with suitable habitat (see section 3.3). *R. riparioides* was often the most dominant instream macrophyte. Sites with exposed earth under the shade of trees contained the greatest diversity of liverworts. *Pellia endiviifolia*, *Lunularia cruciata* and *Concephalum conicum*, were common components of the liverwort flora. *Pellia neesiana*, a northerly species of limited distribution, was recorded at one site. *Chiloscyphus polyanthos* and *Marchantia polymorpha* were also recorded.

Many bryophytes were recorded at only one or two sites. These are almost all common species. They are mostly not river specialists *per se* but inhabit a wide range of moist habitats. Among this group of infrequently encountered species, two which do occur predominantly in running water are *Fontinalis squamosa* and *Hygrohypnum ochraceum*.

Flowering rush (*Butomus umbellatus*) which is mentioned in the SAC designation occurred at site 38-39.

Table 1 Characterisation of *Ranuncion fluitans* and *Callitriche-Batrachion* (CB) communities of sites surveyed on the Gala Water and the River Tweed, 2005

Site no.	CB groups*	Species represented
4-5	Bry, Sta, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Chiloscyphus polyanthos</i> , <i>Callitriche stagnalis</i> , <i>Rorippa nasturtium-aquaticum</i>
6-8	Bry, Sta, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Pellia</i> sp., <i>Callitriche stagnalis</i> , <i>Rorippa nasturtium-aquaticum</i>
9	Bry, Sta, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Callitriche stagnalis</i> , <i>Rorippa nasturtium-aquaticum</i>
10	Bry, Sta, Mar	<i>Fontinalis antipyretica</i> , <i>Callitriche stagnalis</i> , <i>Callitriche platycarpa</i> , <i>Rorippa nasturtium-aquaticum</i>
11-12	Bry, Sta, Mar, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Callitriche stagnalis</i> , <i>Rorippa nasturtium-aquaticum</i> , <i>Ranunculus c.f. peltatus</i>
13	Bry, Sta, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Callitriche platycarpa</i> , <i>Rorippa nasturtium-aquaticum</i>
14	Bry, Sta	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Callitriche stagnalis</i>
16	Bry, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Rorippa nasturtium-aquaticum</i>
17	Bry	<i>Fontinalis antipyretica</i> , <i>Pellia endivifolia</i>
18	Bry, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Rorippa nasturtium-aquaticum</i>
19	Bry, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Brachythecium rivulare</i> , <i>Pellia</i> sp., <i>Rorippa nasturtium-aquaticum</i>
20	Bry, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Rorippa nasturtium-aquaticum</i>
21	Bry, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Rorippa nasturtium-aquaticum</i>
22	Bry, Mar, Sta	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Rorippa nasturtium-aquaticum</i> , <i>Callitriche stagnalis</i>
23	Bry, Sta, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Callitriche platycarpa</i> cf. <i>Ranunculus penicillatus pseudofluitans</i>
24	Bry, Mar, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Rorippa nasturtium-aquaticum</i> , <i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>
25	Bry, Cro	<i>Fontinalis antipyretica</i> , <i>Pellia endivifolia</i> , <i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>
26	Bry, Mar, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Pellia</i> sp., <i>Rorippa nasturtium-aquaticum</i> , <i>Ranunculus peltatus</i>
27	Bry, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Chiloscyphus polyanthos</i> , <i>Ranunculus fluitans</i> x <i>aquatilis</i>
28	Bry, Mar, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Rorippa nasturtium-aquaticum</i> , <i>Ranunculus fluitans</i> x <i>aquatilis</i>
29	Bry, Mar, Cro	<i>Rhynchosostegium riparioides</i> , <i>Pellia</i> sp., <i>Rorippa nasturtium-aquaticum</i> , <i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>
30	Bry, Mar, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Rorippa nasturtium-aquaticum</i> , <i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>
31	Bry, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Ranunculus c.f. penicillatus</i> ssp. <i>pseudofluitans</i>
33	Bry, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Pellia epiphylla</i> , <i>Ranunculus peltatus</i>
34	Bry, Pon, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Potamogeton crispus</i> , <i>Ranunculus c.f. penicillatus</i> ssp. <i>pseudofluitans</i>
35-36	Bry, Pon, Mar	<i>Fontinalis antipyretica</i> , <i>Amblystegium fluviatile</i> , <i>Rorippa nasturtium-aquaticum</i> , <i>Potamogeton crispus</i> , <i>Ranunculus c.f. penicillatus pseudofluitans</i>
37 (U/S)	Bry, Pon	<i>Fontinalis antipyretica</i> , <i>Amblystegium fluviatile</i> , <i>Rhynchosostegium riparioides</i> , <i>Potamogeton crispus</i>
37 (D/S)	Bry, Pon, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Cinclidotus fontinaloides</i> , <i>Potamogeton crispus</i> , <i>Ran. penicillatus</i> ssp. <i>pseudofluitans</i> , <i>Ran. peltatus</i>
38-39	Bry, Pon, Cro, Mar	<i>Fontinalis antipyretica</i> , <i>Amblystegium fluviatile</i> , <i>Potamogeton crispus</i> , <i>Potamogeton pusillus</i> , <i>Rorippa nas. aq.</i> , <i>Ranunculus c.f. penicillatus pseudofluitans</i>
40	Bry, Sta, Mar, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Chiloscyphus polyanthos</i> , <i>Brachythecium rivulare</i> , <i>Call. stag.</i> , <i>Rorippa nas. aq.</i> , <i>Ran. c.f. pen. pse.</i>
41	Bry, Cro, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Ran. pen. pse.</i> , <i>Ran. peltatus</i> , <i>Rorippa nasturtium-aquaticum</i> , <i>Callitriche stagnalis/platycarpa</i>
42	Bry, Pon, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Potamogeton crispus</i> , <i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>
45	Bry, Pon, Cro, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Potamogeton crispus</i> , <i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>
46	Bry, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Pellia endivifolia</i> , <i>Ranunculus peltatus</i>
47	Bry, Pon, Cro, Mar	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Potamogeton crispus</i> , <i>Rorippa nasturtium-aquaticum</i> , <i>Ranunculus peltatus</i>
49	Bry, Pon, Cro	<i>Fontinalis antipyretica</i> , <i>Rhynchosostegium riparioides</i> , <i>Potamogeton crispus</i> , <i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>
50	Bry	<i>Fontinalis antipyretica</i>
51		No representative species

*Bry - Bryophytes, Cro - Crowfoots, Mar - Marginal species, Pon - Pondweeds Sta - Starwort

Table 2 Mosses and liverworts recorded on the Gala Water catchment and the River Tweed, July-August 2005

Mosses	Number of sites
<i>Fontinalis antipyretica</i>	35
<i>Rhynchostegium riparioides</i>	30
<i>Brachythecium rivulare</i>	5
<i>Amblystegium fluviatile</i>	4
<i>Pohlia wahlenbergii</i>	3
<i>Eurhynchium swartzii</i>	2
<i>Mnium hornum</i>	2
<i>Plagiomnium undulatum</i>	2
<i>Rhizomnium punctatum</i>	2
<i>Schistidium alpicola</i>	2
<i>Atrichum undulatum</i>	1
<i>Cinclidous fontinaloides</i>	1
<i>Cratoneuron filicinum</i>	1
<i>Dicranella palustris</i>	1
<i>Fissidens</i> sp.	1
<i>Fissidens taxifolius</i>	1
<i>Fontinalis squamosa</i>	1
<i>Hygrohypnum ochraceum</i>	1
<i>Hypnum cupressiforme</i>	1
<i>Philonotis seriata</i>	1
Liverworts	
<i>Conocephalum conicum</i>	18
<i>Lunularia cruciata</i>	15
<i>Pellia</i> sp.	10
<i>Pellia endiviifolia</i>	5
<i>Chiloscyphus polyanthos</i>	4
<i>Pellia epiphylla</i>	2
<i>Marchantia polymorpha</i>	1
<i>Pellia neesiana</i>	1

3.2 JNCC River Types

The sites surveyed on the Gala Water were classified as groups A and B (Table 3). No group C or D sites were recorded.

Sub-type V (Sandstone, mudstone and hard limestone rivers of England and Wales), Group B (Meso-eutrophic rivers flowing predominantly over sandstone and hard limestone) were most common, accounting for 20 of the sites.

Sub-type VI (Sandstone, mudstone and hard limestone rivers of Scotland and Northern Ireland) accounted for a further 13 sites.

Table 3 Characterisation of sites surveyed on the Gala Water and the River Tweed into JNCC river types

Site no.	Group	Sub-type	Description
4-5	B	Vc	Small, lowland, impoverished mixed sand/clay rivers
6-8	B	Vc	Small, lowland, impoverished mixed sand/clay rivers
9	B	Va	Mesotrophic, upland hard limestone/sandstone rivers
10	A	IVa	Base-rich/neutral impoverished rivers, normally close to source
11-12	B	Vc	Small, lowland, impoverished mixed sand/clay rivers
13	B	Vc	Small, lowland, impoverished mixed sand/clay rivers
14	B	Vc	Small, lowland, impoverished mixed sand/clay rivers
16	B	Vc	Small, lowland, impoverished mixed sand/clay rivers
17 (Still Burn)	A	IVc	Upland rivers with impoverished floras
18	B	Va	Mesotrophic, upland hard limestone/sandstone rivers
19	B	Va	Mesotrophic, upland hard limestone/sandstone rivers
20	A	IVa	Base-rich/neutral impoverished rivers, normally close to source
21	B	Va	Mesotrophic, upland hard limestone/sandstone rivers
22	B	Vc	Small, lowland, impoverished mixed sand/clay rivers
23	B	Vb	Small, lowland, base-rich sand rivers or winterbournes
24	B	Vb	Small, lowland, base-rich sand rivers or winterbournes
25	B	Va	Mesotrophic, upland hard limestone/sandstone rivers
26	B	VId	Small, low-gradient meso-eutrophic rivers
27	B	Va	Mesotrophic, upland hard limestone/sandstone rivers
28	B	Vle	Small, basic, upland rivers
29	B	Vle	Small, basic, upland rivers
30 (Lugate water)	B	Vb	Small, lowland, base-rich sand rivers or winterbournes
31	B	Vle	Small, basic, upland rivers
33	B	Vle	Small, basic, upland rivers
34	B	VId	Small, low-gradient meso-eutrophic rivers
35-36	B	VId	Small, low-gradient meso-eutrophic rivers
37 (U/S)	B	Vc	Small, lowland, impoverished mixed sand/clay rivers
37 (D/S)	B	Vb	Small, lowland, base-rich sand rivers or winterbournes
38-39	B	Vle	Small, basic, upland rivers
40	B	Va	Mesotrophic, upland hard limestone/sandstone rivers
41	B	Vb	Small, lowland, base-rich sand rivers or winterbournes
42	B	Vlc	Middle reaches of upland rivers traversing more base-rich strata
45	B	Vle	Small, basic, upland rivers
46	B	VId	Small, low-gradient meso-eutrophic rivers
47	B	Vle	Small, basic, upland rivers
49 (Tweed)	B	VId	Small, low-gradient meso-eutrophic rivers
50	*	*	Too few species to type river
51	*	*	Too few species to type river
52	*	*	Too few species to type river

3.3 Habitat Types

Observations in the field suggest there are three main types of instream habitat used by macrophytes and four marginal types. All are defined by substrate type and are recognisable hydromorphological features. They are often associated with modifications to the channel or banks and provide an insight into potential impacts associated with alterations to channel morphology.

3.3a Instream

Cobble/pebble shallow glides, runs and riffles

This was by far the most common habitat type and supported aquatic plants of interest. The bed rarely felt armoured under foot suggesting it is highly mobile. Diatoms and filamentous algae were common on this substrate type. Water crowfoots (*Batrachion Ranunculus* spp.) and occasionally curled pondweed (*Potamogeton crispus*) were found on the cobble/pebble mix. They were almost always positioned near the edge of the channel in slower flowing water. The few plants that were found in the centre of the channel were small and are, most likely, subject to winter washout.

The site on the River Tweed (Site 49) was the only location where large stands of water crowfoot developed and these were located toward the centre of the channel on cobble substrate.

Boulders and Bedrock

Mosses and occasionally liverworts were found on submerged or partially submerged bedrock and boulders. Submerged and collapsed riprap and bridge supports acted as an artificial substitute for naturally occurring boulders and bedrock. Hence many of the sites with old rail bank protection supported mosses. Boulders were an occasional rather than a common component of most survey reaches. Aquatic mosses (*Fontinalis* spp. & *Rhynchostegium riparioides*) occurred exclusively on this group of substrates.

Slow water with silty deposits

Habitat of this type occurred where tributaries entered the main river. Often pools developed at the mouth of the tributaries where the water slowed and silt deposited. Immediately upstream of the inflow, a zone of shallow slack water often occurred and silt was also deposited here. Similar conditions occurred where culverted streams running under the railway entered the Gala Water or where the river appeared over-deepened at re-aligned sections of channel. Canadian waterweed (*Elodea canadensis*) and lesser pondweed (*Potamogeton pusillus*) occurred exclusively in the silty areas. The conditions also favoured branched burr reed (*Sparganium erectum*), curled pondweed (*P. crispus*) and the water crowfoots that produce laminar, floating leaves, e.g. pond water crowfoot (*R. peltatus*).

3.3b Marginal

Gravel side/point bars

These were a common feature of many sites and they supported a flora with species uncommon in other marginal habitats. Water-cress (*Rorripa nasturtium-aquaticum/microphyllum*), bog stitchwort (*Stellaria uliginosa*), redshank (*Persicaria maculosa*), procumbent pearlwort (*Sagina procumbens*), knotgrass (*Polygonum aviculare*) and the invasive monkey flower (*Mimulus* agg.) were all commonly encountered.

Eroding earth cliffs (sensu RHS)

Bare earth cliffs were a poor habitat supporting mainly horsetails (*Equisteum* spp.). The moss *Pohlia wahlenbergii* was also found in this habitat.

Wooded earth banks

Under the shade of the trees, liverworts grew among tree roots where the water had begun to expose bare earth. *Concepalum conicum*, *Pellia* species and *Lunularia cruciata* were all common. In the gaps between the trees wood club rush (*Scirpus sylvaticus*) often flourished.

Unshaded earth banks

This was the most common marginal habitat. Throughout the entire catchment reed canary-grass (*Phalaris arundinacea*) dominated the margins. Water forget-me-not (*Myosotis scorpioides*) was also frequently encountered. *Juncus* species were most frequent in the upper part of the catchment. At a number of sites butterbur (*Petasites hybridus*) formed extensive stands.

4. Discussion

We conclude that the river contains an aquatic plant community of conservation importance. In summary, the river supports a diverse plant community with significant water crowfoots (*Batrachion Ranunculus*), liverworts and mosses (Bryophytes). The community is comparable to those present in other Tweed tributaries in the SAC. There is a clear relationship of increasing plant diversity with increasing diversity of physical habitat types. Any work undertaken by the Waverley Rail Project will need to maintain the diversity of habitat, both on the banks and instream.

We conclude that the water crowfoots are living in a system where conditions are close to the limit of their range of tolerances. They tend to occur in low numbers and so require protection even if only one or a few plants are present at a site. Their reproduction is principally from fragments which break off established plants and are carried downstream where they root. Upstream populations are therefore especially important for helping maintain populations at downstream sites and are particularly vulnerable because upstream sites cannot receive inputs of new propagules by this mechanism. For both these reasons we suggest that they need special protection.

The bryophytes (liverworts & mosses) occurred in two distinct habitat types, either instream on stable substrate or on the bank, especially under trees. Where work is to be undertaken both these habitats will need protection.

Comparisons with other Surveys in the Tweed catchment

Surveys using the same JNCC methodology were conducted on other rivers within the Tweed catchment in 2004, enabling comparisons to be made between the Gala Water and similar rivers. The data from these surveys was supplied by SNH. Five sites on the Ettrick Water and three sites on the Yarrow Water are particularly appropriate for comparison as the rivers are in close proximity to the Gala Water and have the same underlying geology. Generally, the aquatic species recorded at both rivers were similar. The main difference between the three rivers was in the bankside vegetation, with many more bryophytes recorded on the Ettrick and Yarrow Water than on the Gala.

The surveys suggest that *Batrachion Ranunculus* and *Potamogeton* species are more widespread on the Gala Water than on the Ettrick Water or Yarrow Water, although surveys on these rivers were less extensive. *Ranunculus peltatus* was recorded at Ettrick Water at only one site, in the lower reaches, and was not recorded on the Yarrow Water. On the Gala Water, *Batrachion Ranunculus* species were recorded at 20 of the 38 sites surveyed.

Potamogeton polygonifolius was recorded at one site on Yarrow Water and no *Potamogeton* species were recorded on the Ettrick Water, in contrast to the two species recorded on the Gala Water. The larger substrate on the Ettrick Water may explain some of the variation in species as boulders provide good habitat for mosses. While boulders did occur at many sites on the Gala Water, they tended to form only a small component of the substrate. *Callitriche* species are similar in abundance on the three rivers.

Surveys on the River Tweed were similar to site 49, our only site on the Tweed. *Potamogeton* species recorded in our survey occurred in a marginal, silty area, a habitat type which may have been absent during the 2004 surveys when no *Potamogeton* species were recorded.

Five surveys conducted on the Gala Water in 1973 by Haslam (1978) found significantly fewer species than were recorded in the 2005 surveys, especially in the lower reaches of the river (although the survey reach was shorter in the 1973 surveys). The marginal species *Sparganium erectum*, *Rorippa nasturtium-aquaticum* and *Glyceria fluitans* were recorded but *Mimulus guttatus*, *Myosotis scorpioides* and *Phalaris arundinacea* were not. The only true aquatic species recorded by Haslam was *Elodea canadensis*.

CB Community Type

Many of the sites on the Gala Water had communities very similar to the CB4 community type. Most sites failed to meet the criteria because they had a component missing, e.g. often *Ranunculus penicillatus pseudofluitans* was not sufficiently abundant. We suggest that this does not mean the river is sub-standard but rather that the definition of the CB community is too narrow and does not take into account the special conditions found in the Tweed catchment. Haslam (1978) surveyed the entire Tweed system and concluded that the factor controlling macrophyte communities, other than the underlying geology, was the spatey nature of the system and unstable substrate which kept macrophyte abundances low. Our surveys supported this explanation for the macrophyte communities on the Gala Water. Overall the diversity of Batrachion *Ranunculus* and bryophytes within the system demonstrate its importance for conservation.

Habitat Requirements of Key Groups

Our findings are similar to those reported elsewhere for habitat requirements of instream macrophytes. Bryophytes found in aquatic plant surveys in England and Wales show preferences for large substrates (Scarlett & O'Hare in press). This agrees with our finding that instream bryophytes occurred exclusively on the most stable substrates; boulders, bridge supports and bedrock. Liverworts were found on bare earth under the shade of trees. Although this habitat occurred frequently, it was often very patchy and localised within sites making it potentially vulnerable to disturbance.

The association of *Potamogeton crispus* and *Elodea canadensis* with slow, deep water over silty substrates is common across Europe (O'Hare et al. submitted). Both species are considered to have potential as indicators of over-deepened sites although in the Gala Water they also occur where slow water and silt are a natural product of the river's hydromorphology. The over-deepened sites are associated with old engineering works on the rail line. *Ranunculus penicillatus* ssp *pseudofluitans* is considered a species of fast flowing waters. In the Gala Water it also occurs in fast water, although at most sites it has been confined to the margins by spatey conditions. Little is known of the habitat preferences of *Ranunculus x bachii* other than it occurs in rivers and can persist for long periods of time. *Ranunculus peltatus* is a species of slow flowing water and is very tolerant of water level fluctuations.

Impact of previous channel alterations

The main alterations to the channel are associated with the rail line. They include substantial realignment of the channel (site 37), bridges and a range of bank protection types, most usually riprap. There were no data available on the macrophyte community as it was before the rail line was constructed so it is impossible to say with complete certainty what changes have occurred in the plant community. However, some general conclusions are possible.

Riprap is the most common bank protection material. It will have replaced the natural earth/gravel banks of the channel with the localised loss of the *Phalaris arudinacea* fringe at sites. In many places the riprap is now partially overgrown and where submerged often provides good habitat for bryophytes. The bases of bridges also provide useful habitat for bryophytes. Their construction will have caused local loss of bank vegetation. Downstream of bridges, mid-stream bars are common and have a similar flora to the natural side bars. The impact of over-deepening has been discussed above. The loss of shallow water in these areas will have led to the loss of suitable habitat for bryophyte, *Ranunculus* and *Callitriche* species.

Old embankments protect fields from flooding and are not associated with the railway. These are of a single design, usually set back 5-10m from the channel and sloping gently towards it forming a structure similar to a ha-ha. As these embankments are set back their impact appears relatively minor. Bank vegetation is similar to that at sites without embankments. It is not possible to say if they have led to a loss of connectivity with the floodplain which would be expected to result in impacts on the flora. In many places these old embankments have been poached and breached.

Conclusions

We concluded that the diversity of the macrophyte community rather than the abundance of its components is more important on the Gala Water. The Batrachion *Ranunculus* populations at individual sites are low but the populations in the Gala Water, taken as a whole, are significant.

There is a strong gradient of increasing habitat quality and macrophyte community diversity and abundance from upstream to downstream sites. The conservation interest of macrophyte communities at sites above site 23 was low. The sites had a limited range of habitat types and supported few macrophytes. Sites 10, 11 and 12 were exceptions to this rule. All 3 sites supported instream macrophytes of interest. Between sites 23 and 37 habitat diversity improves and sites support a wider range of species which contribute to the SAC interest. The bryophyte assemblages are diverse and are complemented by an increasing component of higher plants. From site 37 downstream the plant assemblages most closely resemble the CB4 community type.

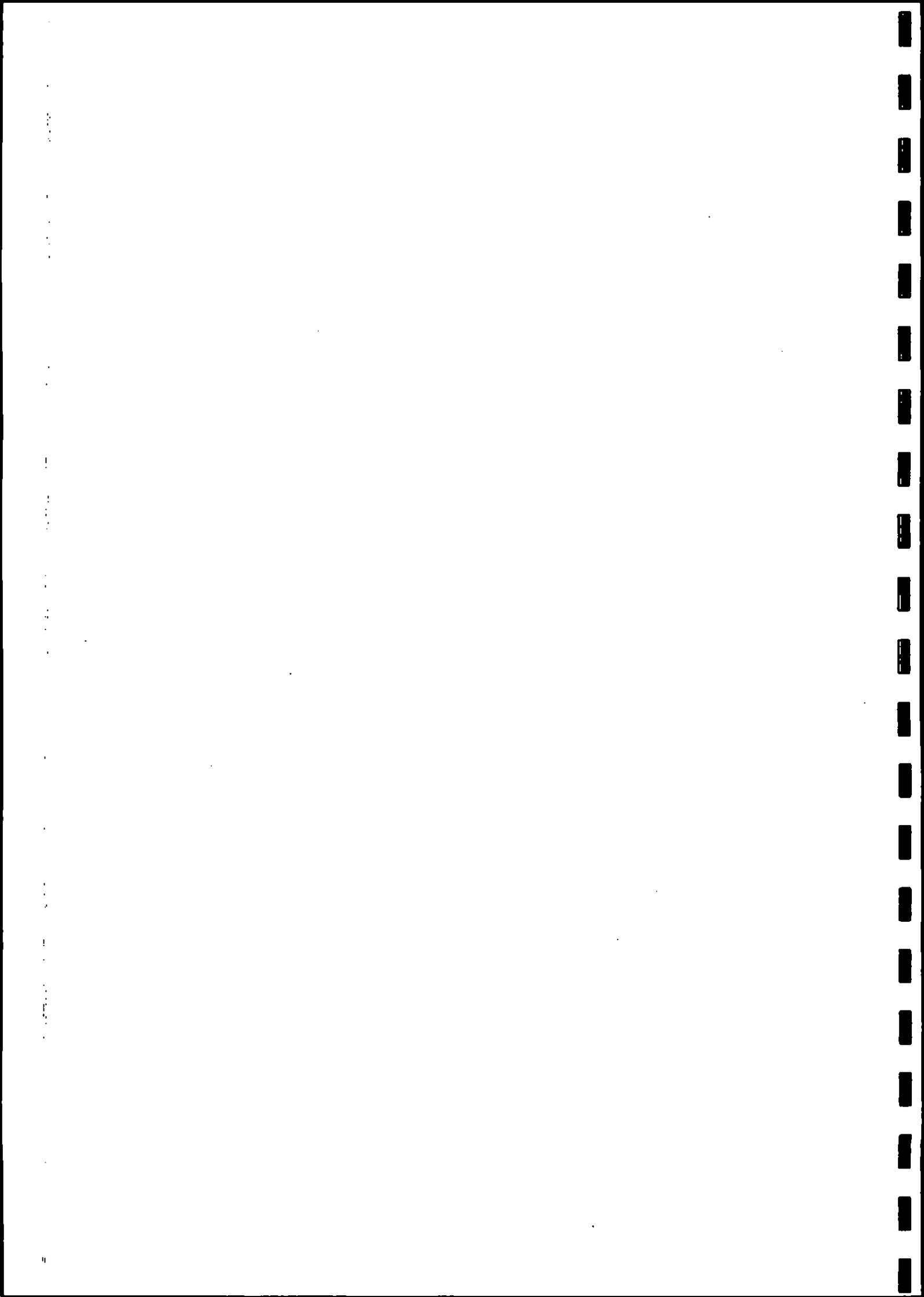
As with all systems, we expect plants to 'turnover' at sites but the location and age of some plant groups in the Gala Water (patches of *Ranunculus* and Liverworts) suggest they are stable over long periods. Some sites (23 & 24), however, only have very small plants of *Ranunculus* and these are considered to be transient. They are single stems and appear to be rooted fragments washed downstream earlier in the summer. Their locations, in mid-stream, suggest they will be washed out by winter floods. *Callitriche* plants, with the exception of those at site 10 and a small number of plants elsewhere, were also very small and should turnover rapidly.

We concluded that temporary or permanent loss of *Ranunculus* or *Callitriche* plants at the site of works would alter the integrity of the SAC. This is most significant in the lower reaches (from site 37 downstream) where the CB community is best represented. Nevertheless, *Ranunculus* plants lost at upstream locations (above site 37) would take an unacceptable long period to recover naturally as there are few plants to sustain the population. The other species of interest are less vulnerable and populations could recover if plants were lost at a few individual locations. However, because the proposed work is so extensive, care would need to be taken not to damage these groups at all locations so the system could successfully re-populate itself.

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6. Appendix



Legend

Substrates

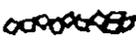
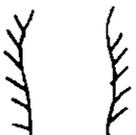
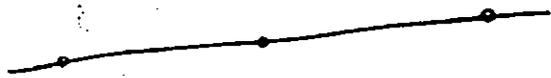
Bed	Bedrock
B	Boulder
Exposed boulder	
Cobble	C
Pebble	P
Sand	Sa
Silt	Si

Macrophyte species

Standard 3 letter abbreviations used

<i>Phalaris arundinacea</i>	
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Other features

Riffle	
Fast water	
Side bar/beach	
Wall or artificial bank	
Rip-rap	
Eroded banks	
Fence	
Route of dismantled railway	
Telegraph poles	

Site Numbers 4-5

Location Gala Water/Shoestanes Burn interface & Shoestanes Burn
Type of Work Riverbank protection & New Culvert
Survey Plan No. 3
Parliamentary Sheet 36
NGR u/s NT 40405 54455
NGR d/s NT 40455 54304
JNCC river type Vc – Small, lowland, impoverished mixed sand/clay rivers
CB community type Borderline CB 3/4
Surveyed length (m) 500

Overview

This site is of limited conservation value for macrophytes.

A small stream, part of the headwaters of Gala Water.

Much of the reach is heavily shaded by dense bankside growth of *Phalaris arundinacea*, limiting the growth of aquatic macrophytes. The majority of the vegetation is confined to marginal species.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Rhynchosygium riparioides</i>	Occasional
<i>Chiloscyphus polyanthus</i>	Rare
<i>Callitriche stagnalis</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare

Representative species of a number of CB communities are present at the site. It most closely resembles a CB4 community (smaller meso-eutrophic rivers). This is the most widely distributed CB type in the UK and most rivers on which this community occur are small tributaries of larger catchments and there is considerable variation within the type. Species diversity at this type is often quite low, and the conservation value may be associated as much with associated habitats as the aquatic plant community present.

Three vegetation components are present at the site (bryophytes, starworts and marginals). The guideline number of components for this CB type is four or more. This and the relatively small cover of relevant species at this site is insufficient for it to be classified as a good quality CB4 community.

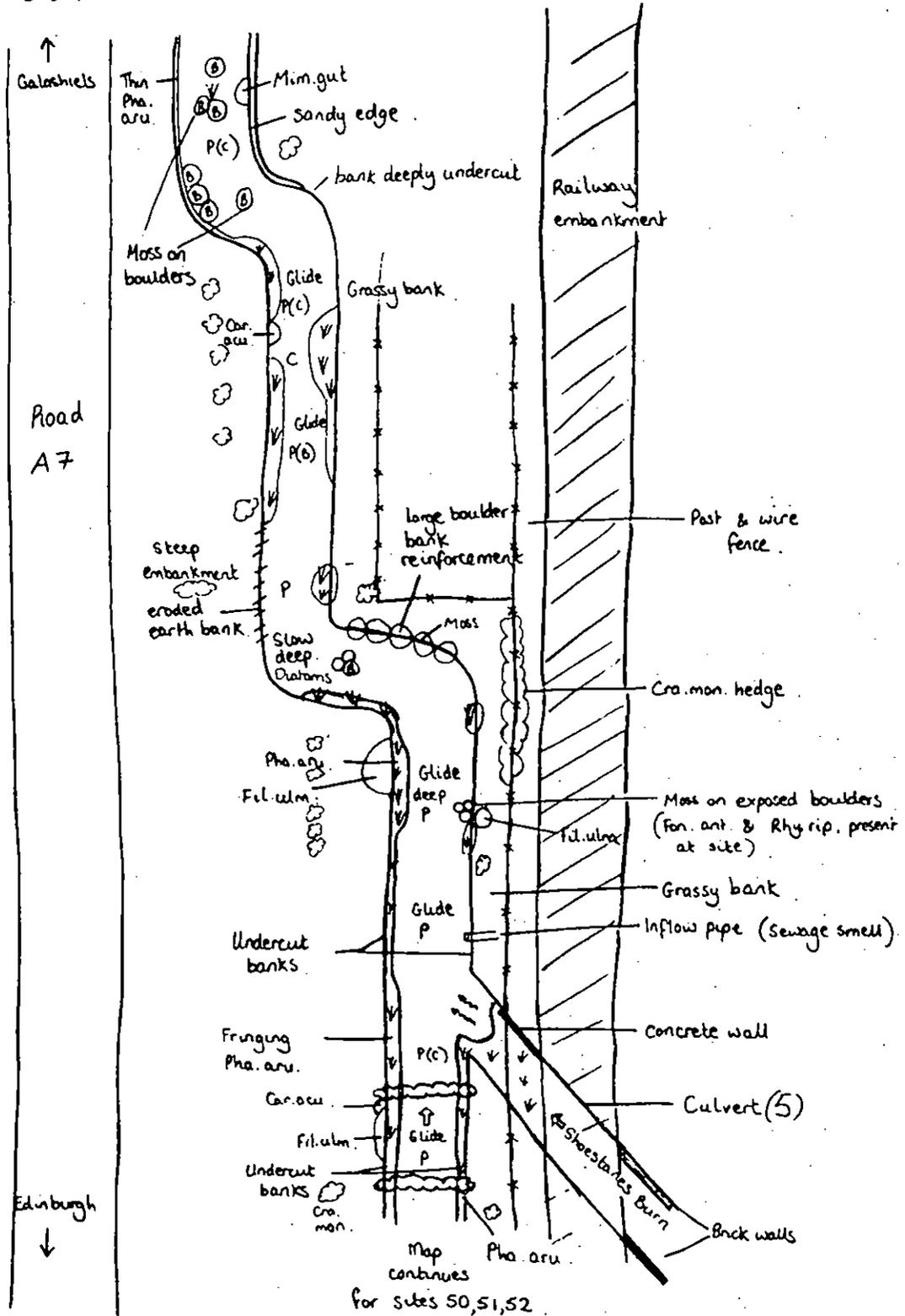
This CB type does not have a close relationship with any JNCC community though it sometimes matches with Type V rivers (Sandstone, mudstone and hard limestone rivers of England and Wales), as is the case here.

Photographs of site



Site sketch map

Sites 4 & 5
500m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2	1	1
<i>Callitriche stagnalis</i>	1	1		
<i>Caltha palustris</i>	2	2		
<i>Carex spp.</i>	1	1		
<i>Chiloscyphus polyanthos</i>	1	1	1	1
<i>Cladophora glomerata</i>			2	2
<i>Deschampsia cespitosa</i>	1	1		
<i>Epilobium montanum</i>	2	1		
<i>Equisetum palustre</i>	2	1		
<i>Filipendula ulmaria</i>	2	1		
<i>Fontinalis antipyretica</i>	2	1	2	2
<i>Glyceria fluitans</i>	2	2		
<i>Holcus lanatus</i>	1	1		
<i>Juncus articulatus</i>	2	1		
<i>Juncus effusus</i>	1	1		
<i>Mentha aquatica</i>	2	2		
<i>Mimulus guttatus</i>	1	1		
<i>Montia fontana</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Phalaris arundinacea</i>	2	3	2	2
<i>Ranunculus hederaceus</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosytem riparioides</i>	1	1	2	2
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Sagina procumbens</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Tussilago farfara</i>	1	1		
<i>Veronica beccabunga</i>	1	1	1	1

Site Numbers 6-8

Location Gala Water/Shoestanes Burn interface & Shoestanes Burn
Type of Work Culvert renewal, bank protection and diversion
Survey Plan No. 3 & 4
Parliamentary Sheet 36 & 37
NGR u/s NT 40496 54231
NGR d/s NT 40721 53793
JNCC river type Vc – Small, lowland, impoverished mixed sand/clay rivers
CB community type Borderline CB4
Surveyed length (m) 600

Overview

These sites are presented together due to their similarity and close proximity. They are both of limited conservation value for macrophytes. Much of the area surveyed was heavily shaded by dense growth of *Phalaris*, with very little in-channel macrophyte growth. Much of the vegetation recorded as aquatic was marginal vegetation trailing into the water and semi-aquatic species such as *Mentha aquatica*. At the lower of the two sites, the aspect opened out and the variety of vegetation increased noticeably. Nutrient input from a manure heap on the left bank may have a slight and temporary impact on species composition at the lower end of the sites. *Fontinalis antipyretica* and *Rhynchostegium riparioides* were recorded on the larger and more stable substrates, including previous bank protection material. Site 7 is located off the main channel of the river.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional/frequent
<i>Rhynchostegium riparioides</i>	Occasional/frequent
<i>Rorippa nasturtium-aquaticum</i>	Occasional
<i>Callitriche stagnalis</i>	Rare

As with the nearby upstream sites 4-5, representative species of a number of CB communities are present at the site, and it too most closely resembles a CB4 community (smaller meso-eutrophic rivers). Three vegetation components are present at the site (bryophytes, starworts and marginals). The guideline number of components for this CB type is four or more. This and the relatively small cover of relevant species at this site is insufficient for it to be classified as a good quality CB4 community.

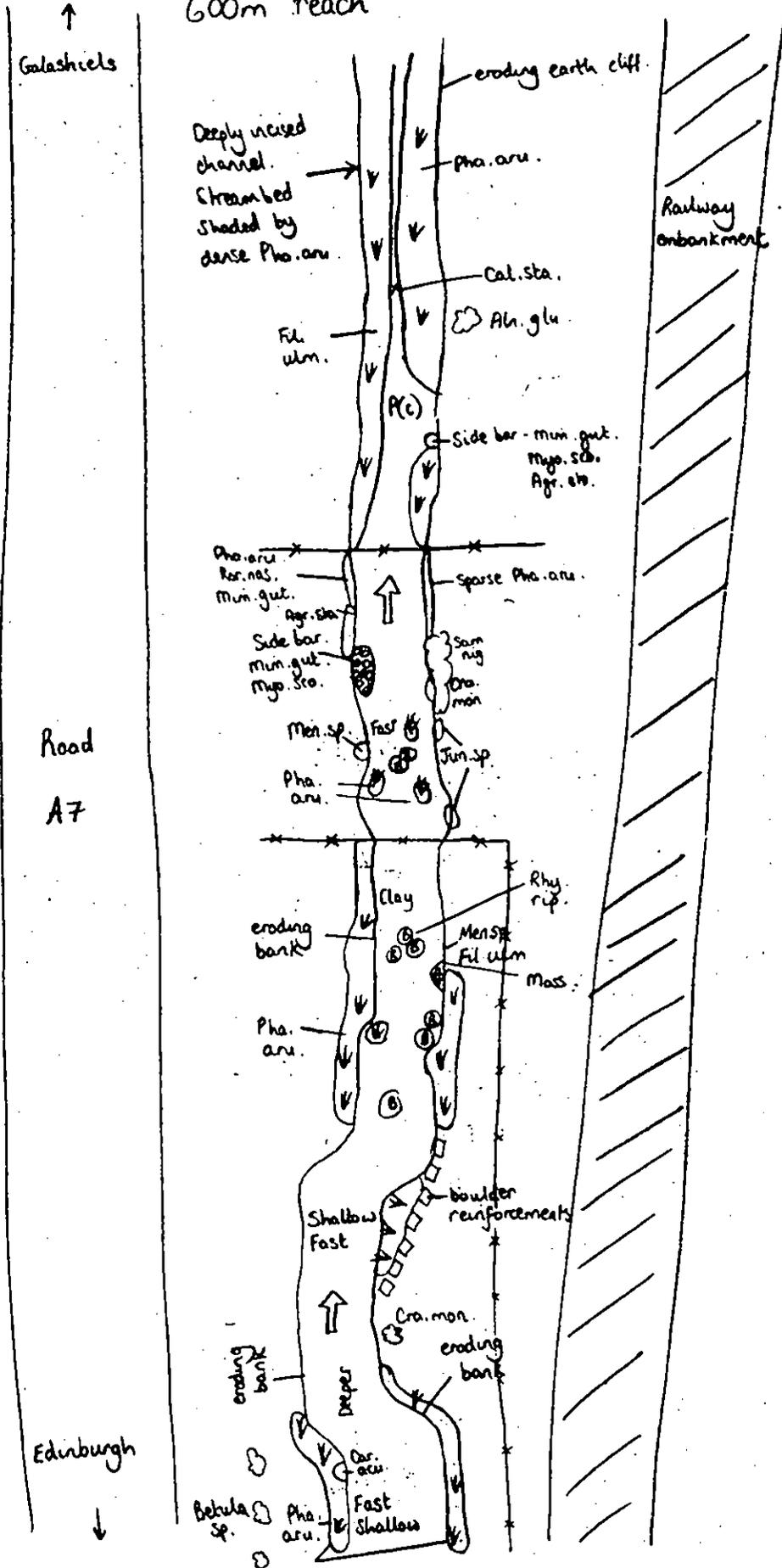
The JNCC river type also matches that of the upstream site.

Photographs of site



Site sketch map

Sites 6-8.
600m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2	2	2
<i>Alopecurus geniculatus</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Callitriche stagnalis</i>			1	1
<i>Cardamine sp.</i>	1	1		
<i>Carex acutiformis</i>	1	1		
<i>Cladophora glomerata</i>			1	1
<i>Deschampsia cespitosa</i>	1	1		
Diatoms			2	3
<i>Epilobium spp.</i>	1	1		
<i>Equisetum arvense</i>	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>	2	2	2	2
<i>Glyceria fluitans</i>	2	2	2	2
<i>Juncus acutiflorus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	1	1	1	1
<i>Lemanea fluviatilis</i>			2	2
<i>Marchantia polymorpha</i>	1	1		
<i>Mentha sp.</i>	1	2	1	2
<i>Mimulus guttatus</i>	2	3	1	2
<i>Montia fontana</i>	1	1		
<i>Myosotis scorpioides</i>	2	2	1	1
<i>Myosoton aquaticum</i>	1	1		
<i>Pellia sp.</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Phalaris arundinacea</i>	2	3	2	2
<i>Plantago major</i>	1	1		
<i>Poa trivialis</i>	2	2	1	1
<i>Pohlia wahlenbergii</i>	1	1		
<i>Ranunculus hederaceus</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>	2	2	1	1
<i>Rorippa nasturtium-aquaticum</i>	2	2	2	2
<i>Rumex sp</i>	1	1		
<i>Sagina procumbens</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Tussilago farfara</i>	1	1		
<i>Urtica dioica</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 9

Location Hangingshaw
Type of Work Riverbank protection
Survey Plan No. 5
Parliamentary Sheet 38
NGR u/s NT 41121 53230
NGR d/s NT 41446 52836
JNCC river type Va – Mesotrophic upland hard limestone/sandstone rivers
CB community type Borderline CB4
Surveyed length (m) 760

Overview

Most of the section is overgrown, especially with *Phalaris arundinacea*. In these areas the instream vegetation is restricted to patches of moss, mainly *Fontinalis antipyretica*. In addition to *Phalaris*, the marginal vegetation contains *Glyceria fluitans*, *Myosotis scorpioides*, *Mimulus guttatus* and *Juncus* spp.

Species contributing to SAC CB Interest

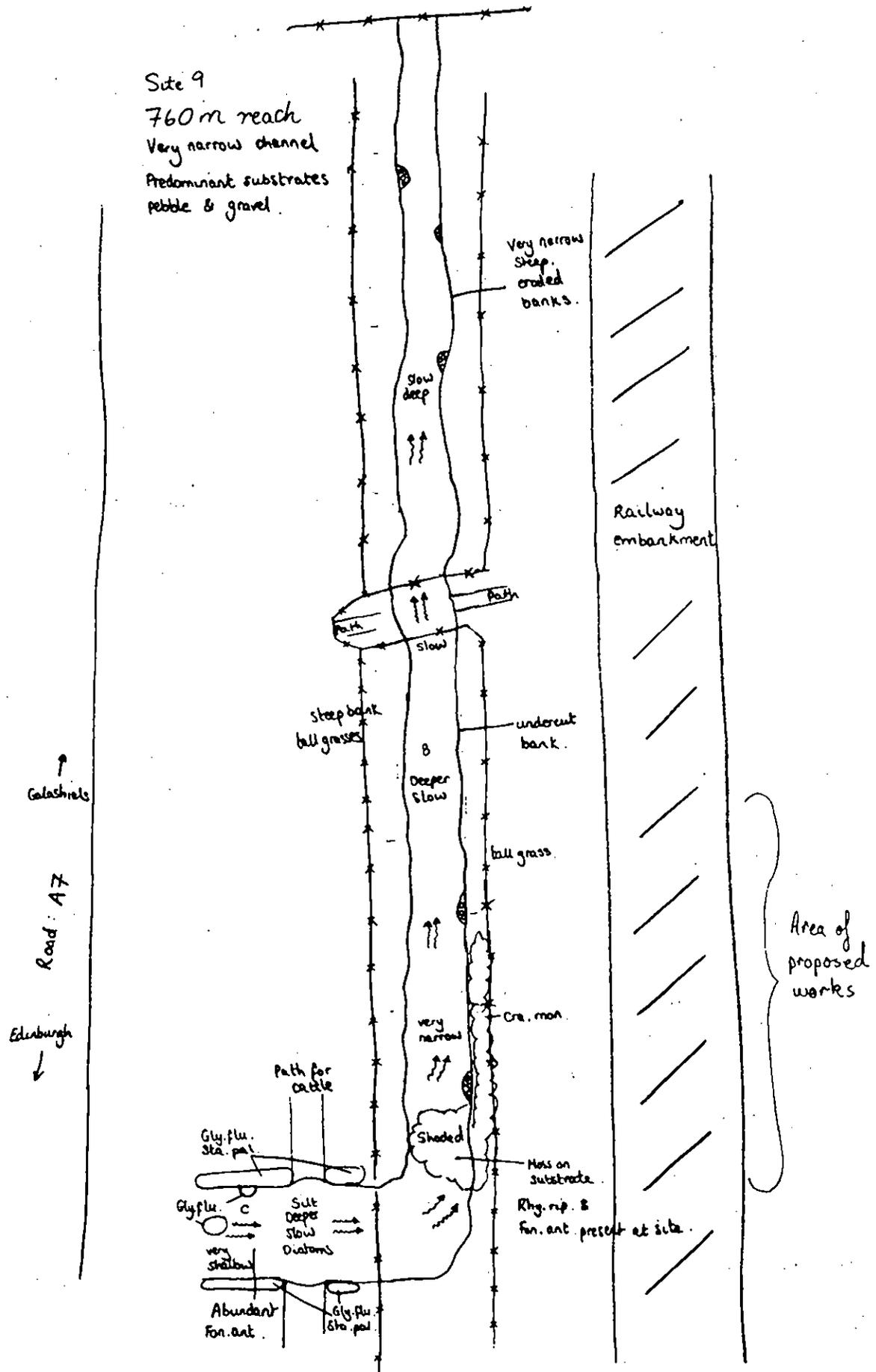
<i>Fontinalis antipyretica</i>	Occasional
<i>Rorippa nasturtium-aquaticum</i>	Occasional
<i>Callitriche stagnalis</i>	Rare
<i>Rhynchosygium riparioides</i>	Rare

The overgrown and shaded nature of this site reduces the growth of aquatic vegetation. The species assemblage present most closely resembles that of a CB 4 type community. Four species representative of this CB community were recorded, though the abundance of these species was so low that the site could not be considered a clear example. Three vegetation components are present (bryophytes, starworts and marginals). The guideline number of components for this CB type is four or more.

Photographs of site



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	1	1	1
<i>Alopecurus geniculatus</i>	1	1	1	1
<i>Callitriche stagnalis</i>	1	1	1	1
<i>Caltha palustris</i>	1	1		
<i>Epilobium montanum</i>	2	1		
<i>Filipendula ulmaria</i>	2	1		
<i>Fontinalis antipyretica</i>	1	1	2	2
<i>Galium palustre</i>	1	1		
<i>Glyceria fluitans</i>	2	2	1	1
<i>Holcus lanatus</i>	1	1		
<i>Juncus articulatus</i>	1	1		
<i>Juncus bufonius</i>	2	1		
<i>Juncus effusus</i>	2	2	1	1
<i>Lemanea fluviatilis</i>			1	1
<i>Mentha sp.</i>	1	1		
<i>Mimulus guttatus</i>	2	2		
<i>Myosotis scorpioides</i>	2	2		
<i>Persicaria maculosa</i>	1	1		
<i>Phalaris arundinacea</i>	2	3	2	2
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>	1	1	1	1
<i>Rorippa nasturtium-aquaticum</i>	1	1	1	1
<i>Rumex acetosella</i>	1	1		
<i>Rumex obtusifolius</i>	1	1		
<i>Sparganium erectum</i>	1	1	2	2
<i>Stachys palustris</i>	1	1		
<i>Stellaria palustris</i>	1	1		
<i>Symphoricarpus albus</i>	2	1		
<i>Trifolium sp</i>	1	1		
<i>Tussilago farfara</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 10

Location Little Gala
Type of Work Underbridge 52
Survey Plan No. 6 & 7
Parliamentary Sheet 39 & 40
NGR u/s NT 41549 52666
NGR d/s NT 41636 52325
JNCC river type IVa – Base rich/neutral impoverished rivers, normally close to source
CB community type Borderline CB2/4
Surveyed length (m) 500

Overview

This site is located near the confluence with Heriot Water. The variety of macrophytes increases towards the downstream end of the site. It is more open than site 9 upstream, partly due to increased grazing. This is reflected in the more diverse and abundant aquatic macrophyte growth, with some healthy stands of *Callitriche stagnalis* and *Callitriche platycarpa*. A silty backwater at the downstream end of the site is noteworthy due to the different habitat it provides. *Potamogeton pusillus* was recorded growing in this area.

Species contributing to SAC CB Interest

<i>Callitriche stagnalis</i>	Frequent
<i>Callitriche platycarpa</i>	Frequent
<i>Rorippa nasturtium-aquaticum</i>	Occasional/Frequent
<i>Fontinalis antipyretica</i>	Occasional

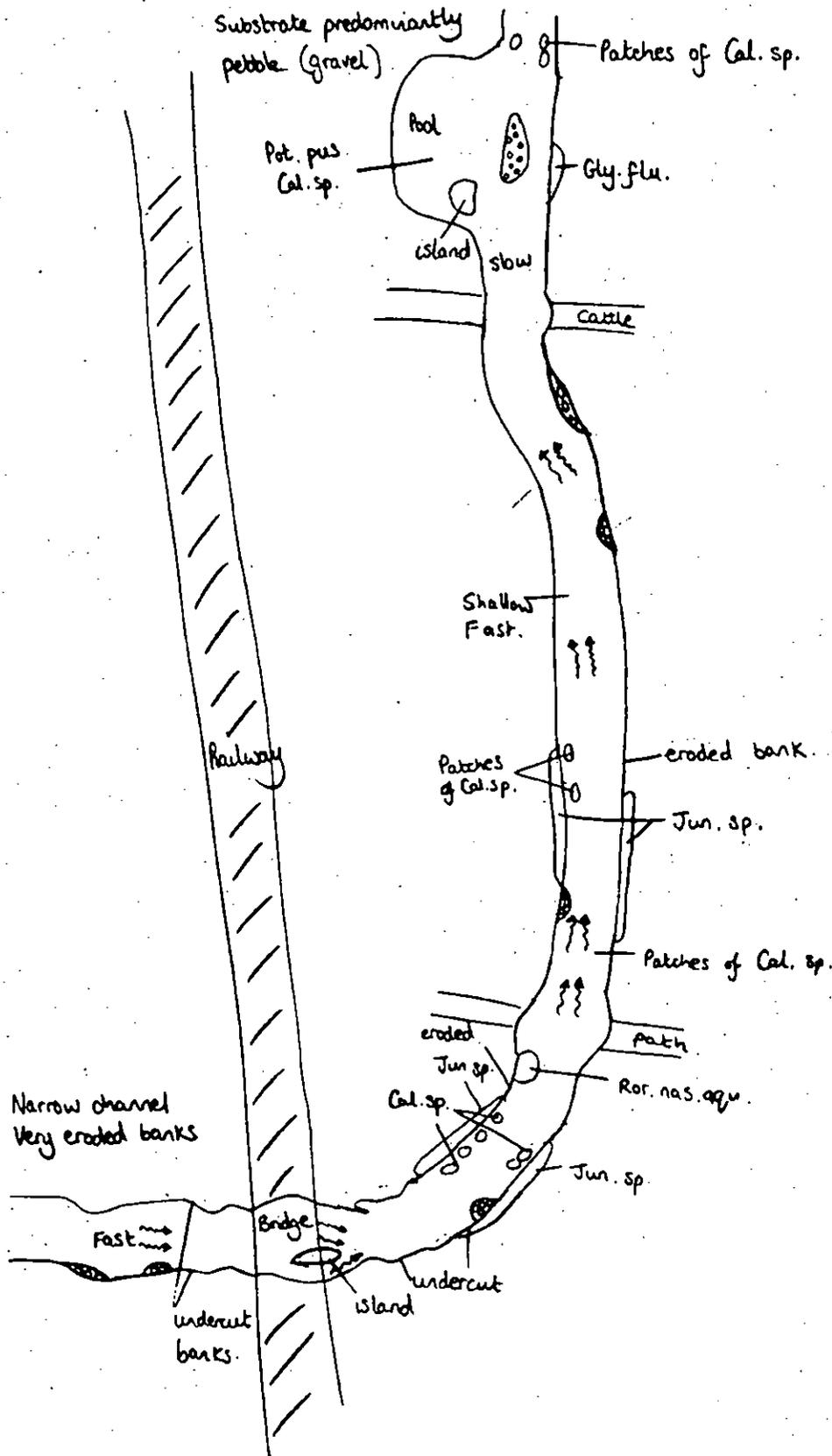
Four species are present which are commonly found in CB community types, including two *Callitriche* species which occur in large stands throughout the downstream part of the site. The species assemblage suggests that the site is a borderline CB2 or CB4 type. Three vegetation components are present at the site (bryophytes, starworts and marginals). The guideline number of components for a CB2 type is six, and four or more for a CB4 community. The species present at the site suggest it most closely resembles a CB4 community.

Photographs of site



Site sketch map

Site 10
500m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	1	1	1
<i>Alopecurus geniculatus</i>	2	1	1	1
<i>Callitriche platycarpa</i>			2	2
<i>Callitriche stagnalis</i>	1	1	2	2
<i>Caltha palustris</i>	1	1		
<i>Cladophora glomerata</i>			1	1
<i>Cruciata laevipes</i>	1	1		
<i>Epilobium montanum</i>	1	1		
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	1
<i>Glyceria fluitans</i>	2	3	2	2
<i>Juncus acutiflorus</i>	2	1		
<i>Juncus articulatus</i>	2	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	2	2		
<i>Mentha aquatica</i>	1	1	1	1
<i>Mimulus guttatus</i>	2	2		
<i>Montia fontana</i>			1	1
<i>Myosotis scorpioides</i>	2	2		
<i>Phalaris arundinacea</i>	2	2	2	2
<i>Potamogeton pusillus</i>			1	1
<i>Ranunculus repens</i>	1	1		
<i>Rorippa nasturtium-aquaticum</i>	2	2	2	2
<i>Rumex sp</i>	1	1		
<i>Senecio aquaticus</i>	2	1		
<i>Stellaria palustris</i>	1	1		
<i>Trifolium sp</i>	1	1		
<i>Veronica beccabunga</i>	2	2	2	2

Site Numbers 11 & 12

Location Haltree
Type of Work Riverbank protection and culvert renewal
Survey Plan No. 7
Parliamentary Sheet 40
NGR u/s NT 41787 52209
NGR d/s NT 41867 51910
JNCC river type Vc – Small, lowland, impoverished mixed sand/clay rivers
CB community type Borderline CB4
Surveyed length (m) 530

Overview

This site is situated below the confluence with Heriot Water and the nature of the river is noticeably different to the upstream sites, with larger substrates and a more dynamic channel, including a mid-channel bar. This is the most upstream site at which a water crowfoot was recorded, with some small but healthy marginal clumps. In-channel vegetation is sparse as much of the substrate is too small and mobile to allow the formation of durable communities. *Fontinalis antipyretica* has colonised the larger and more stable substrate provided by boulders used for previous bank strengthening.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Ranunculus cf peltatus</i>	Rare
<i>Callitriche stagnalis</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Rhynchostegium riparioides</i>	Rare
<i>Hygrohypnum ochraceum</i>	Rare

Four species, representing four vegetation component types (bryophytes, crowfoots, starworts and marginals) are present. The assemblage of species most closely resembles a CB4 type, though the species are only present over a small area, especially the *Ranunculus* which is vulnerable to disturbance and should be protected.

Photographs of site



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2		
Algae			1	1
<i>Callitriche stagnalis</i>			1	1
<i>Caltha palustris</i>	1	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Fontinalis antipyretica</i>			2	2
<i>Glyceria fluitans</i>	2	2		
<i>Hygrohypnum ochraceum</i>	1	1		
<i>Juncus articulatus</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Lemanea fluviatilis</i>			1	1
<i>Mentha sp.</i>	1	1		
<i>Mimulus guttatus</i>	2	2		
<i>Myosotis scorpioides</i>	2	2		
<i>Phalaris arundinacea</i>	2	2		
<i>Poa sp</i>	1	1		
<i>Ranunculus cf peltatus</i>			1	1
<i>Rhynchosygium riparioides</i>			1	1
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Tussilago farfara</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 13

Location Crookstone Mill
Type of Work Underbridge 52
Survey Plan No. 8 & 9
Parliamentary Sheet 41 & 42
NGR u/s NT 42362 51257
NGR d/s NT 42523 50894
JNCC river type Vc – Small, lowland, impoverished mixed sand/clay rivers
CB community type No clear type
Surveyed length (m) 500

Overview

The site contains some species of conservation interest.

The river is predominantly wide and shallow at the site, particularly in the upstream section. Habitat variety is provided by a small back-water at the upstream end of the site (where *Callitriche* was recorded) and the confluence with a small burn. Mosses occur on the more stable large substrates and the bridge supports. There are good marginal communities of *Carex* including *Carex acutiformis* and *rostrata*. Areas of bank erosion are present at the upper end of the site.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Rhynchostegium riparioides</i>	Occasional
<i>Callitriche hamulata</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare

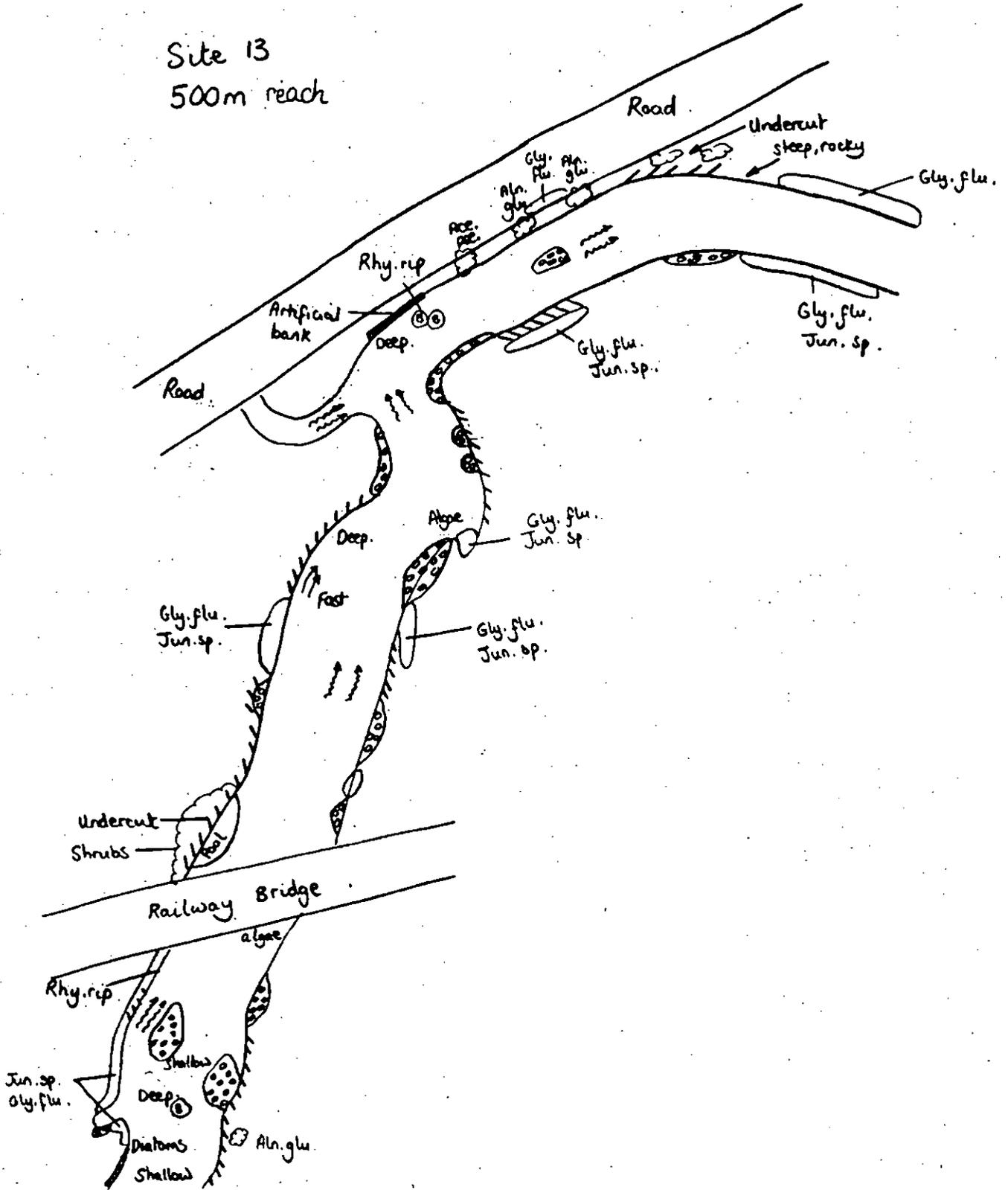
Representative species of 3 CB vegetation components are present - bryophytes, starworts and marginals. However, the cover of these species is insufficient for the site to be regarded as a good example of a specific community type.

Photographs of site



Site sketch map

Site 13
500m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2		
<i>Alnus glutinosa</i>	1	1		
<i>Alopecurus geniculatus</i>	1	1		
<i>Angelica sylvestris</i>	2	1		
<i>Callitriche hamulata</i>			1	1
<i>Caltha palustris</i>	2	2	1	1
<i>Cardamine sp.</i>	1	1		
<i>Carex acutiformis</i>	1	1	1	1
<i>Carex hirta</i>	1	1		
<i>Carex rostrata</i>	2	2	1	1
<i>Centaurea nigra</i>	1	1		
<i>Cladophora glomerata</i>			2	2
<i>Deschampsia cespitosa</i>	1	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum palustre</i>	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>	2	1	2	2
<i>Glyceria fluitans</i>	2	3		
<i>Juncus acutiflorus</i>	1	1		
<i>Juncus arcutus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Lemanea fluviatilis</i>			1	1
<i>Lotus corniculatus</i>	1	1		
<i>Mentha sp.</i>	1	1		
<i>Mimulus guttatus</i>	2	2	1	1
<i>Montia fontana</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Myosoton aquaticum</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Phalaris arundinacea</i>	2	3		
<i>Plantago major</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosytemon riparioides</i>	2	2	2	2
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Sagina procumbens</i>	1	1		
<i>Schistidium alpicola</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1	1	1
<i>Stachys palustris</i>	1	1		
<i>Symphoricarpos sp</i>	1	1		
<i>Tussilago farfara</i>	1	1		
<i>Veronica beccabunga</i>	2	2		

Site Number 14

Location Hollowshank
Type of Work Underbridge 54
Survey Plan No. 9
Parliamentary Sheet 42
NGR u/s NT 42523 50894
NGR d/s NT 42251 50705
JNCC river type Vc – Small, lowland, impoverished mixed sand/clay rivers
CB community type No clear type
Surveyed length (m) 500

Overview

Similar habitats to those found in Site 13. Mosses occur on the more stable large substrates and bridge supports, and marginal *Carex* communities were also recorded.

Species contributing to SAC CB Interest

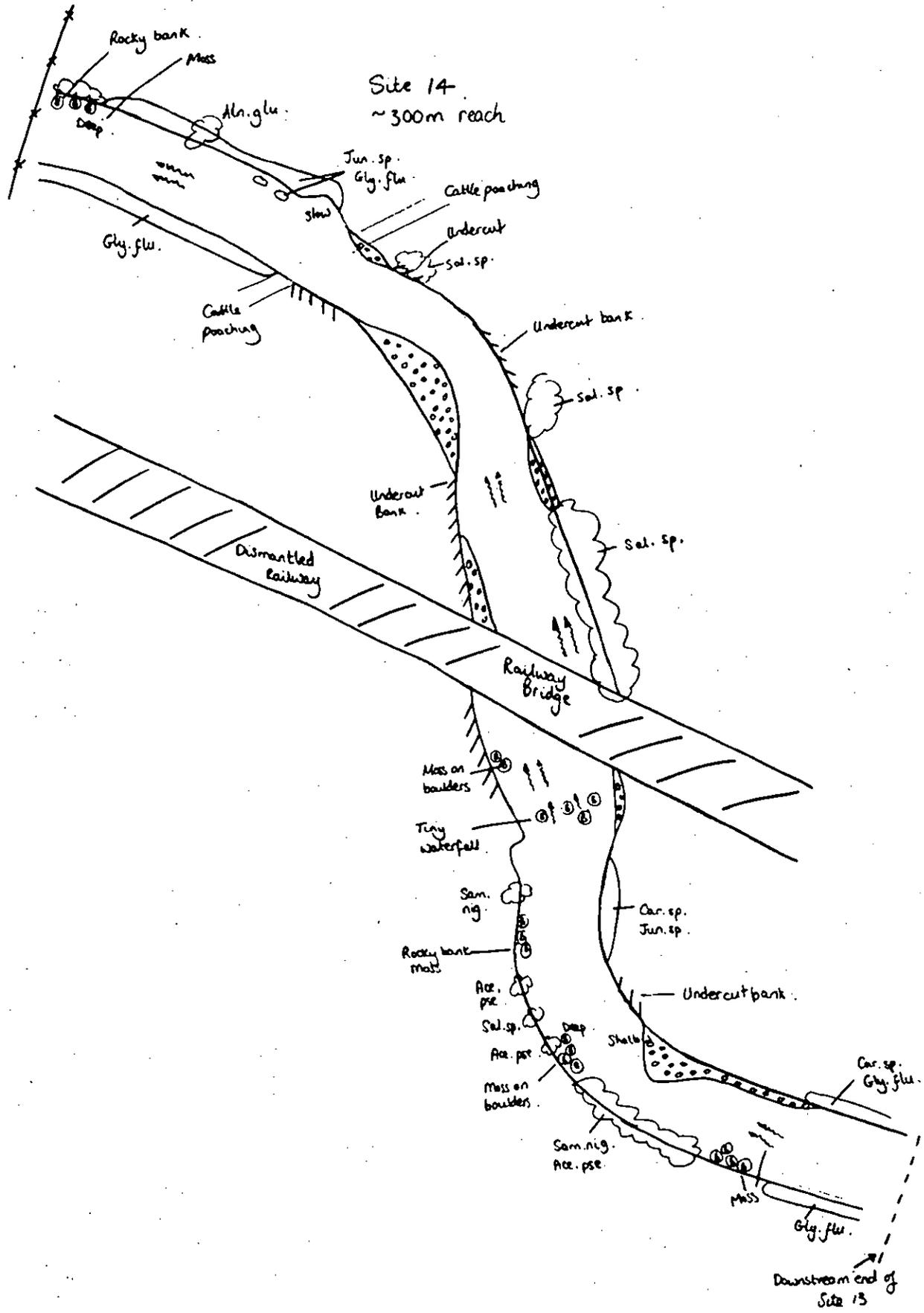
<i>Fontinalis antipyretica</i>	Occasional/frequent
<i>Rhynchostegium riparioides</i>	Occasional
<i>Callitriche stagnalis</i>	Rare

Although there are species of conservation interest at the site, the variety and extent of vegetation in the channel is not sufficient to classify the site as a specific CB community.

Photographs of site



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2	2	2
Algae			2	2
<i>Alnus glutinosa</i>	1	1		
<i>Callitriche stagnalis</i>	1	1	1	1
<i>Caltha palustris</i>	2	2		
<i>Carex acutiformis</i>	2	2	1	1
<i>Carex hirta</i>	1	1		
<i>Carex rostrata</i>	2	2		
<i>Centaurea nigra</i>	1	1		
<i>Chamaenerion angustifolium</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>	2	2	2	2
<i>Glyceria fluitans</i>	2	3		
<i>Juncus acutiflorus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	2	2		
<i>Lemanea fluviatilis</i>			1	1
<i>Lunularia cruciata</i>	2	1		
<i>Mentha aquatica</i>	1	1	1	1
<i>Myosotis scorpioides</i>	2	2		
<i>Pellia sp.</i>	1	1		
<i>Phalaris arundinacea</i>	2	3		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>			2	2
<i>Sagina procumbens</i>	1	1		
<i>Salix sp.</i>	2	2		
<i>Senecio aquaticus</i>	2	1		
<i>Sparganium erectum</i>	1	1	1	1
<i>Tussilago farfara</i>	2	1		
<i>Veronica beccabunga</i>	2	2		

Site Number 16

Location Bower
Type of Work Underbridge 56
Survey Plan No. 10
Parliamentary Sheet 43
NGR u/s NT 42263 50294
NGR d/s NT 42434 50368
JNCC river type Vc – Small, lowland, impoverished mixed sand/clay rivers
CB community type No clear type
Surveyed length (m) 330

Overview

The site has some species of conservation interest.

The character of the macrophyte vegetation is similar to that in the 100m below the survey reach.

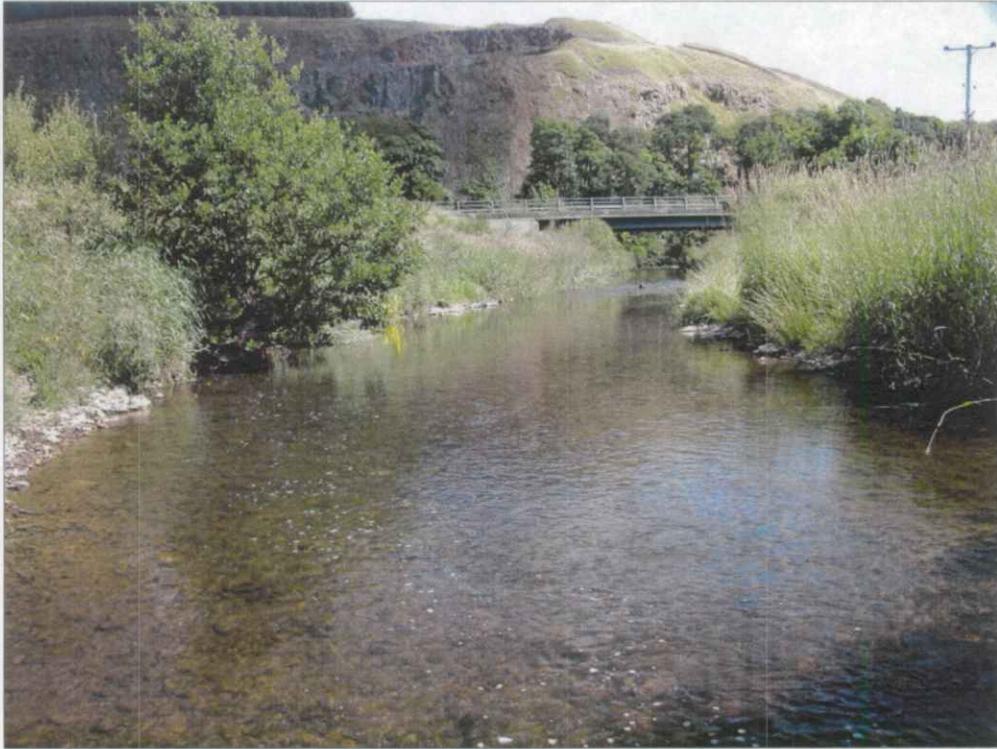
The river is dynamic in the area above the bridge, with evidence of erosion to the banks and bed apparently associated with old engineering works. There is a large, partially vegetated bar near the bridge. There is very little in-stream vegetation other than mosses, which occur on the more stable large substrates and bridge supports.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional/frequent
<i>Rhynchosstegium riparioides</i>	Occasional
<i>Rorippa nasturtium-aquaticum</i>	Rare

Although there are species of conservation interest at the site, the variety and extent of vegetation in the channel is not sufficient to classify the site as a specific CB community.

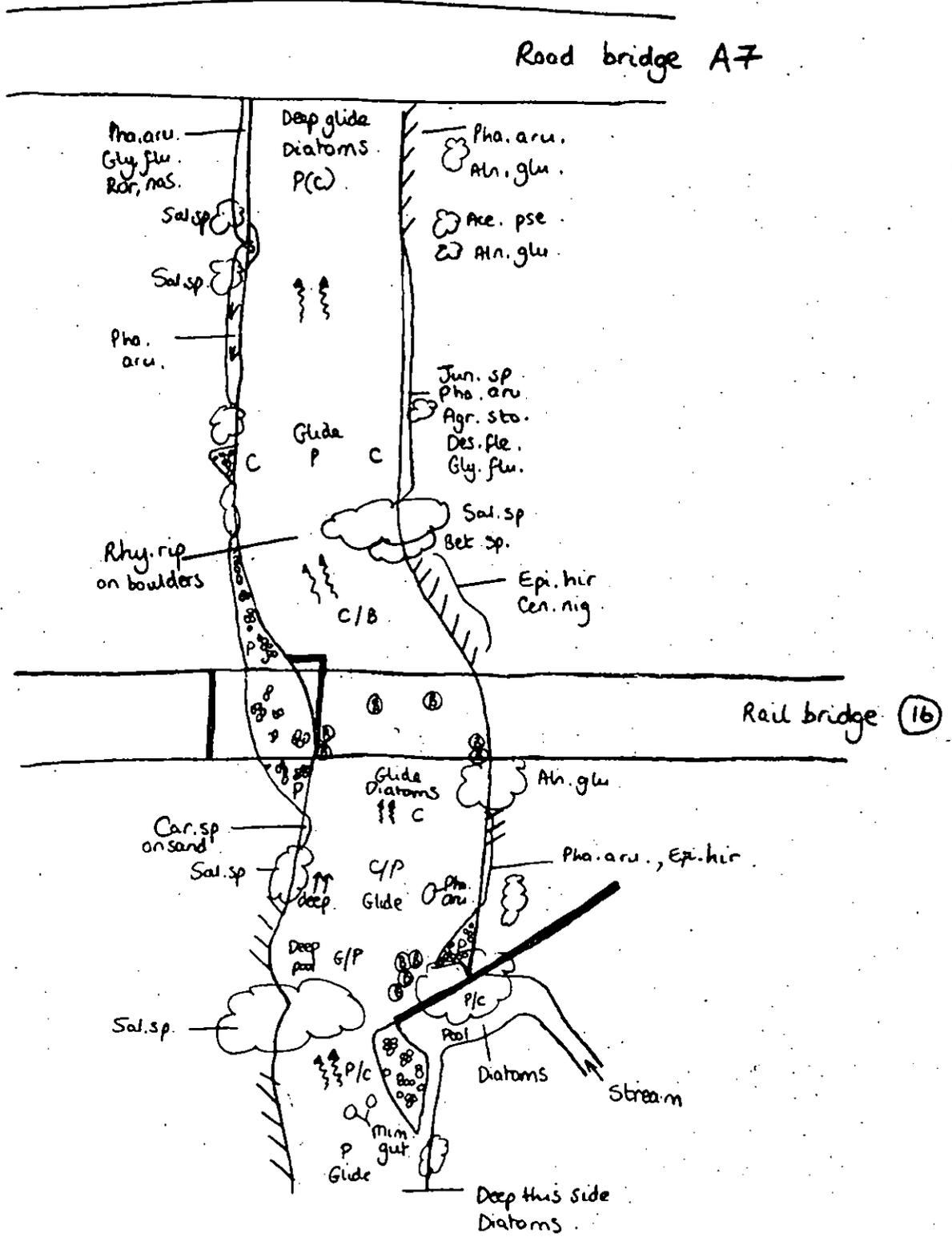
Photographs of site



Site sketch map

Site 16

330m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>				
<i>Alnus glutinosa</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Caltha palustris</i>	2	1		
<i>Carex acutiformis</i>	1	1		
<i>Carex disticha</i>	1	1		
<i>Cladophora glomerata</i>			1	1
<i>Conocephalum conicum</i>	2	1		
<i>Deschampsia cespitosa</i>	1	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum palustre</i>	1	1	1	1
Filamentous green algae	2	2		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>	2	1	2	2
<i>Glyceria fluitans</i>	2	1	1	1
<i>Juncus articulatus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Lemanea fluviatilis</i>			2	2
<i>Lotus corniculatus</i>	1	1		
<i>Lunularia cruciata</i>	1	1		
<i>Mentha aquatica</i>	2	1		
<i>Mimulus guttatus</i>	2	2		
<i>Myosotis scorpioides</i>	2	2		
<i>Pellia endiviifolia</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Phalaris arundinacea</i>	2	2	2	2
<i>Plantago lanceolata</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosytem riparioides</i>			2	2
<i>Rorippa nasturtium-aquaticum</i>	2	1		
<i>Rumex sp.</i>	1	1		
<i>Salix sp.</i>	2	2		
<i>Senecio aquaticus</i>	1	1		
<i>Tussilago farfara</i>	2	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 17

Location Still Burn at Foutainhall
Type of Work Culvert renewal
Survey Plan No. 11
Parliamentary Sheet 44
NGR u/s NT 42938 49400
NGR d/s NT 43321 49539
JNCC river type IVc upland river with impoverished flora
CB community type none matching
Surveyed length (m) 500

Overview

The character of the Still Burn changes repeatedly within the survey reach. Upstream of the rail culvert the burn passes through a new housing estate. It has been landscaped and runs through an extensive culvert. Down stream of the culvert the burn passes through a field of rough pasture before going under a disused branch rail line, it then flows through a heavily wooded zone before entering the Gala Water which is bridged by the branch line too.

The 100m upstream of the rail culvert is effectively devoid of vegetation. Downstream there is no instream vegetation in the burn. As it passes through the pasture *Mysotis scorpioides*, *Veronica beccabunga* and other herbs tolerant to grazing persist. In the wooded section the substrate is fine and little grows although liverworts were noted in one location. Below the confluence with the Gala Water diatoms dominate instream and *Fontinalis antipyretica* is present. Here the banks are not grazed and tall herbs and grasses are present, *Phalaris arundinacea* dominates.

Species contributing to SAC CB Interest

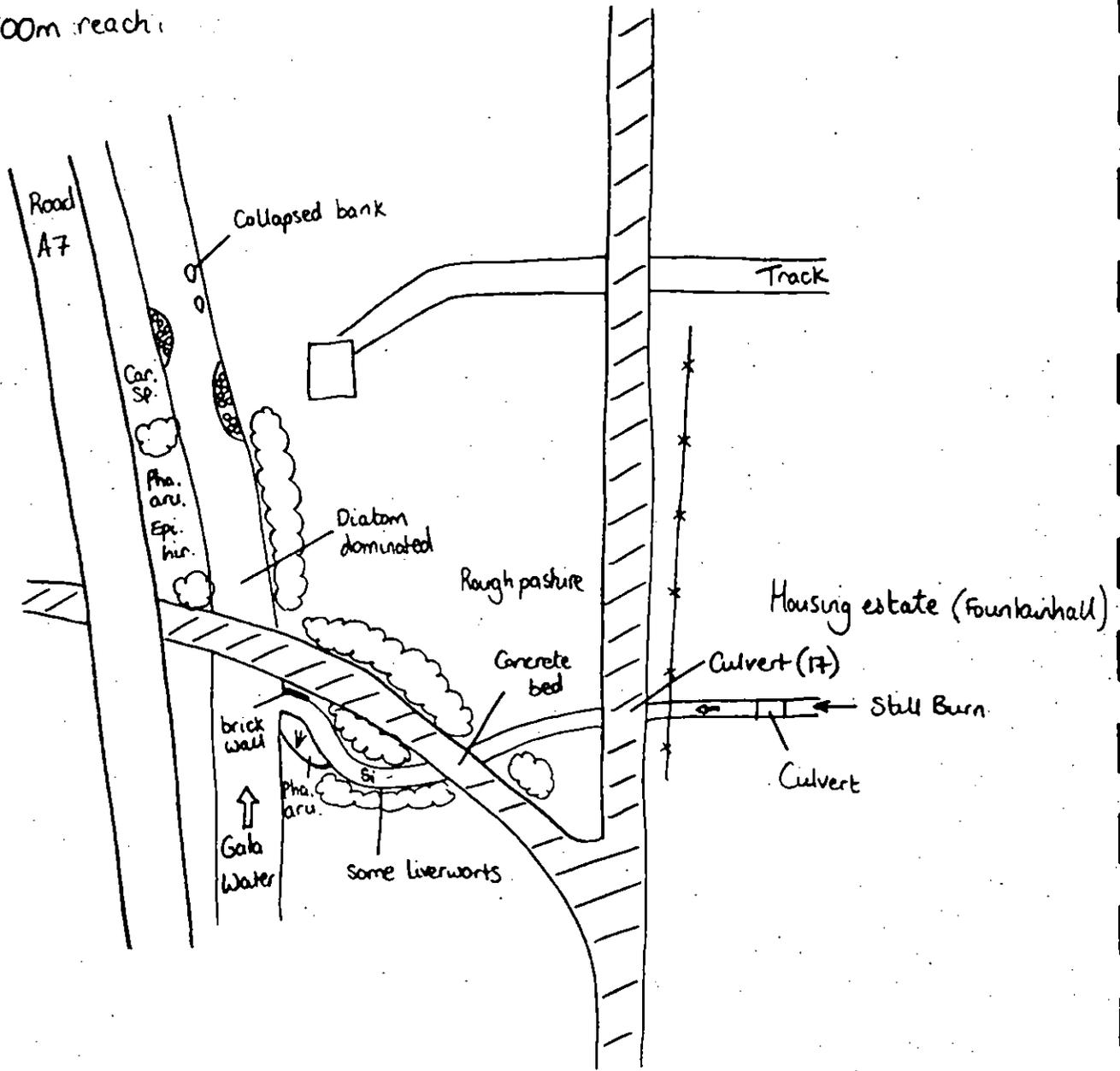
<i>Fontinalis antipyretica</i>	Rare
<i>Pellia endiviifolia</i>	Rare

The Still Burn contains too few species of interest to meet the requirements of a CB community.



Site sketch map

Site 17
500m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Achillea ptarmica</i>	1	1		
<i>Agrostis stolonifera</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Carex spp.</i>	1	2		
<i>Chamaenerion angustifolium</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
Diatoms			3	3
<i>Eleocharis palustris</i>	1	1		
<i>Epilobium hirsutum</i>	2	1		
<i>Epilobium palustre</i>	1	1		
<i>Fontinalis antipyretica</i>			1	1
<i>Galium cruciata</i>	1	1		
<i>Heracleum sphondylium</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Mimulus guttatus x luteus</i>	1	1		
<i>Myosotis scorpioides</i>	3	3		
<i>Pellia endiviifolia</i>	1	1		
<i>Phalaris arundinacea</i>	2	3		
<i>Ranunculus repens</i>	2	2		
<i>Rumex sp</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Stachys arvensis</i>	1	1		
<i>Symphytum officinale</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 18

Location Pirmtaton Burn
Type of Work Riverbank protection
Survey Plan No. 12
Parliamentary Sheet 45
NGR u/s NT 43480 49212
NGR d/s NT 43778 49126
JNCC river type Va – Mesotrophic, upland hard limestone/sandstone rivers
CB community type No clear type
Surveyed length (m) 500

Overview

There are some species of conservation interest at the site.

A variety of habitats occur at the site, including areas of shallow riffle flow and larger substrates and also some deeper glide sections. Large depositional bars are present. Mosses are present on the larger substrates and on some of the existing bank protection boulders. The lower part of the site is shaded by bank-side trees. There are few in-stream macrophytes and some accumulation of diatoms in the slower flowing areas.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Rhynchostegium riparioides</i>	Rare

Although there are species of conservation interest at the site, the variety and extent of vegetation in the channel is not sufficient to classify the site as a specific CB community.

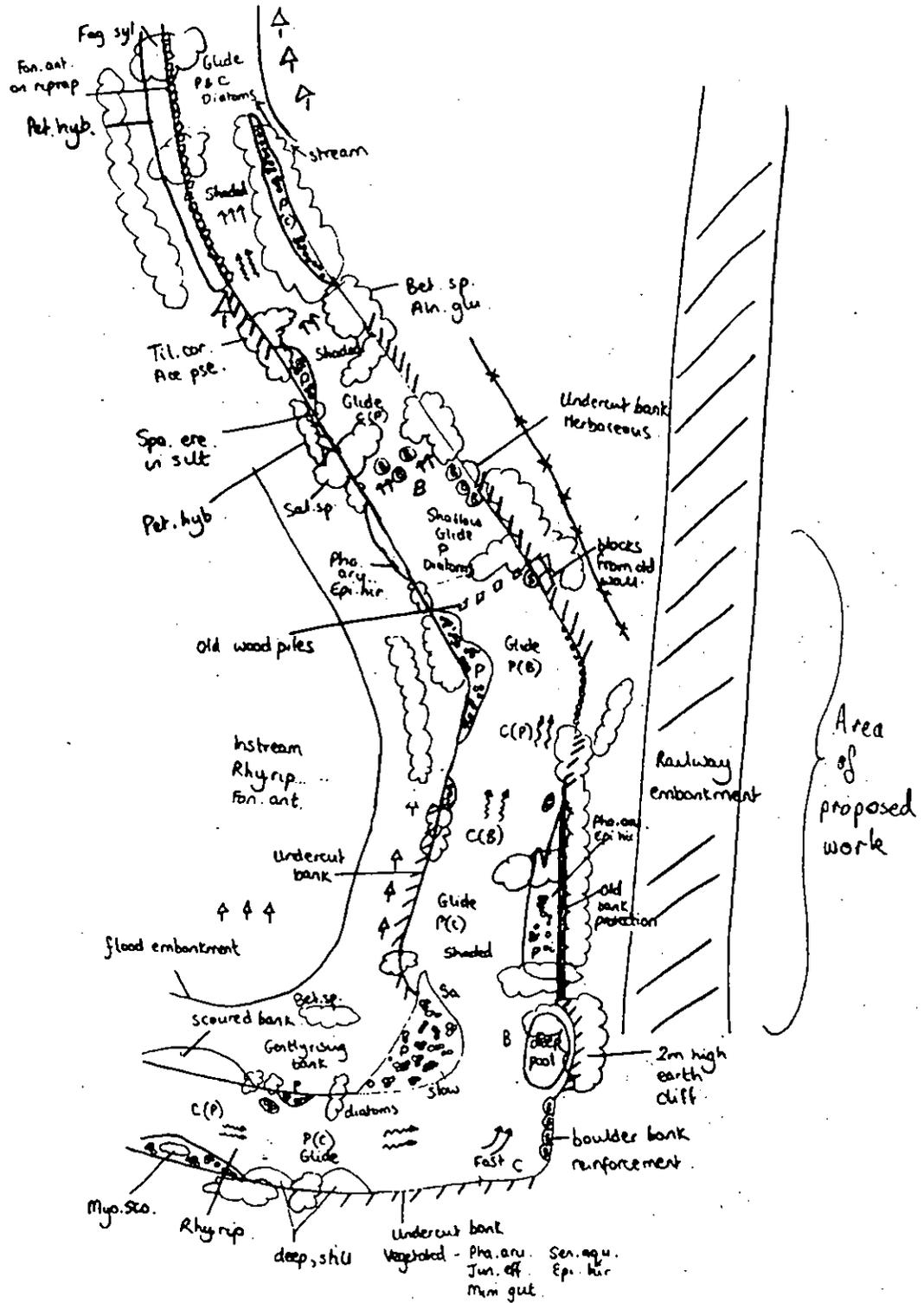
Photographs of site



Site sketch map

Site 18

500m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Cladophora glomerata</i>			2	2
<i>Cocconeis sp.</i>			1	1
Diatoms	2	2		
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense</i>	1	1		
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>	1	1	2	2
<i>Glyceria fluitans</i>	2	2		
<i>Juncus acutiflorus</i>	1	1		
<i>Lemanea fluviatilis</i>			2	2
<i>Mentha sp.</i>	1	1		
<i>Mimulus guttatus</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Petasites hybridus</i>	2	2		
<i>Phalaris arundinacea</i>	2	2		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>	1	1	1	1
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex acetosella</i>	1	1		
<i>Rumex obtusifolius</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Spirogyra sp.</i>			1	1
<i>Tussilago farfara</i>	1	1		
<i>Urtica dioica</i>	1	1		

Site Number 19

Location Plenploth North Water
Type of Work Underbridge 60
Survey Plan No. 13 & 14
Parliamentary Sheet 47 & 48
NGR u/s NT 44181 48481
NGR d/s NT 43970 48106
JNCC river type Va – Mesotrophic, upland hard limestone/sandstone rivers
CB community type No clear type
Surveyed length (m) 500

Overview

The site has species of conservation value.

Above the bridge the river is wide with an open aspect. Some of the site is shaded by bankside trees. The substrate is predominantly comprised of cobbles. There is very little in-stream plant growth apart from mosses and no *Ranunculus* species were recorded. A layer of diatoms is present over much of the slower flowing sections in the site.

Species contributing to SAC CB Interest

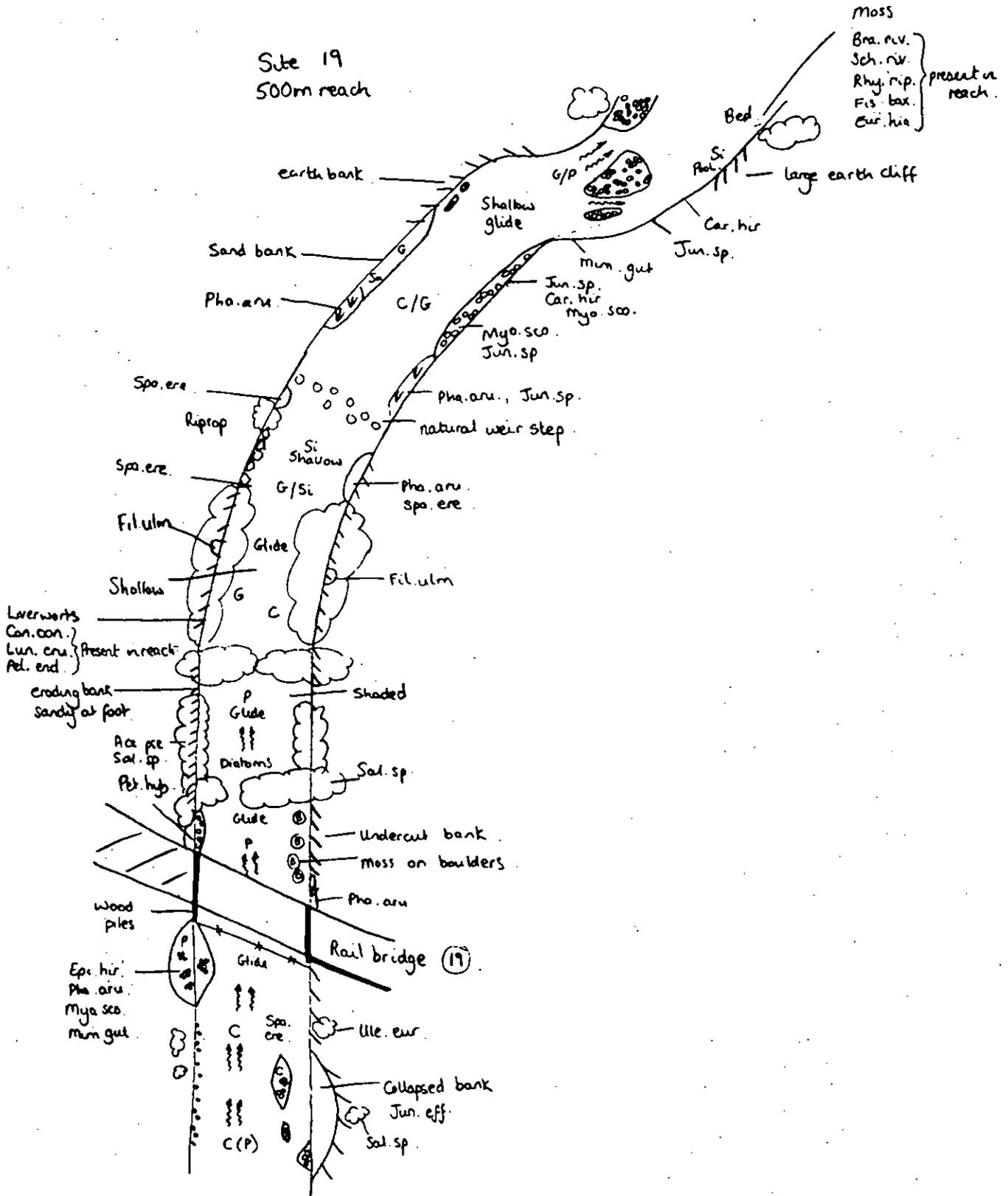
<i>Fontinalis antipyretica</i>	Occasional/frequent
<i>Rhynchostegium riparioides</i>	Occasional
<i>Pellia endiviifolia</i>	Rare
<i>Brachythecium rivulare</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare

Although the moss species at the site are of conservation interest, only two vegetation components of CB communities (bryophytes and marginals) are represented. These are not sufficient to classify the site as being a particular CB type.

Photographs of site



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2		
<i>Angelica sylvestris</i>	1	1		
<i>Brachythecium rivulare</i>	1	1		
<i>Carex hirta</i>	1	1		
<i>Cladophora glomerata</i>			1	2
<i>Conocephalum conicum</i>	1	1		
<i>Cruciata laevipes</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
Diatoms			2	3
<i>Epilobium hirsutum</i>	1	2		
<i>Epilobium palustre</i>	1	1		
<i>Eurhynchium swartzii</i>	1	1		
Fern	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fissidens sp</i>	1	1		
<i>Fissidens taxifolius</i>	1	1		
<i>Fontinalis antipyretica</i>			2	2
<i>Glyceria fluitans</i>	2	2		
<i>Heracleum sphondylium</i>	1	1		
<i>Juncus acutiflorus</i>	2	2		
<i>Juncus effusus</i>	1	2		
<i>Lemanea fluviatilis</i>			1	1
<i>Lunularia cruciata</i>	1	1		
<i>Mentha sp.</i>			1	1
<i>Mimulus guttatus</i>	1	2		
<i>Montia fontana</i>	1	1		
<i>Myosotis scorpioides</i>	1	1		
<i>Pellia endiviifolia</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Petasites hybridus</i>	1	1		
<i>Phalaris arundinacea</i>	2	3		
<i>Pohlia wahlenbergii</i>	1	1		
<i>Prunella vulgaris</i>	1	1		
<i>Ranunculus acris</i>	1	1		
<i>Ranunculus repens</i>	2	2		
<i>Rhynchosstegium riparioides</i>			1	2
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex acetosella</i>	1	1		
<i>Rumex sp</i>	1	2		
<i>Sagina procumbens</i>	1	1		
<i>Schistidium alpicola</i>	1	1		
<i>Senecio aquaticus</i>	1	2		
<i>Sparganium erectum</i>	2	2		
<i>Stachys palustris</i>	1	1		
<i>Stellaria alsine</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 20

Location Torquhan South
Type of Work Underbridge 61
Survey Plan No. 14
Parliamentary Sheet 48
NGR u/s NT 44204 47916
NGR d/s NT 44428 47659
JNCC river type IVa – Base rich/neutral impoverished rivers, normally close to source
CB community type No clear type
Surveyed length (m) 500

Overview

Species contributing to SAC CB Interest

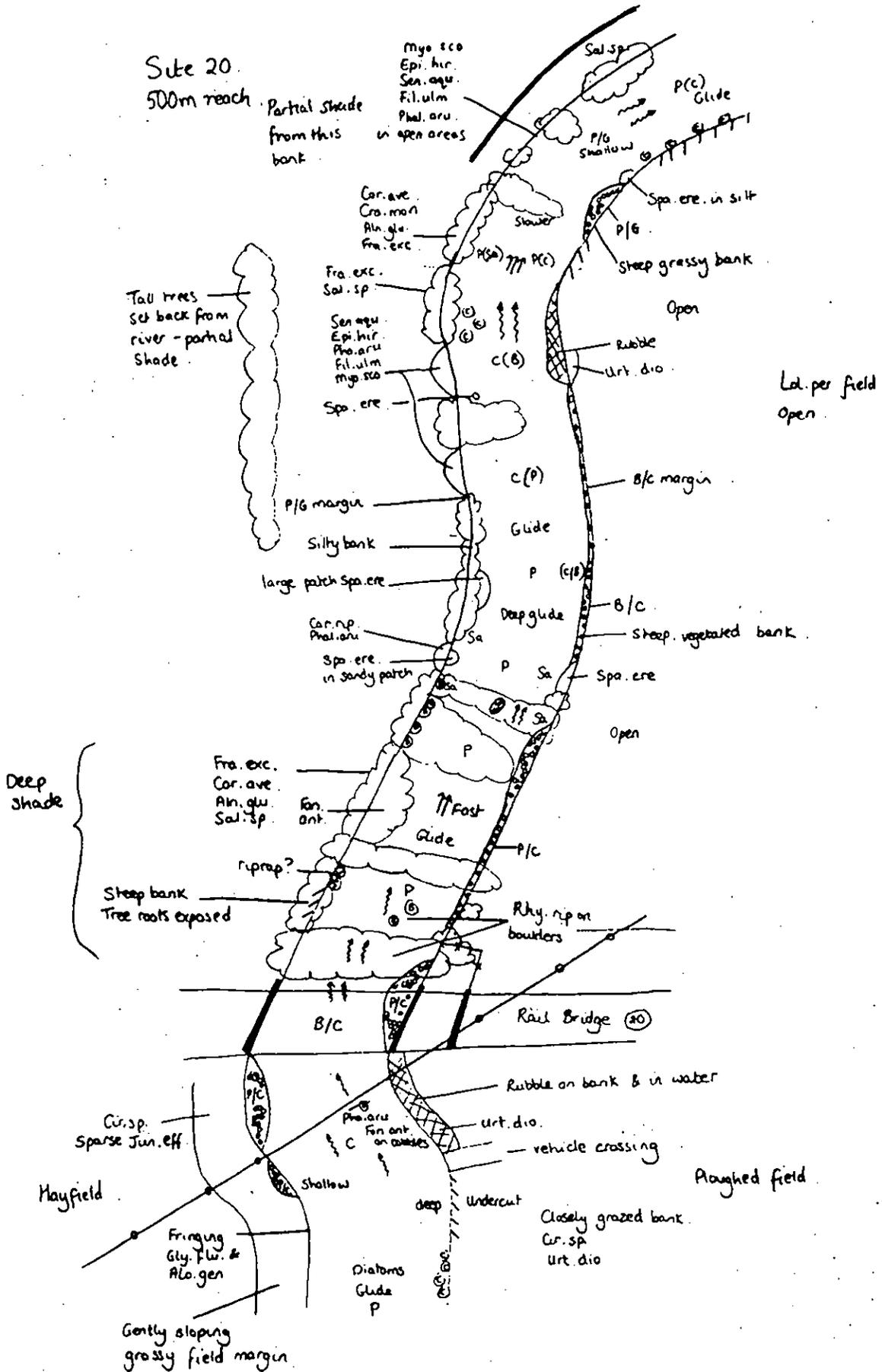
<i>Fontinalis antipyretica</i>	Occasional/frequent
<i>Rhynchostegium riparioides</i>	Occasional
<i>Rorippa nasturtium-aquaticum</i>	Rare

Although there are species of conservation interest at the site, the variety and extent of vegetation in the channel is not sufficient to classify the site as a specific CB community.

Photographs of site



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2	1	1
<i>Alopecurus geniculatus</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Carex riparia</i>	1	1		
<i>Cladophora glomerata</i>			2	2
Diatoms	1	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	2
<i>Glyceria fluitans</i>	1	1		
<i>Juncus acutiflorus</i>	1	1		
<i>Lemanea fluviatilis</i>			1	1
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Phalaris arundinacea</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>			2	2
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex acetosella</i>	1	1		
<i>Rumex obtusifolius</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1	2	2
<i>Stachys palustris</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 21

Location Pirm
Type of Work Riverbank protection
Survey Plan No. 14 & 15
Parliamentary Sheet 48 & 49
NGR u/s NT 44430 47636
NGR d/s NT 44531 47292
JNCC river type Va - mesotrophic, upland community flowing over hard limestone or sandstone
CB community type similar to CB4
Surveyed length (m) 500 the site is contiguous with sites 20 and 22

Overview

The site contains a limited number of macrophyte species of conservation interest. The site is not shaded below the proposed works but despite this there are few instream macrophytes. Mosses dominate the instream flora. The banks are heavily grazed throughout the majority of the site.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Rhynchostegium riparioides</i>	Common
<i>Rorippa nasturtium-aquaticum</i>	Rare

The site does not have a macrophyte community which matches a CB description. It does contain species which make it similar to a CB4 community but there are too few species.

Photographs of site

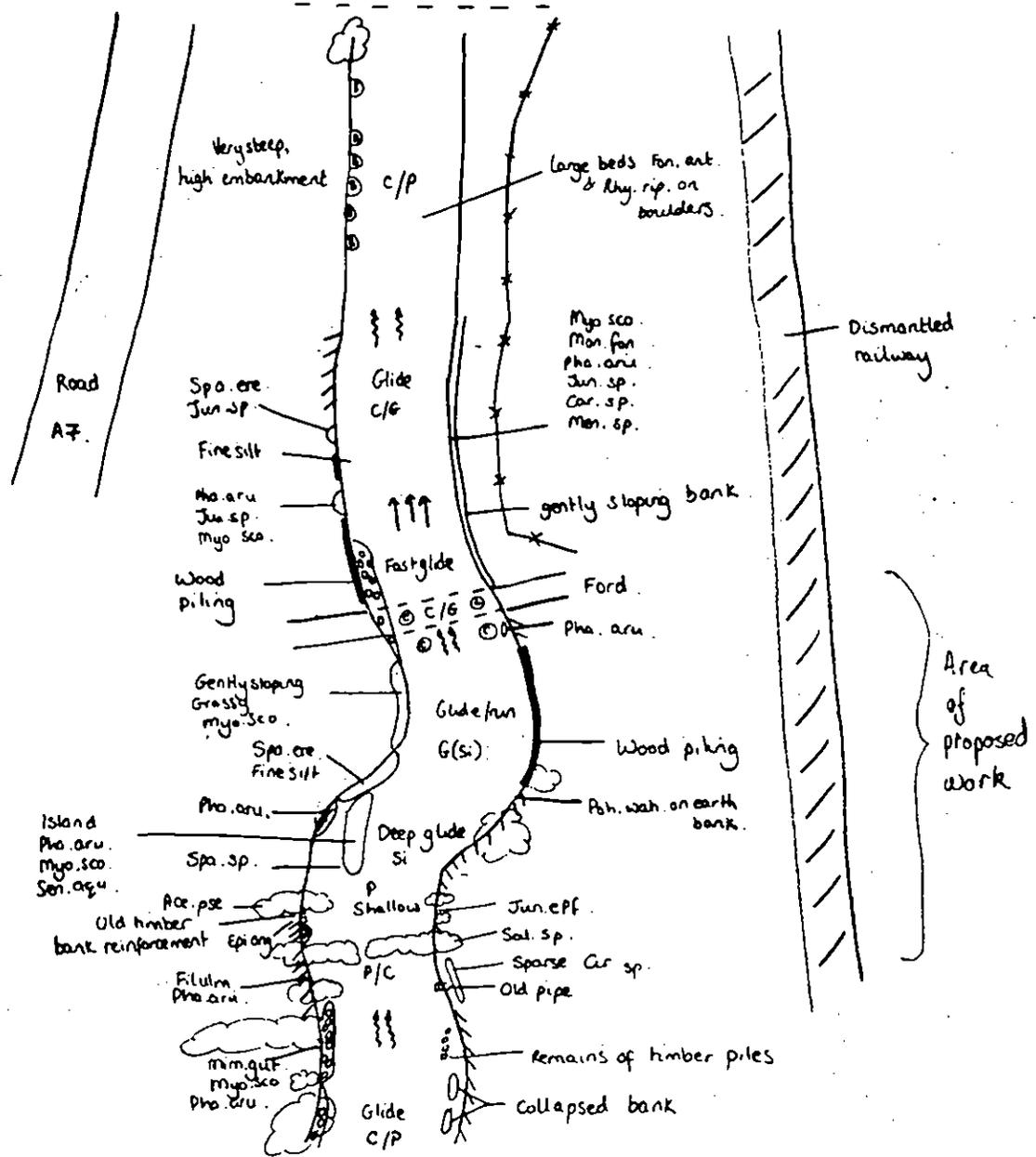


(The A7 road embankment downstream)

Site sketch map

Site 21
500m reach

← continued on map of site 22



Species List

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	1	1		
<i>Alopecurus aequalis</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Carex disticha</i>	1	1		
<i>Carex rostrata</i>	1	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense/palustre</i>	1	1		
<i>Fern</i>	1	1		
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	1
<i>Glyceria fluitans</i>	1	1		
<i>Juncus articulatus</i>	2	1		
<i>Juncus effusus</i>	1	1		
<i>Lemanea fluviatilis</i>			1	1
<i>Mentha aquatica</i>	1	1		
<i>Mimulus sp</i>	1	1		
<i>Myosotis scorpioides</i>	2	1		
<i>Persicaria maculosa</i>	1	1		
<i>Phalaris arundinacea</i>	3	2		
<i>Pohlia wahlenbergii</i>	1	1		
<i>Ranunculus flammula</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosygium riparioides</i>			3	3
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Salix sp.</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Stellaria uliginosa</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 22

Location Gala Water
Type of Work bank protection
Survey Plan No. 16
Parliamentary Sheet 50
NGR u/s NT44466 47161
NGR d/s NT44420 46938
JNCC river type IVc upland river with impoverished flora
CB community type similar to CB4
Surveyed length (m) 500

Overview

The site contains some macrophyte species of conservation interest. The Gala Water meanders gently through pasture land for the entire survey reach. The banks are unfenced and grazed. Instream habitat consists of short riffle sections and run/glides. There are alternate, exposed side bars. The predominant substrate is a loose cobble/gravel mix. The banks were either gently sloping or, in only a few places, eroding earth cliffs (sensu RHS).

The site was surveyed from 100m upstream of the proposed works and through the works sections (circa 400m). The reach below the works was surveyed too and is reported on under site 23. It did not differ in character from the reach reported here.

Instream the flora is dominated by diatoms. *Fontinalis antipyretica* and *Rhynchostegium riparioides* are found on small boulders. On the banks the community is diverse and *Agrostis stolonifera* dominates. The exposed side bars supported a mixed assemblage of small procumbent and stunted herbs such as *Rorippa nasturtium-aquaticum*, *Sagina procumbens*, *Stellaria* and *Mimulus*.

Species contributing to SAC CB Interest

<i>Callitriche stagnalis</i>	Rare
<i>Fontinalis antipyretica</i>	Rare
<i>Rhynchostegium riparioides</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare

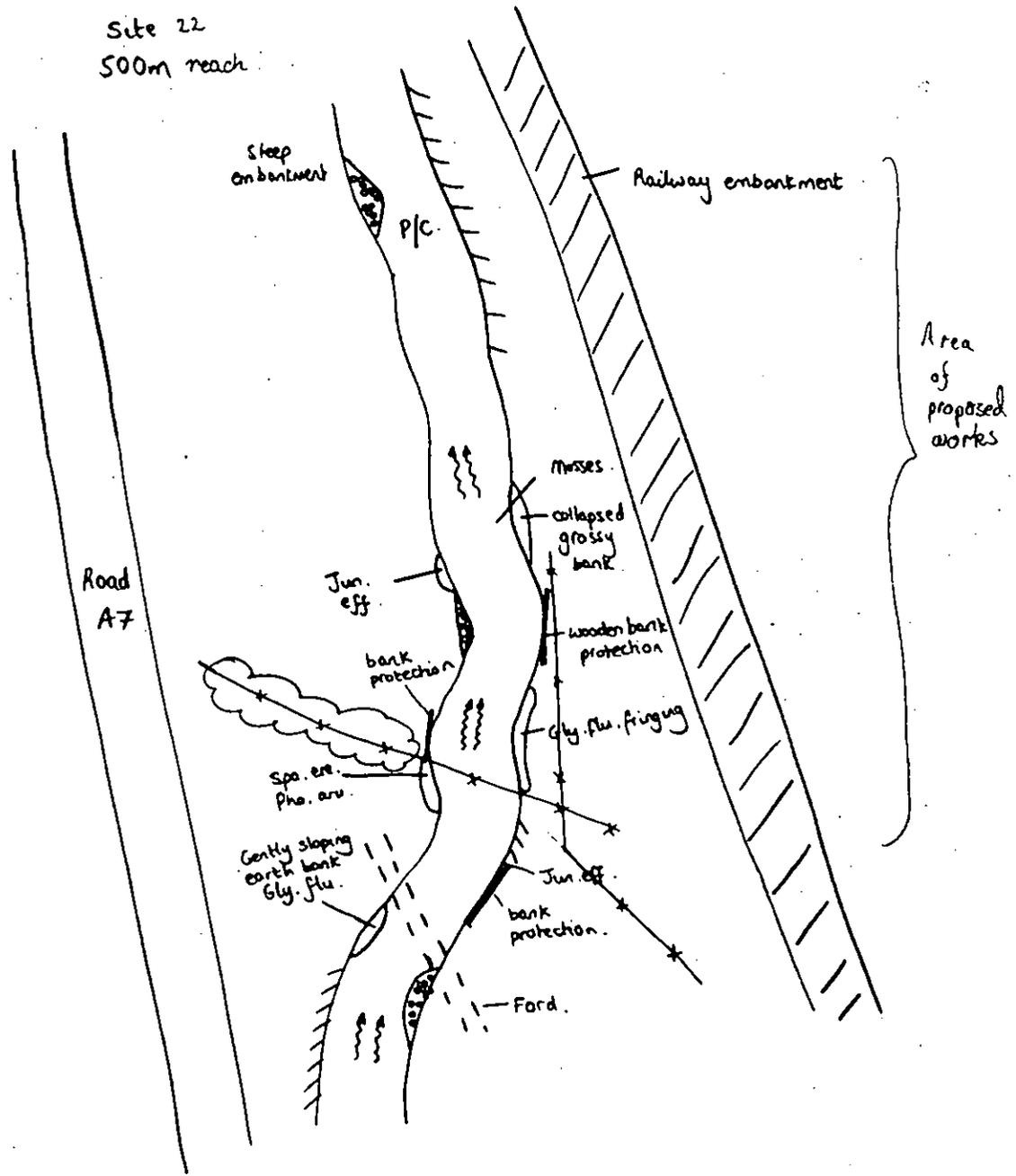
The site is close to a CB4 community type but lacks water crowfoot. It contains the correct types of mosses, starworts and marginal vegetation but all are rare at the site.

Photographs of site



Site sketch map

Site 22
500m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Achillea ptarmica</i>	1	1		
<i>Agrostis stolonifera</i>	2	1		
<i>Amblystegium fluviatile</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Callitriche stagnalis</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Carex rostrata</i>	1	1		
Diatoms			3	3
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	1
<i>Galium cruciata</i>	1	1		
<i>Glyceria fluitans</i>	1	1		
<i>Heracleum sphondylium</i>	1	1		
<i>Juncus acutiflorus</i>	2	1		
<i>Juncus articulatus</i>	2	1		
<i>Juncus effusus</i>	3	2		
Liverworts	1	1		
<i>Lotus pedunculatus</i>	1	1		
<i>Mimulus sp</i>	1	1		
<i>Myosotis scorpioides</i>	1	1		
<i>Myosoton aquaticum</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Phalaris arundinacea</i>	1	1		
<i>Ranunculus acris</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>	1	1		
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Sagina procumbens</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Stellaria sp</i>	1	1		
<i>Veronica anagallis-aquatica</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 23

Location Unnamed burn entering the Gala Water
Type of Work under bridge work at culvert
Survey Plan No. 16
Parliamentary Sheet 50
NGR u/s NT 44272 46779
NGR d/s NT 44295 46465
JNCC river type IVc upland river with impoverished flora
CB community type similar to CB4
Surveyed length (m) 400 contiguous with sites 22 and 24

Overview

The site contains some species of conservation interest. The burn passes through a field of late silage, under the rail line and joins the Gala Water within a 100m. Downstream of the rail culvert the burn and river pass through a field of pasture. Upstream of the culvert the burn has been over-deepened and has no in-stream vegetation. The banks are fenced here and *Juncus effusus* dominates. Immediately downstream of the culvert the channel has silted up and is choked with vegetation. There are large stands of *Mimulus* and *Glyceria fluitans* in the channel. Down stream of the confluence with the Gala water the river has almost no instream vegetation. There is a small amount of *Fontinalis antipyretica*, *Ranunculus* and *Callitriche sp.* present. The channel is a cobble gravel mix with eroding earth cliffs and gently sloping banks. *Juncus effusus* is again dominant although here it is heavily grazed. Two hundred metres below the confluence the site meets the upstream end of the survey reach reported under site 24.

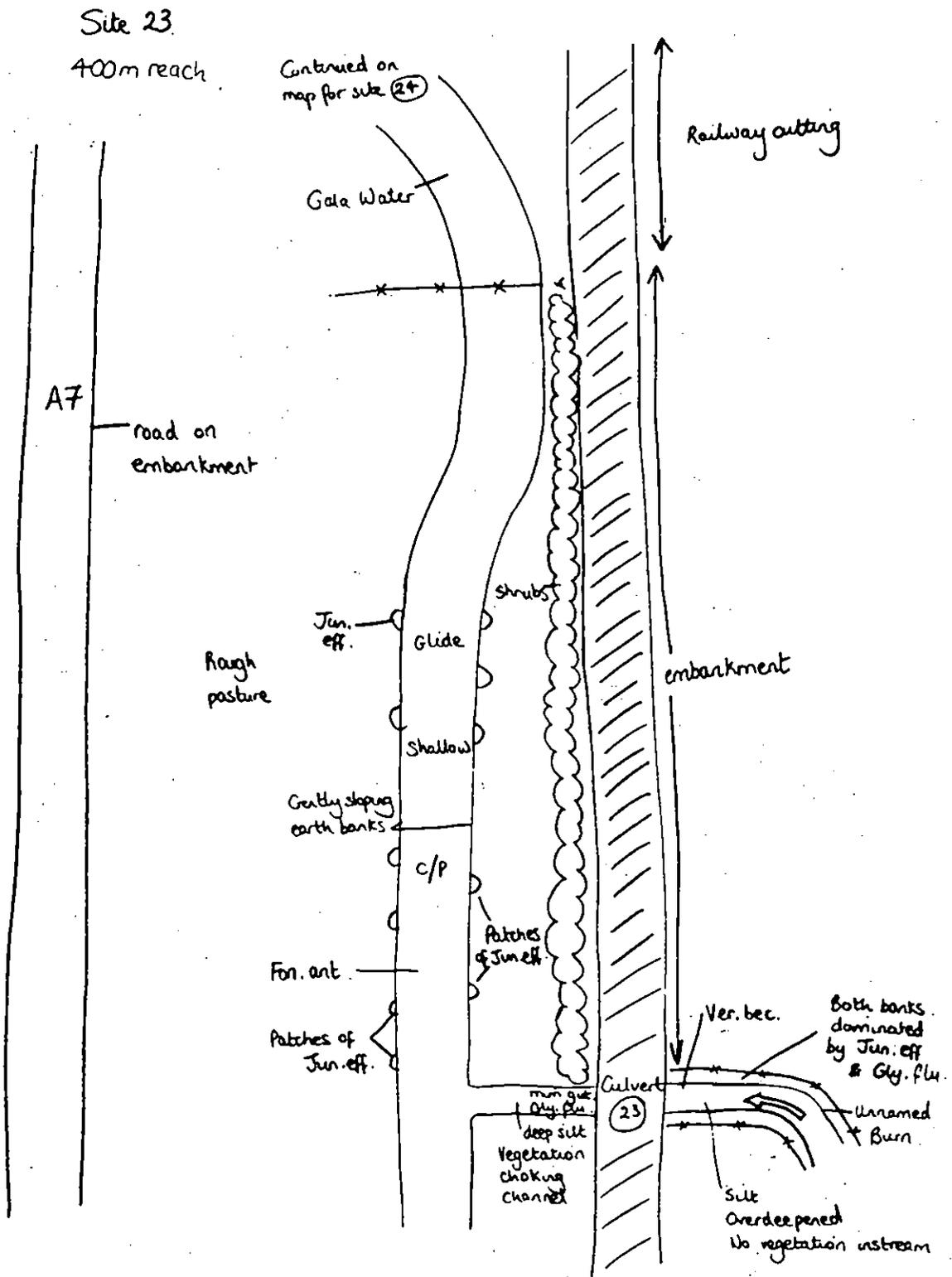
Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Rare
<i>Callitriche cf platycarpa</i>	Rare
<i>Ranunculus cf penicillatus pseudofluitans.</i>	Rare
<i>Rhynchosygium riparioides</i>	Rare

The site is similar to a CB4 community. The water crowfoot (*R. penicillatus pseudofluitans cf*) and the starwort (*C. platycarpa cf*) were only represented by very small, single plants. Neither plant had flowers or fruits which are needed to confirm their identity. Both species may be only transient members of the flora at this site.



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Achillea ptarmica</i>	1	1		
<i>Agrostis stolonifera</i>	2	1		
<i>Alnus glutinosa</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Callitriche cf platycarpa</i>			1	1
<i>Cerastium glomeratum</i>	1	1		
Diatoms			3	3
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense</i>	1	1		
Filamentous green algae			1	1
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	1
<i>Glyceria fluitans</i>	2	1		
<i>Juncus acutiflorus</i>	1	1		
<i>Juncus articulatus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	3	2		
<i>Lotus pedunculatus</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus sp</i>	2	1		
<i>Myosotis scorpioides</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Phalaris arundinacea</i>	1	1		
<i>Plantago lanceolata</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Ranunculus cf penicillatus pseudofluitans</i>			1	1
<i>Rhynchosstegium riparioides</i>	1	1	1	1
<i>Rorippa sp</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Salix sp.</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Stachys palustris</i>	1	1		
<i>Symphoricarpus albus</i>	2	2		
<i>Veronica beccabunga</i>	1	1		

Site Number 24

Location Gala Water
Type of Work bank protection
Survey Plan No. 16 & 17
Parliamentary Sheet 50 & 51
NGR u/s NT 44295 46465
NGR d/s NT 44262 46093
JNCC river type IVc upland river with impoverished flora
CB community type similar to CB4
Surveyed length (m) 500. The site overlaps with site 25 for its last 100m and is also contiguous with site 23.

Overview

The river flows through pasture land which is bordered to the west by the rail line. Upstream of the area of works the river is shallow and riffle like. At the start of the works section where the river is close to the rail cutting it appears to be over-deepened. As the river moves away from the cutting it becomes shallow again.

The banks upstream and the east bank downstream are grazed. The west bank is wet and silty. It supports stands of *Sparganium emersum* and *Carex rostrata*.

Species contributing to SAC CB Interest

<i>Callitriche sp.</i>	Rare
<i>Fontinalis antipyretica</i>	Rare
<i>Ranunculus penicillatus pseudofluitans</i>	Rare
<i>Rhynchosstegium riparioides</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare

The site is similar to a CB4 community but the key species are present in very small amounts. As at site 23 both the water crowfoot (*R. pseudofluitans*) and the starwort (*Callitriche sp.*) were present only as very small plants.

Photographs of the site



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Achillea ptarmica</i>	1	1		
<i>Agrostis stolonifera</i>	2	2		
<i>Alnus glutinosa</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Atrichum undulatum</i>				
<i>Callitriche sp.</i>			1	1
<i>Caltha palustris</i>	1	1		
<i>Carex rostrata</i>	1	1		
Diatoms			3	3
<i>Eleocharis palustris</i>	1	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense</i>	1	1		
Filamentous green algae			1	1
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	1
<i>Glyceria fluitans</i>	1	1		
<i>Heracleum sphondylium</i>	1	1		
<i>Iris pseudacorus</i>	1	1		
<i>Juncus articulatus/acutiflora</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Lotus pedunculatus</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus sp</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Phalaris arundinacea</i>	3	3		
<i>Ranunculus penicillatus pseudofluitans</i>			1	1
<i>Rhynchosstegium riparioides</i>				
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Salix sp.</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	2	1		
<i>Stachys palustris</i>	1	1		
<i>Symphoricarpos albus</i>	2	1		

Site Number 25

Location Wetherstone
Type of Work Underbridge 65
Survey Plan No. 17
Parliamentary Sheet 51
NGR u/s NT 44243 46064
NGR d/s NT 44081 45728
JNCC river type IVc - Upland rivers with impoverished floras
CB community type Similar to CB4
Surveyed length (m) 500m

Overview

The site has species of conservation interest. Upstream of the bridge the site is not shaded whilst downstream the survey reach was shady. Macrophytes were mostly limited to the sunnier, open areas of the channel. The site contains a number of side bars which provided an additional habitat type for macrophytes. Instream the vegetation was dominated by diatoms and macrophytes were rare. The banks were dominated by the tall grass, *Phalaris arundinacea*. A single patch of the water crowfoot, *Ranunculus penicillatus pseudofluitans*, was found upstream of the bridge on a small area of fine sediment.

Species contributing to SAC CB Interest

<i>Ranunculus penicillatus pseudofluitans</i>	Rare
<i>Fontinalis antipyretica</i>	Rare
<i>Pellia endviifolia</i>	Rare

The community most closely resembles the CB4 community type (small meso-trophic rivers). The guideline number of vegetation components for the CB4 community is four or more. There are only two components present, bryophytes and crowfoots. This and the low cover of species at the site would suggest it does not meet the criteria for inclusion in this community type. However the *R. pseudofluitans* and bryophytes increase the conservation value of the site and should be protected.

Photographs of site



Species List

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	1		
<i>Angelica sylvestris</i>	1	1		
<i>Brachythecium rivulare</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
Diatoms			3	3
<i>Dipsacus fullonum</i>	1	1		
<i>Eleocharis palustris</i>	1	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Epilobium palustre</i>	1	1		
<i>Equisetum arvense</i>	1	1		
<i>Eurhynchium swartzii</i>	1	1		
Fern	1	1		
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			1	1
<i>Glyceria fluitans</i>	1	1		
<i>Iris pseudacorus</i>	1	1		
<i>Juncus acutiflorus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Lemanea fluviatilis</i>			1	1
<i>Lunularia cruciata</i>	1	1		
<i>Myosotis scorpioides</i>	2	1		
<i>Pellia endiviifolia</i>	1	1		
<i>Petasites hybridus</i>	2	1		
<i>Phalaris arundinacea</i>	3	3		
<i>Ranunculus penicillatus pseudofluitans</i>			1	1
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>			3	2
<i>Rumex sp</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Stachys palustris</i>	1	1		
<i>Stellaria uliginosa</i>	1	1		

Site Number 26

Location Gala bank
Type of Work Underbridge 67
Survey Plan No. 18
Parliamentary Sheet 52
NGR u/s NT 44234 45554
NGR d/s NT 44632 45421
JNCC river type VI d - Small, low-gradient meso-eutrophic rivers
CB community type Similar to CB4
Surveyed length (m) 600

Overview

There are species of conservation interest at the site, though generally aquatic macrophytes are sparse and much of the channel is smothered with diatoms. The channel is mostly open though there are some shaded sections. *Fontinalis* was recorded on the larger and more stable substrates.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Rhynchostegium riparioides</i>	Rare
<i>Pellia</i> sp.	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Ranunculus peltatus</i>	Rare

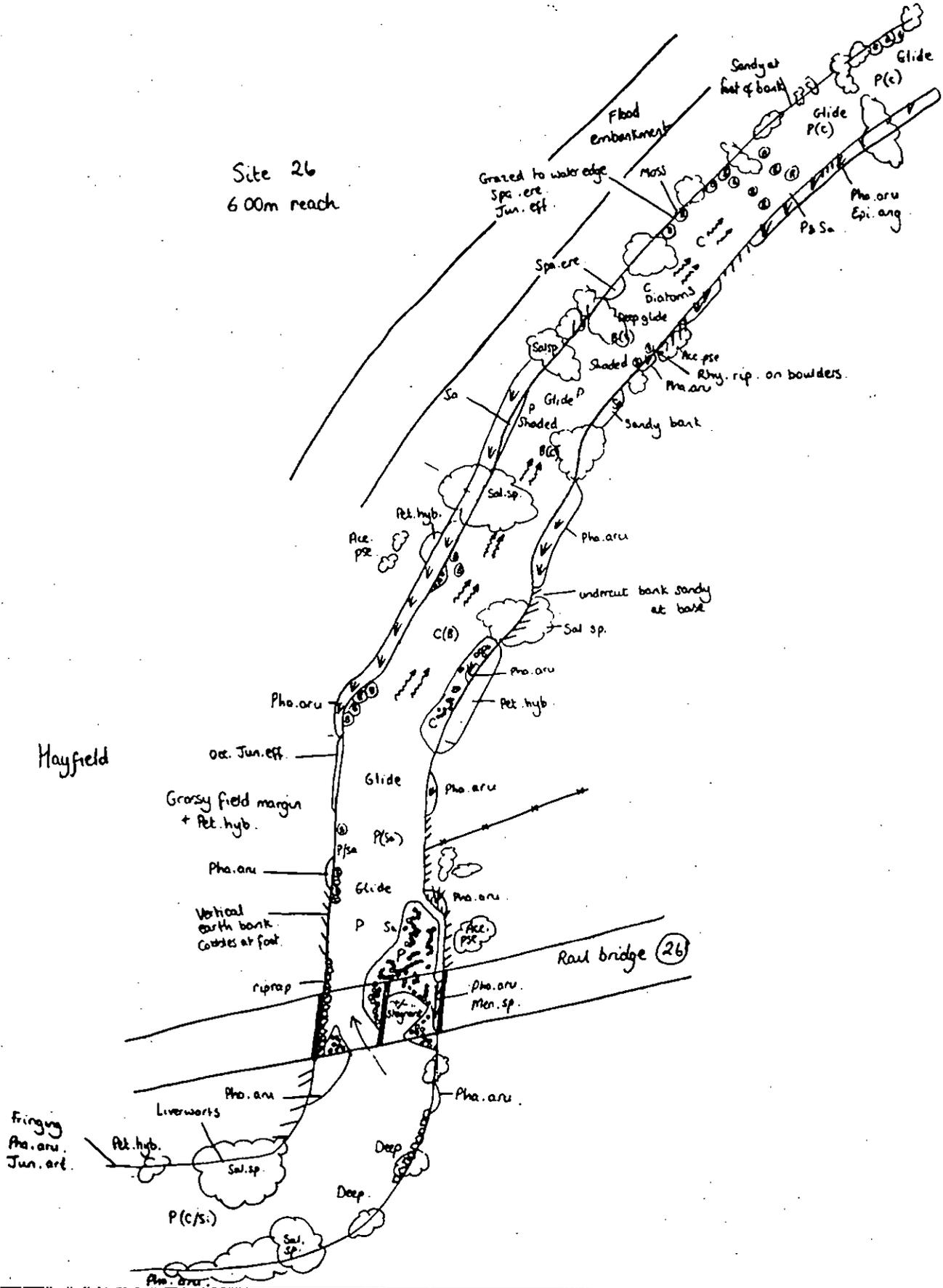
The site did support a range of bryophyte species, including *Pellia* sp., *Lunularia cruciata* and *Concepalum conicum*. The crowfoot, *Ranunculus peltatus* was also present. The variety and extent of the vegetation is similar to that of a CB4 community.

Photographs of site



Site sketch map

Site 26
600m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2		
Algae			1	1
<i>Angelica sylvestris</i>	1	1		
<i>Caltha palustris</i>	1	2		
<i>Centaurea nigra</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
Diatoms			2	3
<i>Eleocharis palustris</i>	1	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Epilobium palustre</i>	1	1		
<i>Equisetum arvense</i>	1	2		
<i>Fontinalis antipyretica</i>			2	2
<i>Glyceria fluitans</i>	2	2		
<i>Heracleum sphondylium</i>	1	1		
<i>Hildenbrandia rivularis</i>			1	1
<i>Juncus acutiflorus</i>	2	2		
<i>Juncus effusus</i>			1	1
<i>Lemanea fluviatilis</i>			2	2
<i>Lotus pedunculatus</i>	1	1		
<i>Lunularia cruciata</i>	1	1		
<i>Mentha sp.</i>	1	2		
<i>Mimulus guttatus</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Pellia sp.</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Petasites hybridus</i>	2	2		
<i>Phalaris arundinacea</i>	2	3		
<i>Polygonum aviculare</i>	1	1		
<i>Ranunculus peltatus</i>			1	1
<i>Ranunculus repens</i>	1	2		
<i>Rhynchosstegium riparioides</i>			1	1
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex acetosella</i>	1	1		
<i>Rumex sp.</i>	1	1		
<i>Sagina procumbens</i>	1	1		
<i>Salix sp.</i>	2	3		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	1	2		
<i>Stachys palustris</i>	1	1		
<i>Stellaria uliginosa</i>	1	1		
<i>Trifolium pratense</i>	1	1		
<i>Vicia cracca</i>	1	1		

Site Number 27

Location Gala Bank
Type of Work Riverbank protection
Survey Plan No. 19
Parliamentary Sheet 53
NGR u/s NT 44598 45535
NGR d/s NT 44956 45276
JNCC river type Va – Mesotrophic upland hard limestone/sandstone rivers
CB community type Similar to CB4
Surveyed length (m) 500 (contiguous with site 28)

Overview

Shaded in parts, and with some areas of eroding earth bank. There are some mosses growing on the larger and more stable substrates and on old bank protection materials. Both riffle and deeper areas are present. The site should be regarded in conjunction with the downstream site (28).

Species contributing to SAC CB Interest

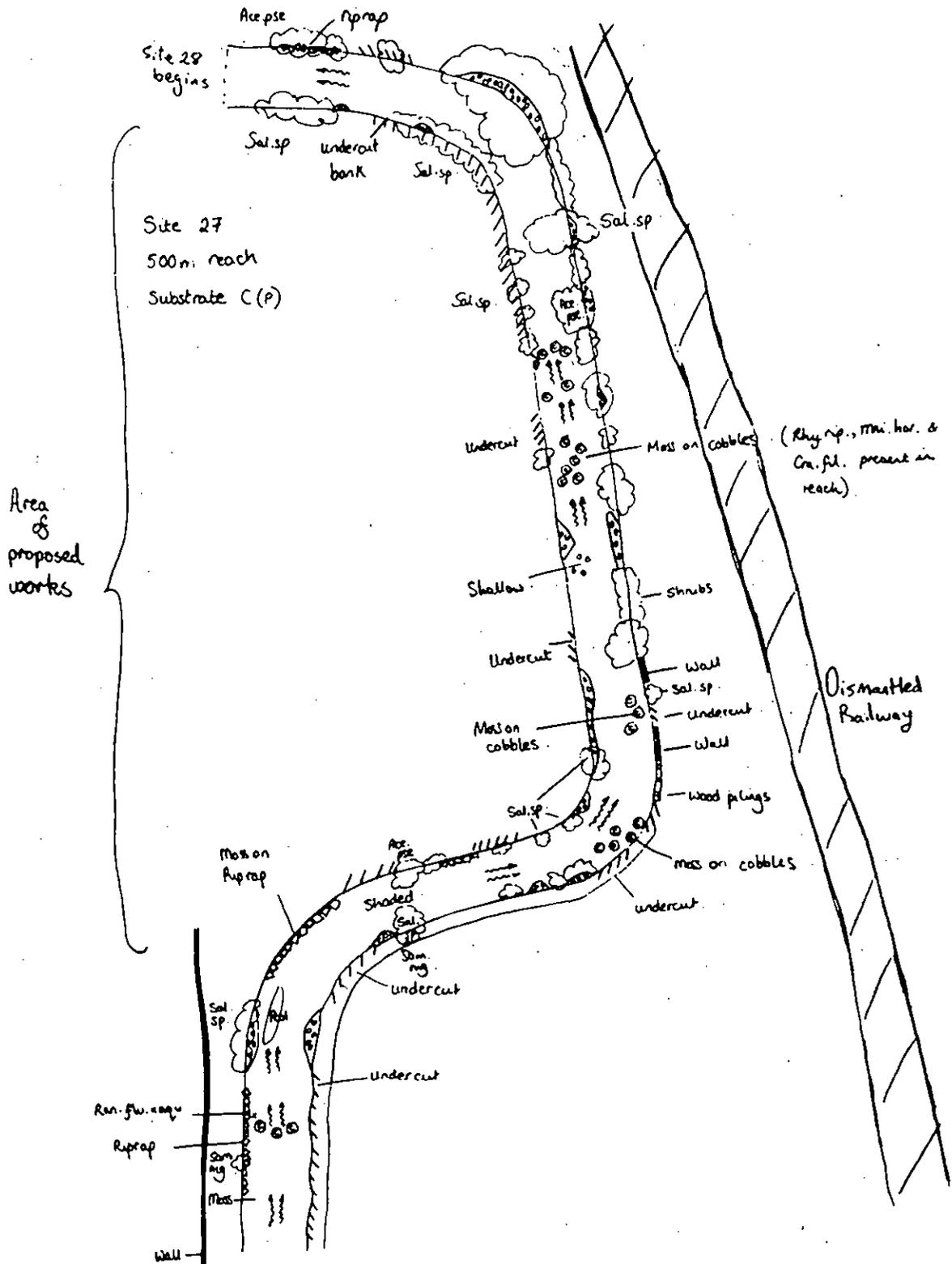
<i>Fontinalis antipyretica</i>	Occasional
<i>Rhynchostegium riparioides</i>	Occasional
<i>Ranunculus bachi</i> (<i>fluitans x aquatilis</i>)	Rare
<i>Chiloscyphus polyanthus</i>	Rare

There are some healthy patches of *Fontinalis antipyretica* as well as a small clump of the *Ranunculus* hybrid *Ranunculus x bachi* (*fluitans x aquatilis*). The presence of the *Ranunculus* hybrid is of interest and it requires protection. The site resembles a CB4 community. However the density of the species is insufficient to classify the site as a good example of a typical CB community.

Photographs of site



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2	1	1
<i>Caltha palustris</i>	2	2	1	1
<i>Centaurea nigra</i>	1	1		
<i>Chiloscyphus polyanthos</i>	1	1		
<i>Cladophora</i> agg.			1	1
<i>Conocephalum conicum</i>	1	1		
<i>Cratoneuron filicinum</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
<i>Equisetum palustre</i>	2	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>			2	2
<i>Fraxinus excelsior</i>	1	1		
<i>Hildenbrandia rivularis</i>			2	2
<i>Iris pseudacorus</i>	2	2	1	1
<i>Juncus acutiflorus</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Lemanea fluviatilis</i>			2	1
<i>Mimulus guttatus</i>	2	2		
<i>Mnium hornum</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Pellia endiviifolia</i>	1	1		
<i>Petasites hybridus</i>	1	1	1	1
<i>Phalaris arundinacea</i>	2	2		
<i>Ranunculus fluitans x aquatilis</i>			1	1
<i>Rhynchosstegium riparioides</i>			2	2
<i>Rumex</i> sp	1	1		
<i>Sagina procumbens</i>	2	1		
<i>Salix</i> sp.	2	2		
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	2	2	1	1
<i>Symphoricarpus albus</i>	2	2		
<i>Trifolium</i> sp	1	1		
<i>Tussilago farfara</i>	2	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 28

Location Gala Bank
Type of Work Riverbank protection
Survey Plan No. 19 & 20
Parliamentary Sheet 53 & 54
NGR u/s NT 45402 45175
NGR d/s NT 44997 45277
JNCC river type VIe – Small, basic, upland rivers
CB community type Similar to CB4
Surveyed length (m) 500

Overview

There are species of conservation importance at this site. Much of the site is deep, with areas of both eroding bank and bank reinforcement. There are few in-stream macrophytes, the majority were recorded at the downstream end of the site where the river opens out into a shallow riffle area. A very rare hybrid water crowfoot (*Ranunculus x bachii*) is present at the site. The presence of the hybrid at this site and site 27 constitute the only modern records for Scotland.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Rhynchosstegium riparioides</i>	Occasional
<i>Ranunculus x bachii</i> (<i>R. fluitans x R. aquatilis</i>)	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare

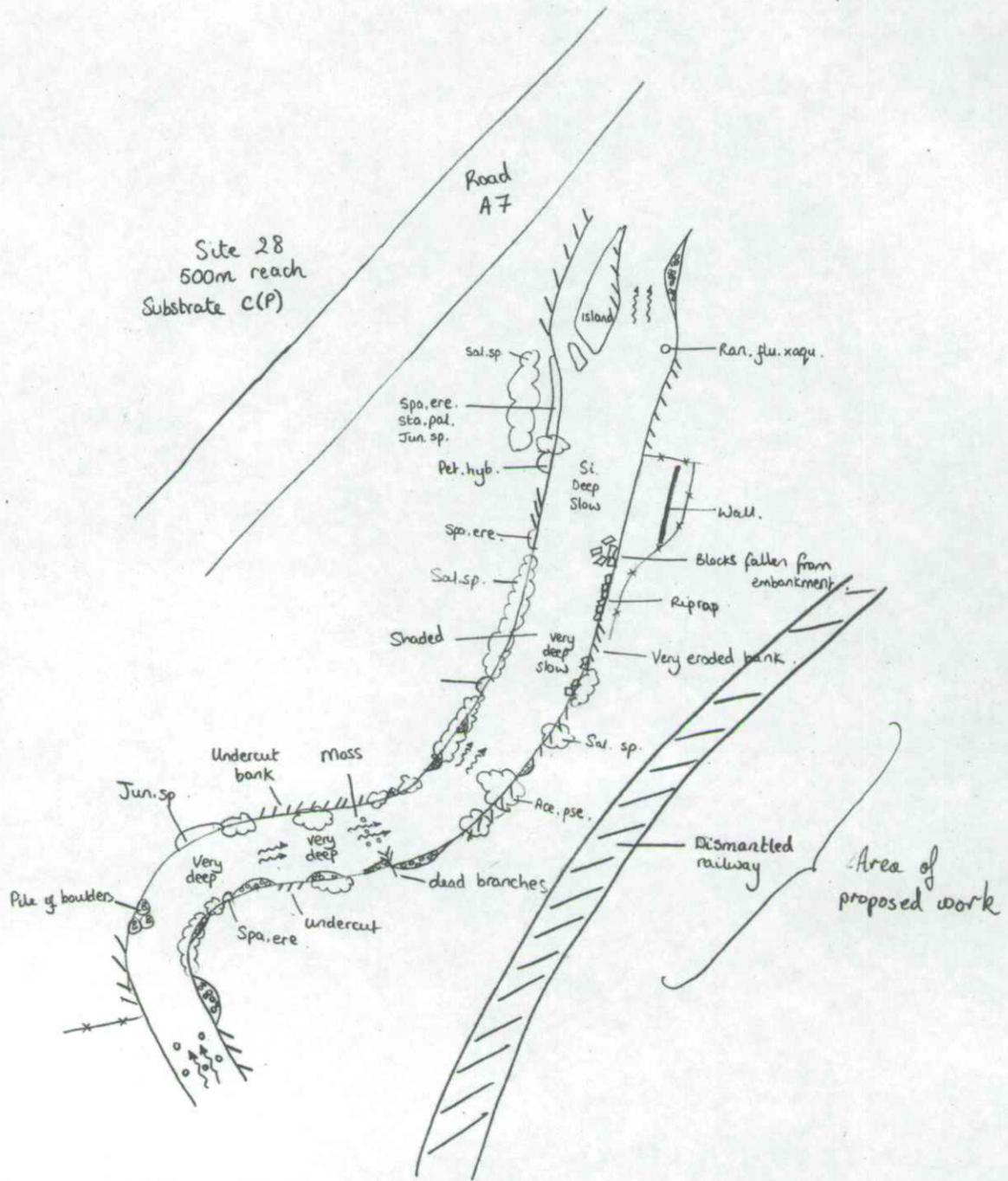
Fontinalis antipyretica and *Ranunculus x bachii* are the main species of interest in this context but are not sufficiently abundant to define the site as a CB community.

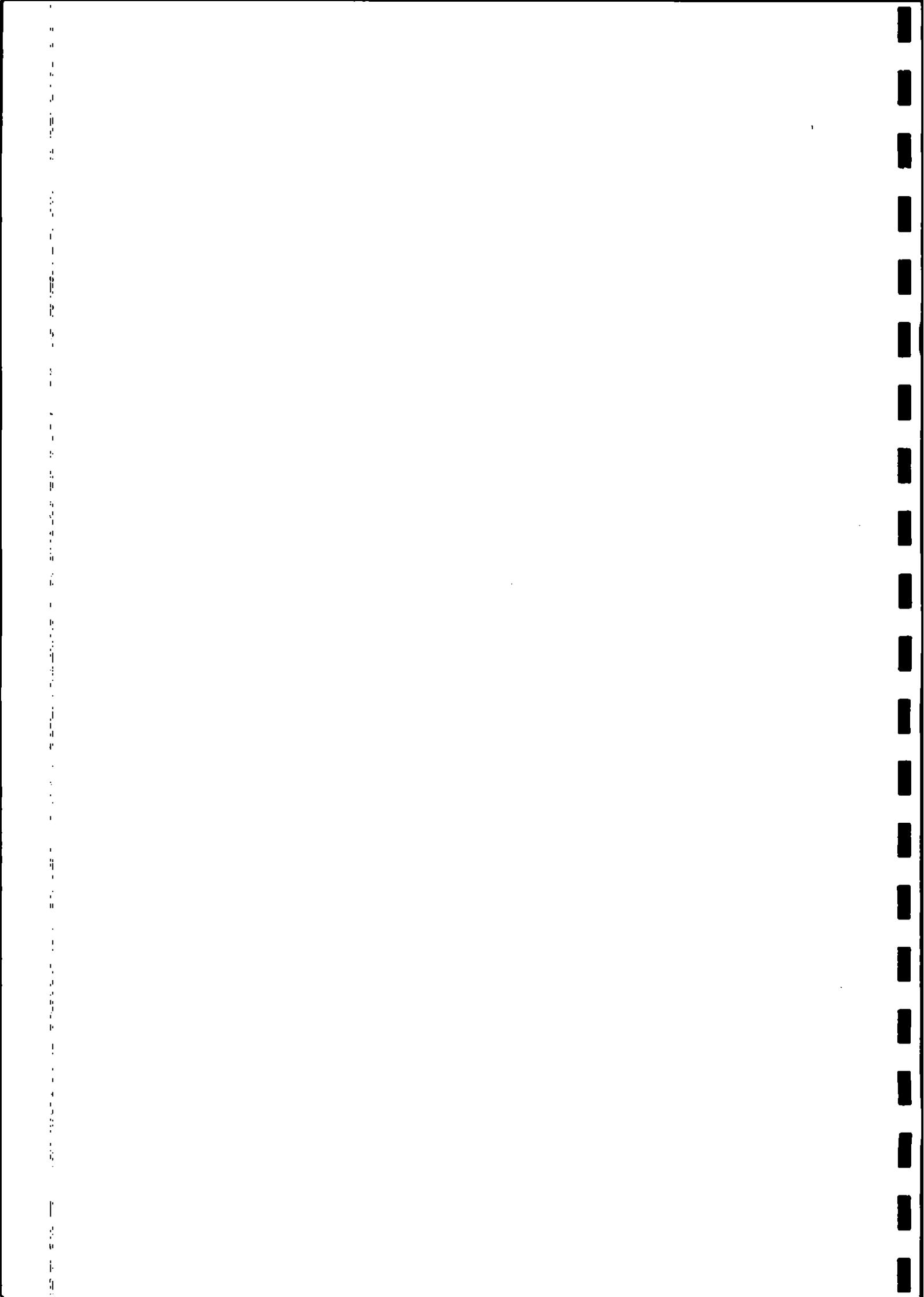
Photographs of site





Site sketch map





Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Acer pseudoplatanus</i>	1	1		
<i>Agrostis stolonifera</i>	2	2		
<i>Alopecurus geniculatus</i>	1	1	1	1
<i>Angelica sylvestris</i>	2	1		
<i>Caltha palustris</i>	2	2	1	1
<i>Carex rostrata</i>	1	1	1	1
<i>Centaurea nigra</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
Diatoms			2	3
<i>Elodea canadensis</i>	2	1		
<i>Epilobium hirsutum</i>	1	1		
<i>Epilobium montanum</i>	1	1		
<i>Equisetum palustre</i>	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>			2	2
<i>Glyceria fluitans</i>	2	2		
<i>Hildenbrandia rivularis</i>			1	1
<i>Juncus articulatus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	2	1		
<i>Lemanea fluviatilis</i>			2	1
<i>Mentha aquatica</i>	2	2	1	1
<i>Mimulus guttatus</i>	2	2		
<i>Myosotis scorpioides</i>	2	2	1	1
<i>Persicaria maculosa</i>	1	1		
<i>Petasites hybridus</i>	2	2	2	2
<i>Phalaris arundinacea</i>	2	3		
<i>Poa sp</i>	1	1		
<i>Ranunculus fluitans x aquatilis</i>			1	1
<i>Rhynchosstegium riparioides</i>			2	2
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Sagina procumbens</i>	1	1		
<i>Salix sp.</i>	2	2		
<i>Senecio aquaticus</i>	1	1		
<i>Senecio jacobaea</i>	1	1		
<i>Sparganium erectum</i>	2	2	2	1
<i>Spergula sp.</i>	1	1		
<i>Stachys palustris</i>	2	1		
<i>Symphoricarpus albus</i>	2	3		
<i>Veronica beccabunga</i>	2	1	1	1

Site Number 29

Location Gala Water
Type of Work River bank protection
Survey Plan No. 21
Parliamentary Sheet 56
NGR u/s NT45528 43999
NGR d/s NT45390 43149
JNCC river type VIe small basic upland river
CB community type Similar to CB4
Surveyed length (m) 900

Overview

Upstream of the proposed works the river is shallow and meanders through rough pasture. In the area of the works the river is shaded. It is bordered on the east banks by a set back embankment which is planted with, now mature, deciduous trees. The west bank passes close to the rail line and it is wooded. The site appears over-deepened although short riffles do occur along its length. This channel configuration continues below the area of the proposed works. The substrate is a gravel mix and is finer than at any of the other sites.

Instream macrophytes only occur downstream of the area of the works. The community is dominated by *Elodea canadensis*. *Ranunculus* (probably *penicillatus* ssp. *pseudofluitans*) also occurs. In the works area some liverworts occur on the shady banks.

The site should be regarded in conjunction with the downstream site (30).

Species contributing to SAC CB Interest

<i>Ranunculus cf penicillatus pseudofluitans</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Pellia</i> sp.	Rare
<i>Rhynchosygium riparioides</i>	Rare

The site contains a flora somewhat similar to a CB4 community but the site lacks sufficient floral diversity to be described as CB4. The water crowfoot at this site was not in flower at the time of sampling.

Photographs of the site



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Achillea ptarmica</i>	1	1		
<i>Agrostis stolonifera</i>	2	2		
<i>Alnus glutinosa</i>	2	2		
<i>Angelica sylvestris</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
Diatoms			3	3
<i>Eleocharis palustris</i>	1	1		
<i>Elodea canadensis</i>			2	1
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense</i>	1	1		
Fern	1	1		
Filamentous green algae			1	1
<i>Filipendula ulmaria</i>	1	1		
<i>Galium palustre</i>	1	1		
<i>Glyceria fluitans</i>	1	1		
<i>Heracleum sphondylium</i>	1	1		
<i>Hildenbrandia rivularis</i>			1	1
<i>Juncus articulatus/acuteiflora</i>	1	1		
<i>Juncus effusus</i>	2	1		
<i>Lotus pedunculatus</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus</i>	1	1		
<i>Myosotis scorpioides</i>	1	1		
<i>Myosoton aquaticum</i>	1	1		
<i>Pellia sp.</i>	1	1		
<i>Petasites hybridus</i>	1	1		
<i>Phalaris arundinacea</i>	3	2		
<i>Plantago lanceolata</i>	1	1		
<i>Potamogeton pusillus</i>			1	1
<i>Ranunculus acris</i>	1	1		
<i>Ranunculus cf penicillatus. pseudofluitans</i>			1	1
<i>Ranunculus repens</i>	1	1		
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rhynchosstegium riparioides</i>			1	1
<i>Rumex sp</i>	1	1		
<i>Salix sp.</i>	1	1		
<i>Scirpus sylvaticus</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	2	2		
<i>Stachys palustris</i>	1	1		
<i>Stellaria alsine</i>	1	1		

Site Number 30

Location Lugate Water entering Gala Water
Type of Work under bridge work
Survey Plan No. 22
Parliamentary Sheet 57
NGR u/s NT 45275 43145
NGR d/s NT 45593 43023
JNCC river type IVc upland impoverished river
CB community type similar to CB4
Surveyed length (m) 500m

Overview

The site contains some species of conservation interest. The Lugate Water enters the Gala Water 150m downstream of the rail bridge. Upstream of the rail bridge the Lugate Water passes through rough pasture and has low banks. Below the rail bridge the channel becomes more shaded and a large bed of *Petasites* flanks the right bank. In-stream the rivers alternate between shallow riffle and runs and are mainly devoid of flora.

Species contributing to SAC CB Interest

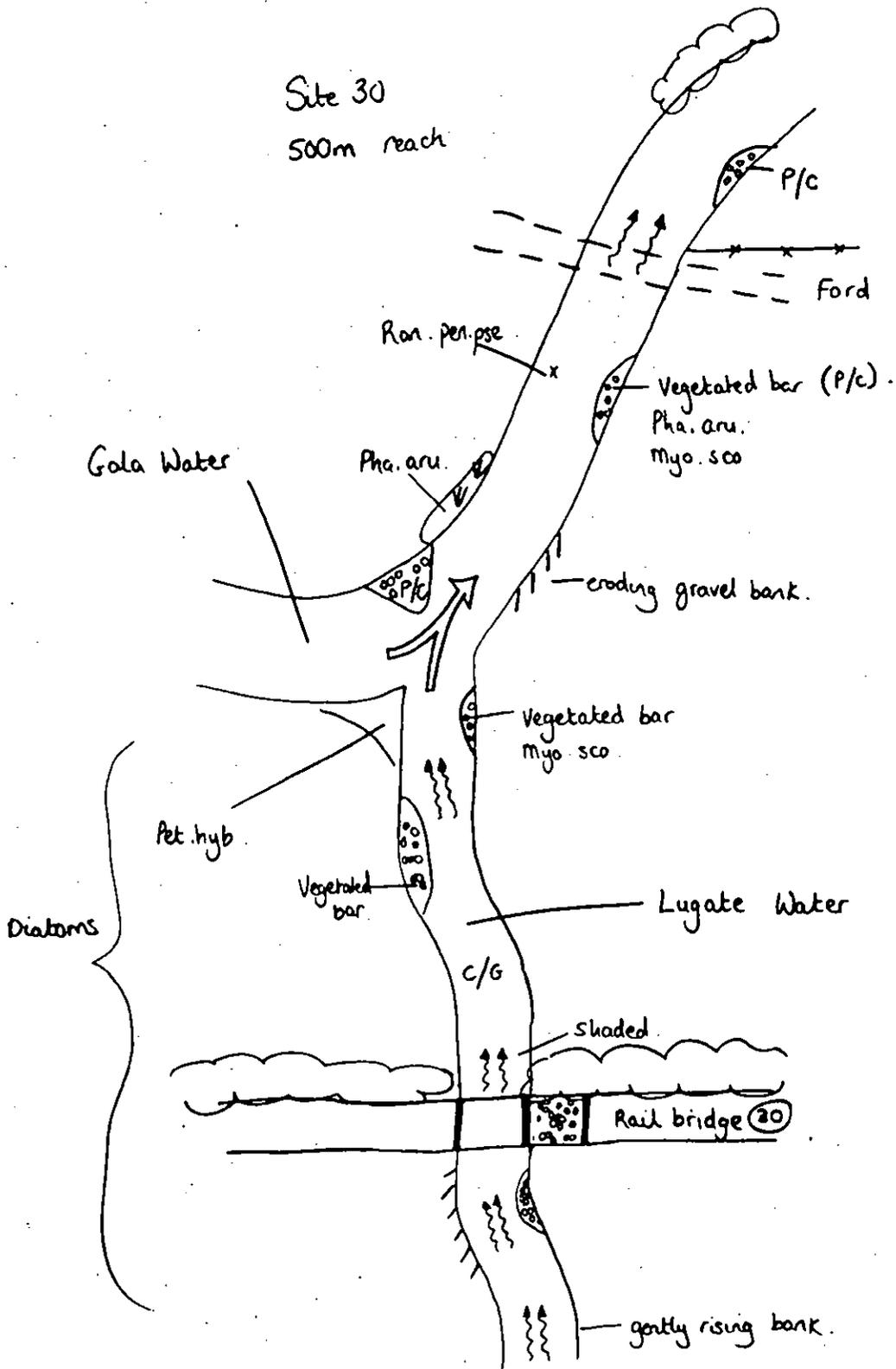
<i>Fontinalis antipyretica</i>	Rare
<i>Ranunculus cf penicillatus pseudofluitans</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Rhynchostegium riparioides</i>	Rare

The site is similar to a CB4 community but lacks a sufficient diversity and abundance of instream macrophytes to qualify.

Photographs of the site



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	1	1		
<i>Brachytecium rivulare</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Carex hirta</i>	1	1		
Diatoms			3	3
<i>Dipsacus fullonum</i>	1	1		
<i>Eleocharis palustris</i>	1	1		
<i>Epilobium palustre</i>	1	1		
Filamentous green algae			1	1
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			1	1
<i>Galium cruciata</i>	1	1		
<i>Galium palustre</i>	1	1		
<i>Heracleum sphondylium</i>	1	1		
<i>Juncus articulatus/acuteiflora</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus x luteus</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Myosoton aquaticum</i>	1	1		
<i>Petasites hybridus</i>	1	1		
<i>Phalaris arundinacea</i>	2	2		
<i>Plantago lanceolata</i>	1	1		
<i>Ranunculus cf penicillatus. pseudofluitans</i>			1	1
<i>Ranunculus repens</i>	1	1		
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rhynchosygium riparioides</i>			1	1
<i>Rumex sp</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Stachys palustris</i>	1	1		
<i>Stellaria alsine</i>	1	1		
<i>Tussilago farfara</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 31

Location Ferniehirst Water
Type of Work Underbridge 72
Survey Plan No. 23
Parliamentary Sheet 59
NGR u/s NT 44882 41982
NGR d/s NT 44785 41629
JNCC river type VIe – Small, basic, upland rivers
CB community type Similar to CB4
Surveyed length (m) 500

Overview

A mixture of shallow run/riffle habitat and deeper glide habitats are present at the site. Vegetation is sparse in the channel, though there are some healthy patches of *Ranunculus*. The channel is partly shaded by overhanging trees below the bridge.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Rhynchosstegium riparioides</i>	Occasional
<i>Ranunculus cf penicillatus pseudofluitans</i>	Rare

The presence of the *Ranunculus* species increases the conservation value of the site, and although similar to a CB4 community, the site is not a good example due to the variety and extent of additional macrophytes.

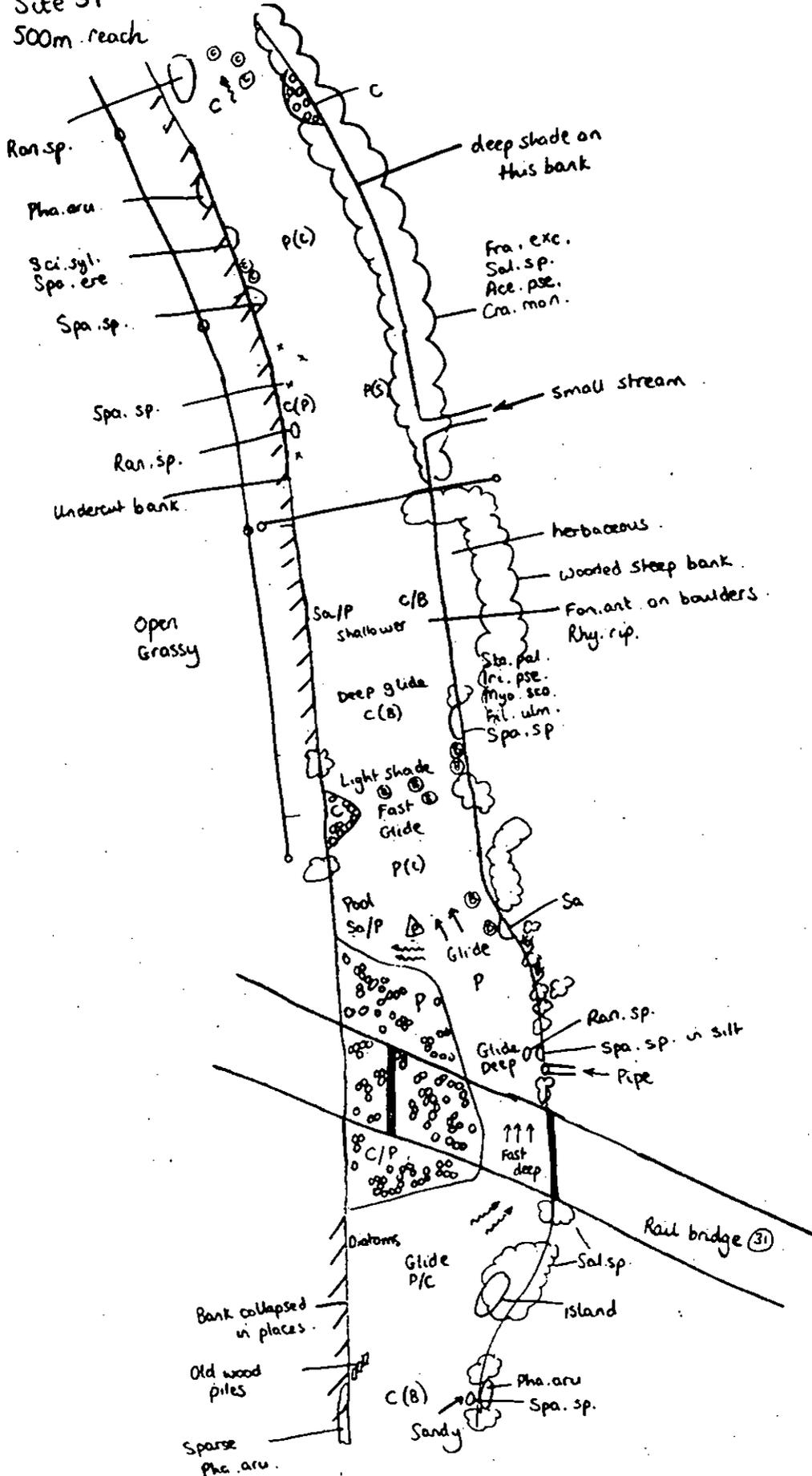
Photographs of site



Site sketch map

Site 31

500m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2	1	1
<i>Caltha palustris</i>	2	2	1	1
<i>Cardamine sp.</i>	1	1		
<i>Conocephalum conicum</i>	2	1		
<i>Eleocharis palustris</i>	1	1	1	1
<i>Equisetum palustre</i>	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>			2	2
<i>Glyceria fluitans</i>	2	2		
<i>Heracleum sphondylium</i>	1	1		
<i>Hildenbrandia rivularis</i>			2	1
<i>Iris pseudacorus</i>	1	1		
<i>Juncus acutiflorus</i>	1	1		
<i>Juncus articulatus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Lemanea fluviatilis</i>			2	1
<i>Lotus sp</i>	1	1		
<i>Lunularia cruciata</i>	1	1		
<i>Mentha aquatica</i>	1	1	1	1
<i>Mimulus guttatus</i>	2	2		
<i>Myosotis scorpioides</i>	2	2		
<i>Phalaris arundinacea</i>	2	2		
<i>Ranunculus repens</i>	1	1		
<i>Ranunculus cf penicillatus pseudofluitans</i>			2	2
<i>Rhynchosstegium riparioides</i>	2	1	2	2
<i>Ribes nigrum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Sagina procumbens</i>	1	1		
<i>Salix sp.</i>	2	2		
<i>Scirpus sylvaticus</i>	2	2		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	2	2		
<i>Spirogyra sp.</i>			2	2
<i>Stachys palustris</i>	2	1		
<i>Tussilago farfara</i>	1	1		

Site Number 33

Location Bowshank North
Type of Work Underbridge 73B
Survey Plan No. 23 & 24
Parliamentary Sheet 59 & 60
NGR u/s NT 44814 41601
NGR d/s NT 45332 41373
JNCC river type VIe – Small, basic, upland rivers
CB community type Borderline CB4
Surveyed length (m) 750

Overview

A variety of habitat types occur within this section – shallow runs/riffles, impounded areas, dense shading and open sections. The flow is apparently impounded by a weir at the downstream end of the site. An island occurs at the top of the stretch.

Ranunculus was recorded at the site in deeper, slower flowing water and also at the upstream end of the site in shallow run habitat.

The *Ranunculus* recorded at the downstream end of the section was in poor condition due to smothering by diatoms and algae. Dense accumulations of diatom growth were recorded in the slower flowing parts of the site below the bridge.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Rhynchostegium riparioides</i>	Occasional
<i>Pellia epiphylla</i>	Rare
<i>Ranunculus peltatus</i>	Rare

Two vegetation components of CB communities were recorded at the site (bryophytes and crowfoots) and the presence of the *Ranunculus* increases the conservation value of the site. However the variety and cover of species is not sufficient to classify the site as a specific and good quality CB community.

Photographs of site



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2		
<i>Alopecurus geniculatus</i>	2	1		
<i>Angelica sylvestris</i>	2	2		
<i>Caltha palustris</i>	2	2	2	1
<i>Carex acutiformis</i>	1	1	1	1
<i>Conocephalum conicum</i>	2	1		
Diatoms			2	2
<i>Eleocharis palustris</i>	2	1		
<i>Elodea canadensis</i>			1	1
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense</i>	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>			2	2
<i>Galium palustre</i>	1	1		
<i>Glyceria fluitans</i>	2	2		
<i>Hildenbrandia rivularis</i>			1	1
<i>Juncus articulatus</i>	1	1		
<i>Juncus bufonius</i>	2	1		
<i>Juncus effusus</i>	1	1		
<i>Heracleum sphondylium</i>	1	1		
<i>Lathyrus pratensis</i>	1	1		
<i>Lemanea fluviatilis</i>			1	1
<i>Lunularia cruciata</i>	2	1		
<i>Lysimachia nummularia</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus</i>	2	2		
<i>Myosotis scorpioides</i>	2	2		
<i>Oedogonium sp.</i>			1	1
<i>Pellia epiphylla</i>	2	1		
<i>Persicaria maculosa</i>	1	1	1	1
<i>Petasites hybridus</i>	2	1	1	1
<i>Phalaris arundinacea</i>	2	3	1	1
<i>Ranunculus peltatus</i>			2	2
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>			2	2
<i>Rumex sp.</i>	1	1		
<i>Salix sp.</i>	2	2		
<i>Scirpus sylvaticus</i>	2	2		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium emersum</i>			2	2
<i>Sparganium erectum</i>	2	2	2	2
<i>Stachys palustris</i>	1	1		
<i>Tussilago farfara</i>	1	1		
<i>Vaucheria sp.</i>			2	1
<i>Veronica beccabunga</i>	1	1		
<i>Vicia cracca</i>	1	1		

Site Number 34

Location Gala Water at Bowshanks
Type of Work Under bridge work
Survey Plan No. 24
Parliamentary Sheet 60
NGR u/s NT 45505 41056
NGR d/s NT 45340 40693
JNCC river type VI d small, low gradient meso-eutrophic river
CB community type similar to CB4
Surveyed length (m) 500. The site is contiguous with site 33

Overview

The site contains some species of conservation interest. The site is partially shaded throughout. The site is characterised by a limited number of instream macrophytes occurring at low abundance.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Rare
<i>Potamogeton crispus</i>	Rare
<i>Potamogeton pusillus</i>	Rare
<i>Rhynchostegium riparioides</i>	Occasional
<i>Ranunculus cf penicillatus pseudofluitans</i>	Rare

The macrophyte community is similar to a CB4 type. The site contains the correct types of bryophytes, water crowfoots and pondweed species to meet the requirements of CB4 community type. Water crowfoot (*R. penicillatus pseudofluitans cf*) should be dominant in CB4 communities but only a single plant was recorded.

Photographs of site



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	1	1		
<i>Alnus glutinosa</i>	3	3		
<i>Angelica sylvestris</i>	1	1		
<i>Brachythecium rivulare</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
Diatoms			3	3
<i>Eleocharis palustris</i>	1	1		
<i>Elodea canadensis</i>			1	1
<i>Enteromorpha sp.</i>			1	1
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense</i>	1	1		
Filamentous green algae			1	1
<i>Filipendula ulmaria</i>	2	1		
<i>Fontinalis antipyretica</i>			2	1
<i>Heracleum sp.</i>	1	1		
<i>Hildenbrandia rivularis</i>	1	1		
<i>Iris pseudacorus</i>	1	1		
<i>Juncus acutiflorus</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Lotus sp</i>	1	1		
<i>Lunularia cruciata</i>	1	1		
<i>Lycopus europaeus</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus</i>	1	1		
<i>Mnium hornum</i>	1	1		
<i>Myosotis scorpioides</i>	2	1		
<i>Pellia sp.</i>	1	1		
<i>Petasites hybridus</i>	1	1		
<i>Phalaris arundinacea</i>	3	2		
<i>Plantago sp.</i>	1	1		
<i>Potamogeton crispus</i>			1	1
<i>Potamogeton pusillus</i>			1	1
<i>Ranunculus repens</i>	1	1		
<i>Ranunculus cf penicillatus pseudofluitans</i>			1	1
<i>Rhynchosstegium riparioides</i>			2	2
<i>Rorippa sylvestris</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Scirpus sylvaticus</i>	1	1		
<i>Senecio aquaticus</i>			1	1
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	1	1		
<i>Sponge</i>			1	1
<i>Stachys palustris</i>	1	1		
<i>Stellaria media</i>	1	1		

Site Number 35-36

Location Gala Water at Bowshank south
Type of Work bank protection work (35) and culvert renewal (36)
Survey Plan No. 61
Parliamentary Sheet 25
NGR u/s NT 45275 40901
NGR d/s NT 45358 40883
JNCC river type VI d small, low gradient mesotrophic rivers
CB community type similar to CB4
Surveyed length (m) 500

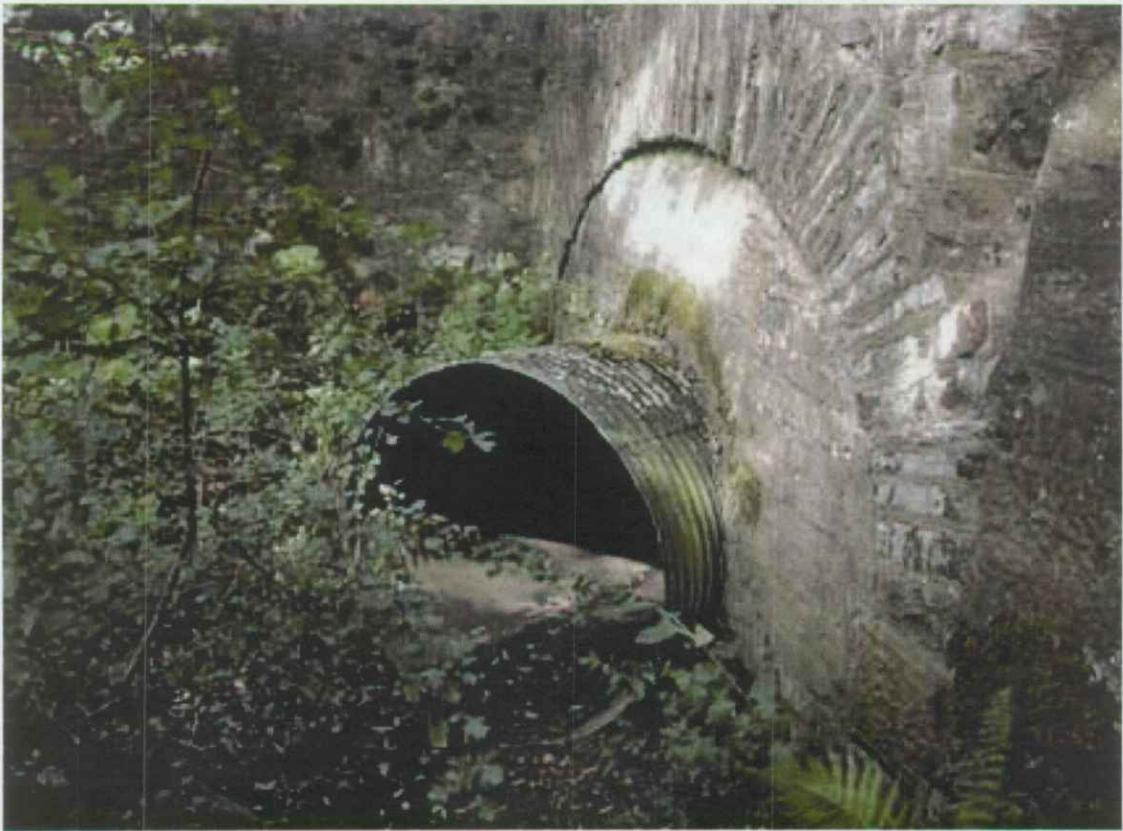
Overview

The site contained species of conservation interest. Site 35, bank protection and site 36 were adjacent to one another and are dealt with together. As at many of the sites there is a considerable amount of shading limiting growth of instream macrophytes. The site differs from many others in containing areas of deeper slow flowing water and small deposits of fine sediment. Pondweeds and water crowfoot are found growing on these fine sediments where light reaches them.

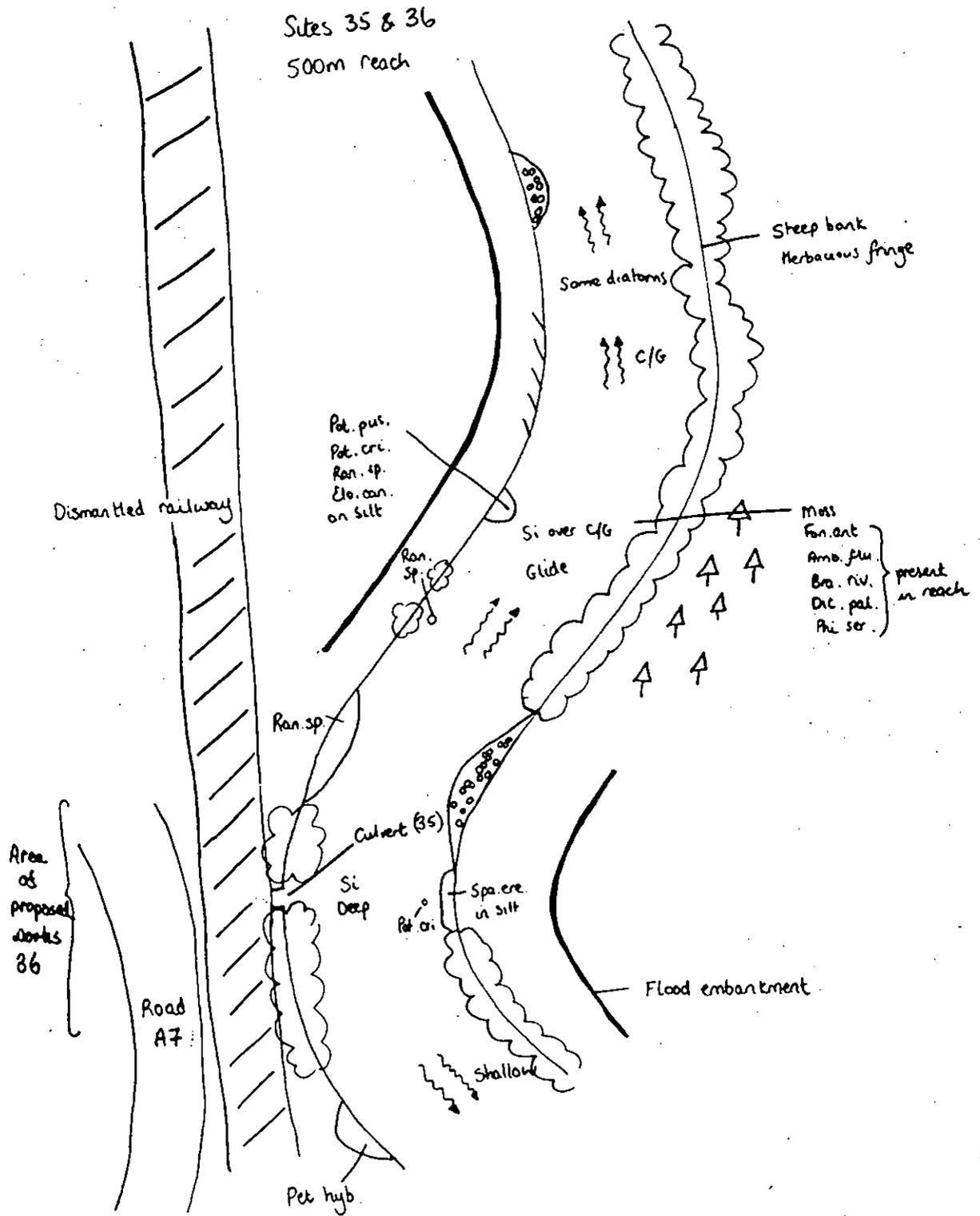
Species contributing to SAC CB Interest

<i>Amblystegium fluviatile</i>	Occasional
<i>Fontinalis antipyretica</i>	Rare
<i>Potamogeton crispus</i>	Rare
<i>Potamogeton pusillus</i>	Rare
<i>Ranunculus cf penicillatus pseudofluitans</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Brachythecium rivulare</i>	Rare

The site had a community which contains the correct species to meet the requirements of a CB4 community but they are not present in sufficiently large amounts.



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	1	1		
<i>Alnus glutinosa</i>	2	3		
<i>Amblystegium fluviatile</i>			2	2
<i>Brachythecium rivulare</i>	1	1		
<i>Caltha palustris</i>	2	2		
<i>Carex spp.</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
Diatoms			3	3
<i>Dicranella palustris</i>	1	1		
<i>Eleocharis palustris</i>	1	1		
<i>Elodea canadensis</i>			1	1
<i>Epilobium hirsutum</i>	1	1		
<i>Epilobium palustre</i>	1	1		
<i>Equisetum arvense</i>	2	1		
Filamentous green algae			2	1
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	1
<i>Iris pseudacorus</i>	1	1		
<i>Juncus acutiflorus</i>	2	1		
<i>Juncus bufonius</i>	1	1		
<i>Lotus pedunculatus</i>	1	1		
<i>Lunularia cruciata</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus</i>	1	1		
<i>Myosotis scorpioides</i>	3	2		
<i>Pellia sp.</i>	1	1		
<i>Petasites hybridus</i>	1	1		
<i>Phalaris arundinacea</i>	2	2		
<i>Philonotis seriata</i>	1	1		
<i>Plantago lanceolata</i>	1	1		
<i>Plantago major</i>	1	1		
<i>Potamogeton crispus</i>			1	1
<i>Potamogeton pusillus</i>			1	1
<i>Ranunculus repens</i>	2	2		
<i>Ranunculus cf. penicillatus pseudofluitans</i>			1	1
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp.</i>	2	1		
<i>Salix sp.</i>	2	3		
<i>Scirpus sylvaticus</i>	1	1		
<i>Senecio sp.</i>	2	1		
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	1	1		
Sponge			1	1
<i>Stachys palustris</i>	1	1		
<i>Trifolium sp.</i>	1	1		

Site Number 37

Location Gala Water at Bowland
Type of Work bank protection
Survey Plan No. 26&27
Parliamentary Sheet 62 & 63
NGR u/s NT 45900 39767
NGR d/s NT 46093 39300
JNCC river type U/S Vc Small, lowland, impoverished mixed sand/clay rivers
D/S Vb Small, lowland, base-rich sand rivers or winterbournes
CB community type similar to CB4
Surveyed length (m) 2 500m reaches + 50m

Overview

The site is of high conservation value. The site is a long straightened section of channel, circa 550m long. It was surveyed as two 500m reaches with an addition 50m surveyed to complete the site. The site is straightened and over-deepened through much of its length. Below the straightened reach the river shallows. The site is less shaded than most sites and submerged macrophytes (mosses, pondweeds and water crowfoots) grow in a number of patches.

Species contributing to SAC CB Interest

<i>Cinclidotus fontinaloides</i>	Rare
<i>Fontinalis antipyretica</i>	Rare
<i>Potamogeton crispus</i>	Occasional
<i>Ranunculus penicillatus pseudofluitans</i>	Occasional
<i>Rhynchosstegium riparioides</i>	Rare
<i>Amblystegium fluviatile</i>	Occasional

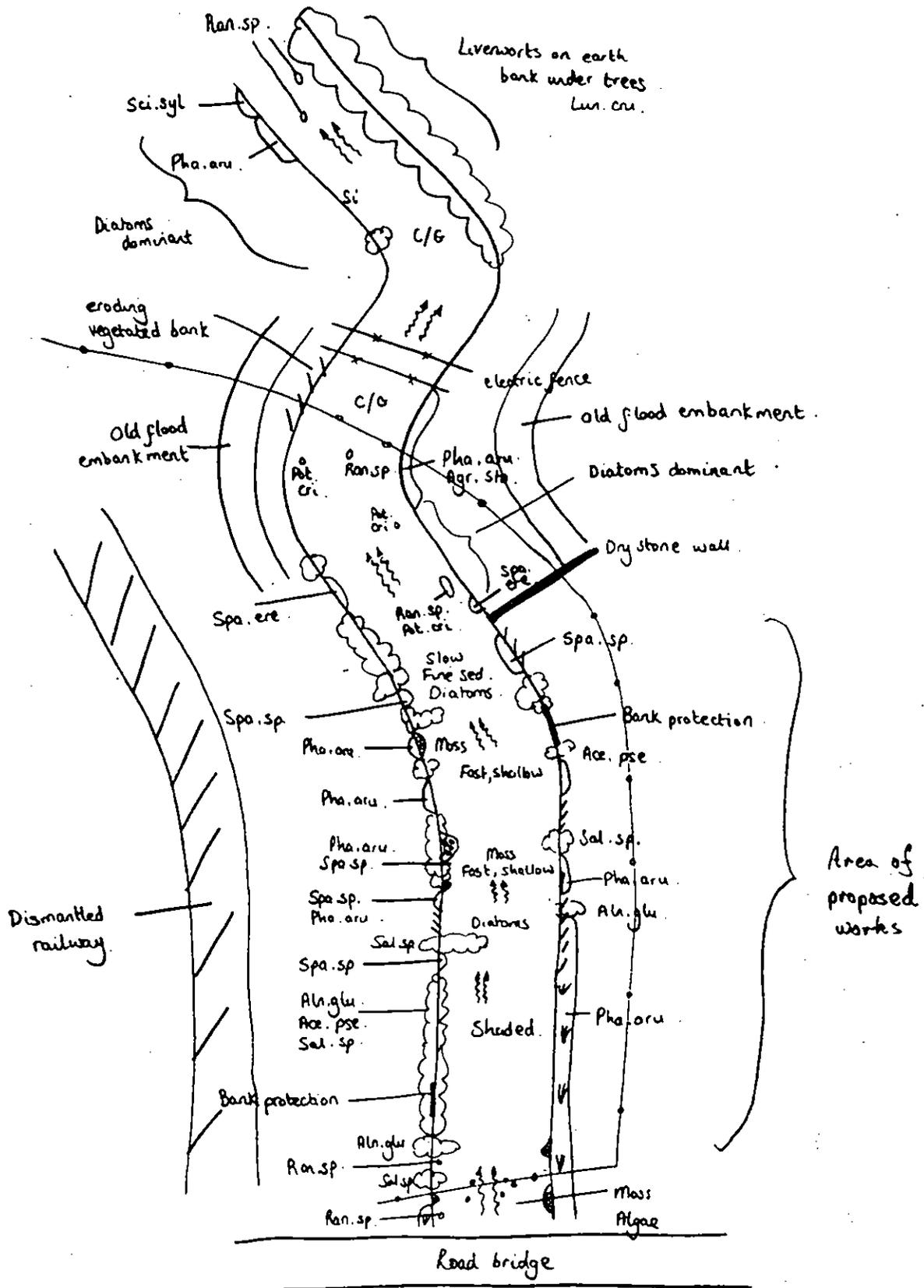
The site is a close match for a CB4 community and it supports healthier populations of submerged macrophytes than all other sites. However it does not quite match the requirements of a CB4 community as the water crowfoot (*R. penicillatus pseudofluitans* cf) is not the dominant submerged species. The pondweed (*P. crispus*) is the dominant instream higher plant. However the site is clearly of high conservation value both in terms of the diversity of species it supports and the relatively large water crowfoot population present at the site.

Photographs of the site



Site sketch map

Site 37 1000m reach



Species list (Upstream 500m)

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
Algae			3	2
<i>Alnus glutinosa</i>	2	3		
<i>Amblystegium fluviatile</i>			2	2
<i>Caltha palustris</i>	2	2		
<i>Carex spp.</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
<i>Didymosphenia geminata</i>			3	3
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense</i>	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>			2	1
<i>Juncus acutiflorus</i>	2	2		
<i>Lunularia cruciata</i>	1	1		
<i>Mentha aquatica</i>	2	2		
<i>Mimulus guttatus</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Petasites hybridus</i>	1	1		
<i>Phalaris arundinacea</i>	3	3		
<i>Plantago lanceolata</i>	1	1		
<i>Potamogeton crispus</i>			1	1
<i>Ranunculus repens</i>	2	2		
<i>Ranunculus sp</i>			1	1
<i>Rhynchosstegium riparioides</i>			1	1
<i>Rumex sp</i>	2	1		
<i>Salix sp.</i>	3	3		
<i>Scirpus sp</i>	2	2		
<i>Senecio sp</i>	1	1		
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	3	2	2	2
<i>Sponge</i>			1	1
<i>Stachys palustris</i>	2	2		

Species list (Downstream 500m)

MacrophyteName	Bank(relative)	Bank(%)	Aquatic(relative)	Aquatic(%)
<i>Agrostis stolonifera</i>	2	2		
<i>Angelica sylvestris</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Carex hirta</i>	1	1		
<i>Cinclidotus fontinaloides</i>			1	1
Diatoms			3	3
<i>Epilobium hirsutum</i>	1	1		
<i>Epilobium palustre</i>	1	1		
<i>Equisetum arvense</i>	1	1		
Fern	1	1		
Filamentous green algae			1	1
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			1	1
<i>Galium cruciata</i>	1	1		
<i>Glyceria fluitans</i>	1	1		
<i>Heracleum sphondylium</i>	1	1		
<i>Hildenbrandia rivularis</i>			1	1
<i>Hypnum cupressiforme</i>			1	1
<i>Iris pseudacorus</i>	1	1		
<i>Juncus articulatus/acutiflora</i>			1	1
<i>Lunularia cruciata</i>			1	1
<i>Lycopus europaeus</i>	1	1		
<i>Mentha aquatica</i>	2	1		
<i>Mimulus sp</i>	1	1		
<i>Myosotis scorpioides</i>	1	1		
<i>Petasites hybridus</i>	1	1		
<i>Phalaris arundinacea</i>	3	3		
<i>Plantago lanceolata</i>	1	1		
<i>Polygonum sp.</i>	1	1		
<i>Potamogeton crispus</i>			2	1
<i>Ranunculus peltatus</i>			1	1
<i>Ranunculus penicillatus ssp. pseudofluitans</i>			2	1
<i>Rhynchosstegium riparioides</i>			1	1
<i>Rumex sp</i>	1	1		
<i>Scirpus sylvaticus</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium emersum</i>			1	1
<i>Sparganium erectum</i>	3	3		
Sponge			1	1
<i>Stellaria alsine</i>	1	1		

Site Numbers 38 & 39

Location Whitelee
Type of Work Riverbank protection (38) and culvert renewal (39)
Survey Plan No. 28
Parliamentary Sheet 64
NGR u/s NT 46534 39188
NGR d/s NT 46444 38881
JNCC river type VIe - Small, basic, upland rivers
CB community type similar to CB4
Surveyed length (m) 500

Overview

There are species of conservation interest present at the site. The site contains two proposed works. The bank protection works pertain to the Gala Water whilst the culvert to be renewed contains a small stream which enters the Gala Water about 70m downstream of the culvert. The small stream contained no instream macrophytes and had a similar marginal flora to the main river.

There are a number of species of interest (mosses, pondweed and water crowfoot) found downstream of the area of proposed works on the Gala Water and the confluence of the culverted stream and the Gala Water.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Potamogeton crispus</i>	Occasional
<i>Potamogeton pusillus</i>	Rare
<i>Amblystegium fluviatile</i>	Rare
<i>Ranunculus cf penicillatus pseudofluitans</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare

The site is similar to a CB4 community. It contains the correct species of pondweed, water crowfoot, mosses and marginal vegetation. However these species are present in only low numbers and the water crowfoot (*R. cf penicillatus pseudofluitans*) is not dominant.

Photographs of site



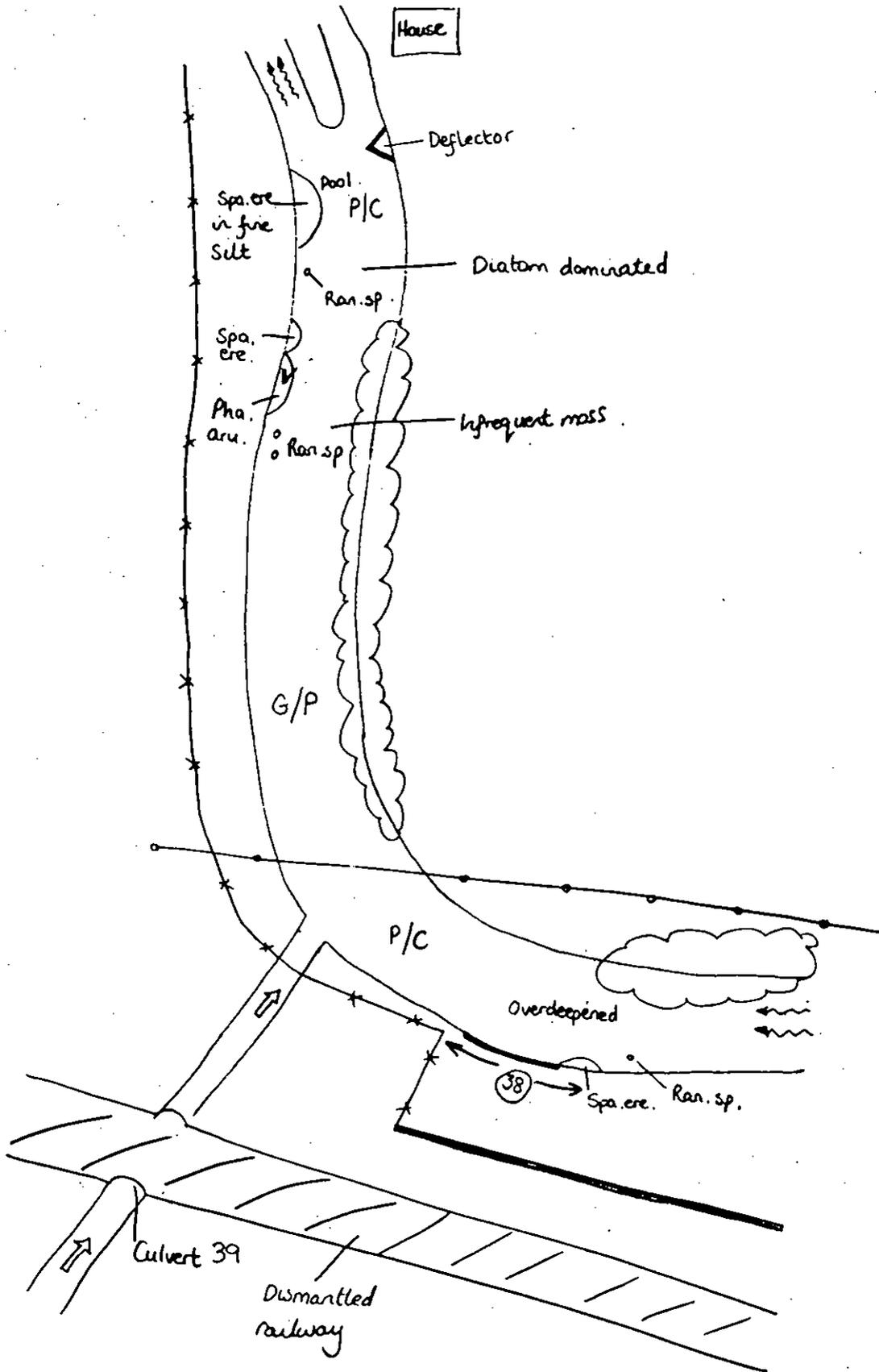
Site 38



Site 39 downstream of culvert

Site sketch map

Sites 38 & 39
500m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	3	3		
<i>Alnus glutinosa</i>	3	3		
<i>Amblystegium fluviatile</i>			1	1
<i>Angelica sylvestris</i>	1	1		
<i>Butomus umbellatus</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
<i>Eleocharis palustris</i>	1	1		
<i>Elodea canadensis</i>			1	1
<i>Epilobium hirsutum</i>	1	1		
<i>Epilobium palustre</i>	1	1		
<i>Equisetum arvense</i>	1	1		
Fern	1	1		
Filamentous green algae			1	1
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			3	1
<i>Heracleum sphondylium</i>	1	1		
<i>Iris pseudacorus</i>	1	1		
<i>Juncus bufonius</i>	1	1		
<i>Juncus effusus</i>	2	2		
<i>Mentha aquatica</i>	2	2		
<i>Mimulus guttatus</i>	1	1		
<i>Montia fontana</i>	1	1		
<i>Myosotis scorpioides</i>	1	1		
<i>Myosoton aquaticum</i>	1	1		
<i>Phalaris arundinacea</i>	2	2		
<i>Plantago major</i>	1	1		
<i>Potamogeton crispus</i>			2	1
<i>Potamogeton pusillus</i>			1	1
<i>Potentilla palustris</i>	1	1		
<i>Ranunculus repens</i>	2	2		
<i>Ranunculus cf penicillatus pseudofluitans</i>			1	1
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rorippa palustris</i>	1	1		
<i>Scirpus sylvaticus</i>	1	1		
<i>Sparganium emersum</i>	1	1		
<i>Sparganium erectum</i>	1	1		
Sponge			1	1
<i>Stachys palustris</i>	1	1		
<i>Tussilago farfara</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 40

Location Whin Water
Type of Work Underbridge 84
Survey Plan No. 29
Parliamentary Sheet 65
NGR u/s NT 47135 38906
NGR d/s NT 47590 38653
JNCC river type Va – Mesotrophic, upland hard limestone/sandstone rivers
CB community type CB4
Surveyed length (m) 500

Overview

This site has a greater quantity of large substrates than the other sites on Gala Water and therefore more appropriate habitat conditions for mosses (though these were not numerous). Much of the site is shaded by tree cover and most of the marginal species were not as numerous as at other sites, though small patches of healthy *Ranunculus* are present.

The site is one of the less engineered sites surveyed on the river.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional
<i>Ranunculus cf penicillatus pseudofluitans</i>	Rare
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Callitriche stagnalis</i>	Rare
<i>Brachythecium rivulare</i>	Rare
<i>Chiloscyphus polyanthus</i>	Rare
<i>Rhynchostegium riparioides</i>	Rare

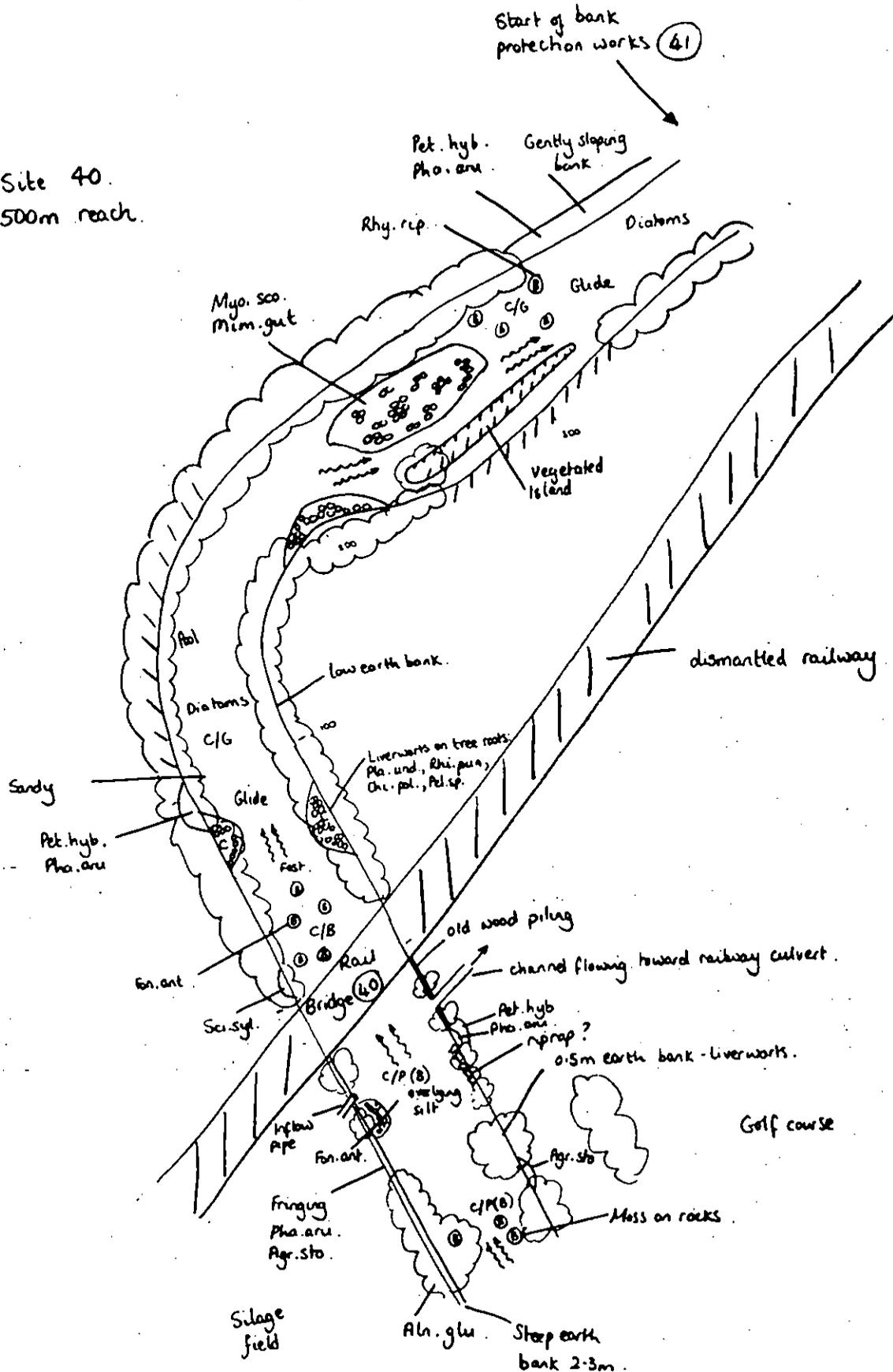
There is a good variety of macrophytes at the site including *Ranunculus*, making it of high conservation value and enabling it to be classified as a CB4 community (though the cover of the vegetation types is lower than normal at such sites). Four different vegetation components are represented and the location is one of the less impacted areas of the river.

Photographs of site



Site sketch map

Site 40.
500m reach.



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	2	2		
<i>Allium ursinum</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Brachythecium rivulare</i>	1	1		
<i>Callitriche stagnalis</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Cardamine flexuosa</i>	1	1		
<i>Carex remota</i>	1	1		
<i>Chiloscyphus polyanthos</i>	1	1		
<i>Chrysosplenium oppositifolium</i>	1	1		
<i>Cladophora glomerata</i>			1	1
<i>Cocconeis</i> sp.			1	1
<i>Conocephalum conicum</i>	1	1		
<i>Cruciata laevipes</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
Diatoms			2	3
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum arvense</i>	1	1		
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			1	2
<i>Galium palustre</i>	1	1		
<i>Glyceria fluitans</i>	1	1		
<i>Hildenbrandia rivularis</i>			2	2
<i>Juncus effusus</i>	1	1		
<i>Lathyrus pratensis</i>	1	1		
<i>Lemanea fluviatilis</i>			1	1
<i>Lunularia cruciata</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus</i>	1	1		
<i>Mnium hornum</i>	1	1		
<i>Montia sibirica</i>	2	2		
<i>Myosotis scorpioides</i>	2	1		
<i>Pellia endiviifolia</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Petasites hybridus</i>	2	2		
<i>Phalaris arundinacea</i>	2	2		
<i>Plagiomnium undulatum</i>	1	1		
<i>Ranunculus acris</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Ranunculus cf. penicillatus</i> ssp. <i>pseudofluitans</i>			1	1
<i>Rhizomnium punctatum</i>	1	1		
<i>Rhynchosstegium riparioides</i>			2	2
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Scirpus sylvaticus</i>	2	2		
<i>Scrophularia auriculata</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Stachys palustris</i>	1	1		
<i>Stachys sylvatica</i>	2	1		
<i>Stellaria media</i>	1	1		
<i>Tussilago farfara</i>	1	1		

Site Number 41

Location near Torquhan
Type of Work Embankment
Survey Plan No. 29
Parliamentary Sheet 65
NGR u/s NT 47590 38653
NGR d/s NT 47831 38699
JNCC river type Vb - Small, lowland, base-rich sand rivers or winterbournes
CB community type similar to CB4
Surveyed length (m) 900

Overview

This site is of high conservation value. It has an especially diverse flora. The banks are heavily shaded through most of its length but the river is sufficiently wide to allow light to reach the channel in many places allowing patches of instream vegetation to grow. The weir pool acts as an ideal habitat for many macrophytes, including water crowfoot and pondweed species. The crowfoots were found on the gabions forming the weir. Downstream of the weir the site contained many fragments of crowfoot plants at the time of sampling. Only those fragments that were rooted were recorded. The shady banks of the stream provided habitat for both vascular plants (*Scirpus sylvaticus*) and a wide range of bryophytes (*Pellia sp.*) whilst exposed gravel side bars supported a flora of mainly procumbent herbs (*Sagina procumbens*).

Species contributing to SAC CB Interest

<i>Callitriche platycarpa</i>	Rare
<i>Callitriche stagnalis/platycarpa</i>	Rare
<i>Fontinalis antipyretica</i>	Occasional
<i>Potamogeton crispus</i>	Rare
<i>Ranunculus penicillatus ssp. pseudofluitans</i>	Rare
<i>Rhynchosstegium riparioides</i>	Occasional
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Pellia sp.</i>	Rare
<i>Brachythecium rivulare</i>	Rare

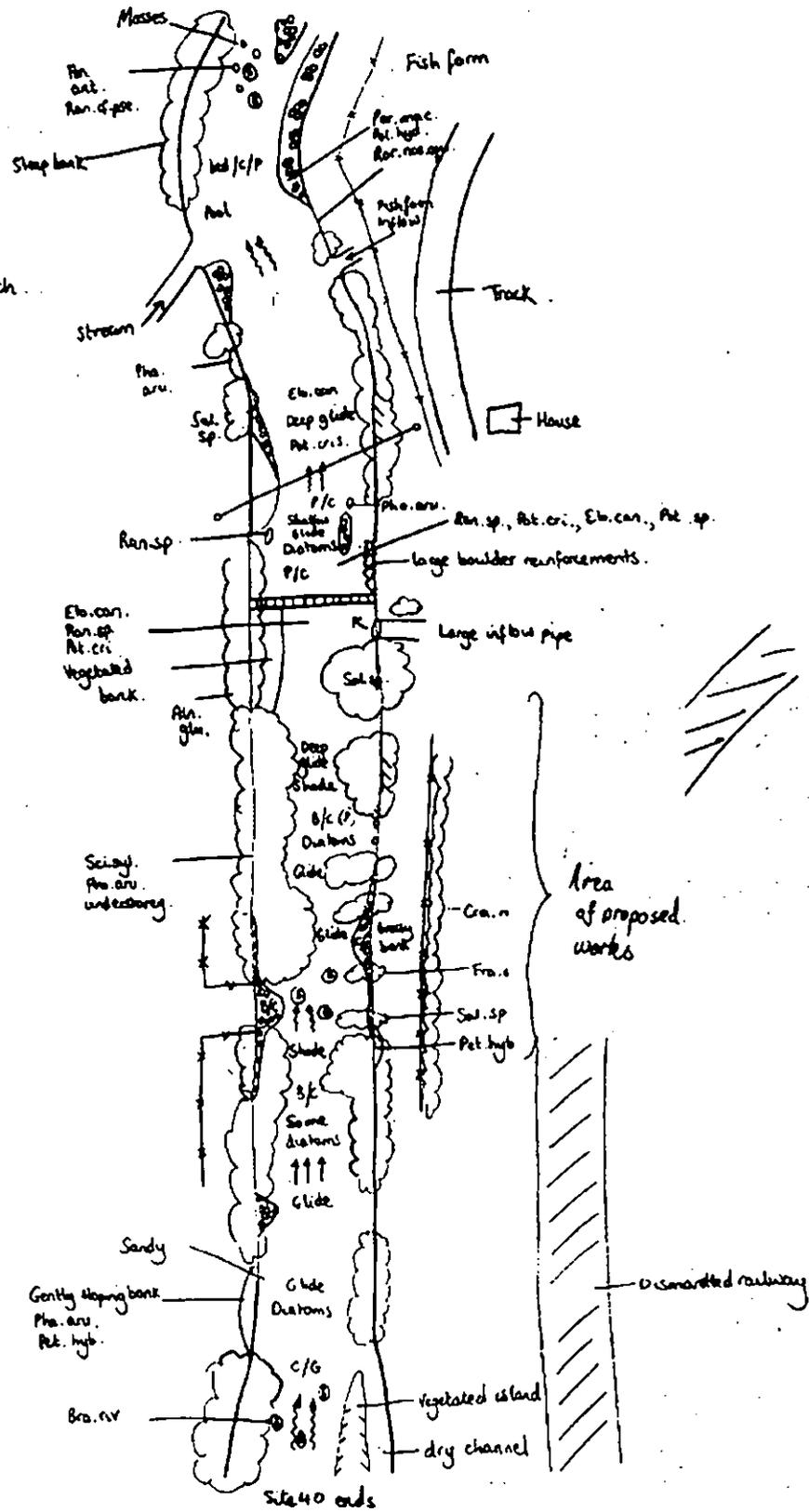
The site has a macrophyte assemblage which matches the requirements of a CB4 community type. The correct types of pondweed, water crowfoot, bryophytes and marginal plants are present and the moss *Rhynchosstegium riparioides* dominates the instream macrophyte flora.

Photographs of site



Site sketch map

Site 41
800m reach



Species List

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	1	1		
<i>Amblystegium fluviatile</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Brachythecium rivulare</i>	1	1		
<i>Callitriche platycarpa</i>			1	1
<i>Callitriche stagnalis/platycarpa</i>			1	1
<i>Chiloscyphus polyanthos</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
<i>Cruciata laevipes</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
Diatoms			3	3
<i>Elodea canadensis</i>			1	1
<i>Equisetum spp.</i>	1	1		
Fern	1	1		
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	2
<i>Heracleum sphondylium</i>	1	1		
<i>Hildenbrandia rivularis</i>			1	1
<i>Juncus articulatus</i>	1	1		
<i>Lemanea fluviatilis</i>			2	1
<i>Lunularia cruciata</i>	1	1		
<i>Lycopus europaeus</i>	1	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus sp</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Pellia sp.</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Petasites sp.</i>	1	1		
<i>Phalaris arundinacea</i>	3	2		
<i>Plagiomnium undulatum</i>	1	1		
<i>Polygonum aviculare</i>	1	1		
<i>Potamogeton crispus</i>			1	1
<i>Potamogeton pusillus</i>			1	1
<i>Ranunculus peltatus</i>			1	1
<i>Ranunculus penicillatus ssp. pseudofluitans</i>			1	1
<i>Ranunculus repens</i>	1	1		
<i>Rhizomnium punctatum</i>	1	1		
<i>Rhynchosstegium riparioides</i>			2	2
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Sagina procumbens</i>	1	1		
<i>Scirpus sylvaticus</i>	1	1		
<i>Sparganium erectum</i>	2	1		
<i>Stachys palustris</i>	1	1		
<i>Stellaria uliginosa</i>	1	1		
<i>Trifolium pratense</i>	1	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 42

Location Torwoodlee water
Type of Work Underbridge 87
Survey Plan No. 30
Parliamentary Sheet 70
NGR u/s NT 47556 37963
NGR d/s NT na
JNCC river type VIc Middle reaches of upland rivers traversing more base-rich strata
CB community type similar to CB4
Surveyed length (m) 500

Overview

The site contains species of conservation value. This site differs from most of the other sites surveyed on the Gala Water in its large substrate size and extensive shading. The river is dynamic in an area upstream of the bridge, downstream the water is mostly deeper. Some patches of *Ranunculus penicillatus ssp. pseudofluitans* and *Potamogeton crispus* are present downstream of the bridge. Much smaller patches of *Ranunculus* occur upstream of the bridge in the shallower and more fast flowing area of the channel. Mosses are frequent on the exposed cobbles and boulders near the bridge.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional/frequent
<i>Rhynchostegium riparioides</i>	Occasional/frequent
<i>Potamogeton crispus</i>	Rare
<i>Ranunculus penicillatus pseudofluitans</i>	Rare

As with almost all sites on the Gala Water the community most closely resembles a CB4 community but lacks key elements. Here the correct type of marginal vegetation is missing and the water crowfoot *R. penicillatus pseudofluitans cf* is not abundant enough to meet the criteria for inclusion as a CB4 community. The site does however contain more water crowfoot than many sites on the Gala Water and it should be protected.

Photographs of site



Site Number 45

Location Galashiels
Type of Work Underbridge
Survey Plan No. 30
Parliamentary Sheet 70
NGR u/s Not recorded
NGR d/s Not recorded
JNCC river type VIe - Small, basic, upland rivers
CB community type CB4
Surveyed length (m) 500

Overview

The site has a macrophyte community of conservation interest. The site is heavily shaded throughout but the channel is wide allowing instream macrophytes to develop in more open patches. There are small patches of deep water and silty substrate which add to the diversity of instream habitat.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Rare
<i>Potamogeton crispus</i>	Rare
<i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>	Rare
<i>Rhynchoetogium riparioides</i>	Occasional
<i>Rorippa nasturtium-aquaticum</i>	Dominant

The site contains four vegetation components and meets the requirements for community type CB4. The correct types of crowfoot, pondweed, bryophytes and marginal species are present. In addition *Rhynchoetogium riparioides* is the dominant instream macrophyte species, which also fits with the required criteria for CB4 communities.

Photographs of site



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agropyron sp.</i>	1	1		
<i>Agrostis stolonifera</i>	2	2		
<i>Caltha palustris</i>	2	2		
<i>Cladophora agg.</i>			2	3
<i>Elodea canadensis</i>			1	1
<i>Epilobium hirsutum</i>	1	1		
<i>Filipendula ulmaria</i>	1	2		
<i>Fontinalis antipyretica</i>			2	2
<i>Glyceria fluitans</i>	2	2		
<i>Lemanea fluviatilis</i>			1	1
Liverworts	1	1		
<i>Mentha sp.</i>	1	1		
<i>Mimulus guttatus</i>	2	2		
<i>Myosotis scorpioides</i>	2	2		
<i>Oedogonium sp.</i>			1	1
<i>Petasites hybridus</i>	2	2		
<i>Phalaris arundinacea</i>	2	3		
<i>Potamogeton crispus</i>			1	1
<i>Ranunculus penicillatus ssp. pseudofluitans</i>			1	1
<i>Rhynchosstegium riparioides</i>			2	3
<i>Rorippa palustris</i>	1	1		
<i>Rumex acetosella</i>	1	1		
<i>Rumex sp.</i>	1	1		
<i>Salix sp.</i>	1	1		
<i>Scirpus sylvaticus</i>	1	1		
<i>Sparganium erectum</i>	1	2	1	1
Sponge			1	1
<i>Stachys palustris</i>	1	1		
<i>Symphytum officinale</i>	1	1		
<i>Tussilago farfara</i>	1	2		
<i>Vaucheria sp.</i>			1	1

Species List

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	1	1		
<i>Alopecurus geniculatus</i>	1	1		
<i>Amblystegium fluviatile</i>	1	1		
<i>Amblystegium tenax</i>	1	1		
<i>Angelica sylvestris</i>	1	1		
<i>Brachythecium rivulare</i>			1	1
<i>Caltha palustris</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
<i>Cratoneuron filicinum</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
<i>Elodea canadensis</i>			1	1
<i>Epilobium hirsutum</i>	2	1		
Fern	1	1		
Filamentous green algae			1	1
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			2	1
<i>Glyceria fluitans</i>	1	1		
<i>Hildenbrandia rivularis</i>			1	1
<i>Lunularia cruciata</i>	2	1		
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus</i>	1	1		
<i>Myosotis scorpioides</i>	2	1		
<i>Pellia sp.</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Petasites hybridus</i>	1	1		
<i>Phalaris arundinacea</i>	2	1		
<i>Potamogeton crispus</i>			1	1
<i>Ranunculus penicillatus ssp. pseudofluitans</i>			1	1
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>			3	1
<i>Rorippa nasturtium-aquaticum</i>	2	1		
<i>Rorippa sylvestris</i>	1	1		
<i>Rumex acetosella</i>	1	1		
<i>Rumex sp.</i>	1	1		
<i>Salix sp.</i>	1	1		
<i>Scirpus sylvaticus</i>	1	1		
<i>Sparganium erectum</i>	1	1		
<i>Stachys palustris</i>	1	1		
<i>Symphytum officinale</i>	1	1		
<i>Tussilago farfara</i>	1	1		

Site Number 46

Location Kilnknowe
Type of Work Underbridge_95
Survey Plan No. 31 & 32
Parliamentary Sheet 71 & 72
NGR u/s NT 48235 37065
NGR d/s NT 48454 36830
JNCC river type VIId - Small, low-gradient meso-eutrophic rivers
CB community type no clear type
Surveyed length (m) 350 access limited by health and safety requirements

Overview

The site contains some species of conservation interest. This site is located within Galashiels and parts of the bank and channel are heavily modified. A large weir is present at the upstream end of the site. Algae growth is extensive on the more stable artificial substrates, and bryophytes have accumulated on these areas and the more course substrates. Himalayan balsam (*Impatiens glandulifera*) was recorded on the banks. Channel vegetation is sparse, in part due to shading by bankside trees. A depositional bar is present downstream of the bridge. The marginal vegetation is similar to that found at other sites on the river.

Species contributing to SAC CB Interest

<i>Fontinalis antipyretica</i>	Occasional/Frequent (some large areas)
<i>Rhynchostegium riparioides</i>	Occasional/Frequent
<i>Ranunculus peltatus</i>	Rare
<i>Pellia endiviifolia</i>	Rare

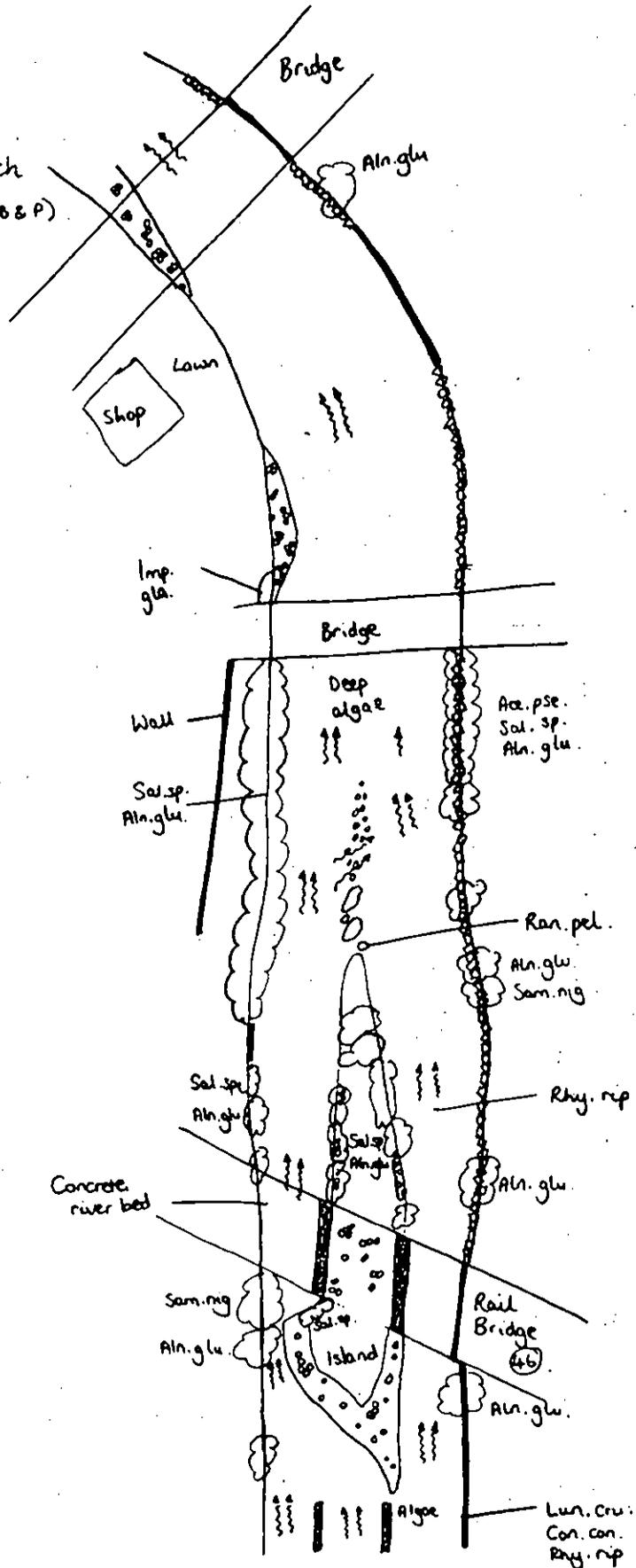
The site does not match any CB community but it does contain species of conservation interest.

Photographs of site



Site sketch map

Site 46
 350 + m reach
 Substrate C (B & P)
 Urban



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Acer pseudoplatanus</i>	1	1		
<i>Aegopodium podagraria</i>	1	1		
<i>Agrostis stolonifera</i>	2	2		
<i>Alnus glutinosa</i>	2	2		
<i>Caltha palustris</i>	2	1		
<i>Cardamine sp.</i>	1	1		
<i>Carex spp.</i>	1	1		
<i>Centaurea nigra</i>	1	1		
<i>Conocephalum conicum</i>	1	1		
<i>Convolvulus sp.</i>	1	1		
<i>Elodea canadensis</i>			1	1
<i>Epilobium hirsutum</i>	1	1		
<i>Epilobium spp.</i>	1	1		
<i>Equisetum arvense</i>	1	1		
Fern	1	1		
<i>Filipendula ulmaria</i>	2	2		
<i>Fontinalis antipyretica</i>	2	1	2	2
<i>Galium sp</i>	1	1		
<i>Heracleum sphondylium</i>	1	1		
<i>Hildenbrandia rivularis</i>			1	1
<i>Impatiens glandulifera</i>	1	1		
<i>Juncus acutiflorus</i>	1	1		
<i>Lunularia cruciata</i>	1	1		
<i>Mentha aquatica</i>	2	1		
<i>Mimulus guttatus</i>	2	1		
<i>Mimulus guttatus x luteus</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Oedogonium sp.</i>	1	1	2	3
<i>Pellia endiviifolia</i>	1	1		
<i>Persicaria maculosa</i>	1	1		
<i>Petasites hybridus</i>	2	2		
<i>Phalaris arundinacea</i>	2	2		
<i>Ranunculus peltatus</i>			1	1
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>	2	1	2	2
<i>Ribes nigrum</i>	1	1		
<i>Rorippa sylvestris</i>	1	1		
<i>Rumex sp</i>	1	1		
<i>Salix sp.</i>	2	2	1	1
<i>Scirpus sylvaticus</i>	1	1		
<i>Solanum dulcamara</i>	1	1		
<i>Sparganium erectum</i>	1	1	2	1
<i>Stachys palustris</i>	2	1		
<i>Tussilago farfara</i>	1	1		
<i>Urtica dioica</i>	1	1		

Site Number 47

Location Comley Bank Mill Retail Park
Type of Work Riverbank protection
Survey Plan No. 32
Parliamentary Sheet 72
NGR u/s NT 48559 36793
NGR d/s NT 48856 36531
JNCC river type VIe – Small, basic, upland rivers
CB community type similar to CB4
Surveyed length (m) 650

Overview

A heavily modified stretch of Gala Water, flowing through Galashiels. Extensive bank reinforcement, a large weir and a fish pass are present. The channel is constrained by high, reinforced banks downstream of the weir and the flow is impounded above the weir.

Most of the aquatic macrophytes at the site occur in a small area just upstream of the weir.

Himalayan balsam (*Impatiens glandulifera*) and Japanese knotweed (*Fallopia japonica*) were both recorded at the site.

Species contributing to SAC CB Interest

<i>Rhynchostrigium riparioides</i>	Frequent
<i>Potamogeton crispus</i>	Occasional (some large stands)
<i>Rorippa nasturtium-aquaticum</i>	Rare
<i>Fontinalis antipyretica</i>	Rare
<i>Ranunculus peltatus</i>	Rare

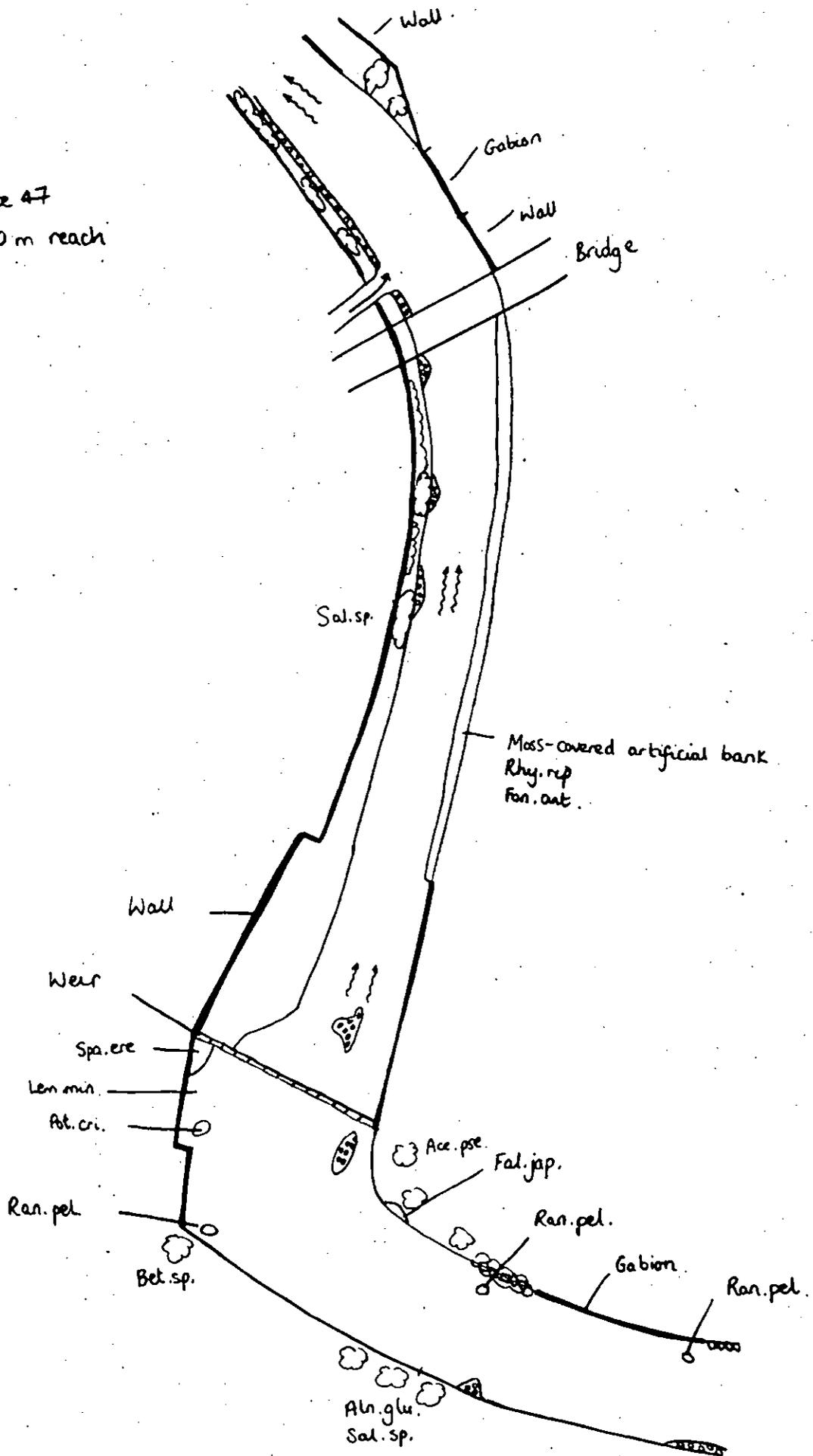
The site contains elements of a CB4 community but lacks *Ranunculus penicillatus* *pseudofluitans*.

Photographs of site



Site sketch map

Site 47
650 m reach



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Acer pseudoplatanus</i>	1	1		
<i>Agrostis stolonifera</i>	2	2		
<i>Alnus glutinosa</i>	2	1		
<i>Angelica sylvestris</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Circaea lutetiana</i>	1	1		
<i>Cladophora glomerata</i>			2	2
<i>Elodea canadensis</i>			2	1
<i>Epilobium hirsutum</i>	1	1		
<i>Equisetum palustre</i>	1	1		
<i>Fallopia japonica</i>	1	1		
<i>Filipendula ulmaria</i>	1	1		
<i>Fontinalis antipyretica</i>			1	1
<i>Impatiens glandulifera</i>	1	1		
<i>Juncus articulatus</i>	1	1		
<i>Juncus effusus</i>	1	1		
<i>Lemna minor</i>			1	1
<i>Mentha aquatica</i>	1	1		
<i>Mimulus guttatus</i>	2	2		
<i>Myosotis scorpioides</i>	1	1		
<i>Oedogonium sp.</i>			1	1
<i>Persicaria maculosa</i>	1	1		
<i>Petasites hybridus</i>	2	2		
<i>Phalaris arundinacea</i>	2	2	1	1
<i>Potamogeton crispus</i>			2	1
<i>Ranunculus peltatus</i>			2	1
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>			2	3
<i>Rorippa nasturtium-aquaticum</i>	1	1		
<i>Rumex sp.</i>	1	1		
<i>Salix sp.</i>	2	2		
<i>Scirpus sylvaticus</i>	1	1		
<i>Solanum dulcamara</i>	1	1	1	1
<i>Sparganium erectum</i>	1	1	1	1
<i>Tussilago farfara</i>	2	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 49

Location River Tweed at Red Bridge
Type of Work Underbridge 104
Survey Plan No. 34
Parliamentary Sheet 77
NGR u/s NT
NGR d/s NT
JNCC river type VI d – Small, low-gradient meso-eutrophic rivers
CB community type CB3
Surveyed length (m) 500

Overview

The two main habitat types consist of shallow fast flowing cobble/boulder/bedrock areas and deeper slower flowing reaches. *Ranunculus* was recorded in both fast and slow flowing areas. *Potamogeton pusillus* and *Elodea canadensis* were recorded in a deep and silty pooled area downstream of the bridge. The deeper, slower flowing areas downstream of the bridge are almost devoid of aquatic plant growth.

Himalayan balsam (*Impatiens glandulifera*) and Japanese knotweed (*Fallopia japonica*) were both recorded at the site.

Discharge from a Water Treatment Works at the upstream end of the site may have some influence on the variety and extent of species at the site.

Species contributing to SAC CB Interest

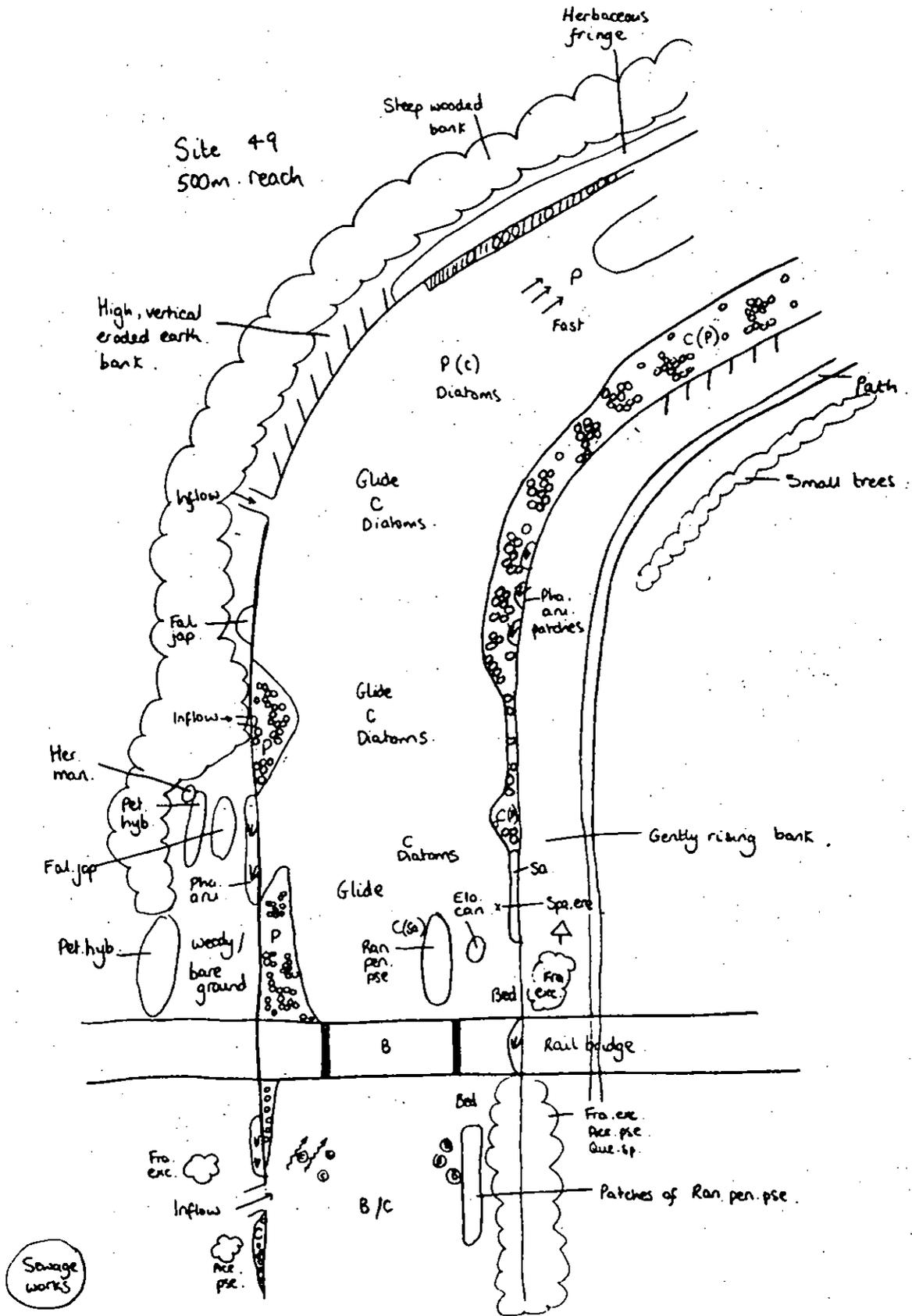
<i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>	Occasional
<i>Fontinalis squamosa</i>	Rare
<i>Rhynchosstegium riparioides</i>	Rare
<i>Potamogeton crispus</i>	Rare

This site is a CB3 community (large *Ranunculus fluitans* rivers) due to the variety of species present. The river Tweed contains a significant quantity of CB3c community in the borders area.

Photographs of site



Site sketch map



Species list

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Agrostis stolonifera</i>	1	1		
<i>Alliaria petiolata</i>	1	1		
<i>Caltha palustris</i>	1	1		
<i>Centaurea nigra</i>	1	1		
<i>Cirsium arvense</i>	1	1		
<i>Cladophora</i> agg.			2	2
<i>Conocephalum conicum</i>	1	1		
<i>Deschampsia cespitosa</i>	1	1		
<i>Eleocharis palustris</i>	1	1		
<i>Elodea canadensis</i>			2	2
<i>Epilobium hirsutum</i>	1	1		
<i>Epilobium</i> spp.	1	1		
<i>Equisetum arvense</i>	1	1		
<i>Fallopia japonica</i>	2	2		
<i>Filipendula ulmaria</i>	1	2		
<i>Fontinalis squamosa</i>			1	1
<i>Hildenbrandia rivularis</i>			1	2
<i>Hypericum maculatum</i>	1	1		
<i>Impatiens glandulifera</i>	2	2		
<i>Juncus acutiflorus</i>	1	1		
<i>Lemna minor</i>			1	1
<i>Lysimachia vulgaris</i>	1	1		
<i>Matricaria discoidea</i>				
<i>Mimulus guttatus</i>	1	1		
<i>Myosotis scorpioides</i>	2	2		
<i>Myosoton aquaticum</i>	1	1		
<i>Oedogonium</i> sp.			2	2
<i>Papaver</i> sp	1	1		
<i>Pellia</i> sp.	1	1		
<i>Persicaria amphibia</i>	1	1		
<i>Persicaria hydropiper</i>	1	1		
<i>Phalaris arundinacea</i>	2	2		
<i>Plantago lanceolata</i>	1	1		
<i>Potamogeton crispus</i>			1	1
<i>Potamogeton pusillus</i>			1	1
<i>Potentilla palustris</i>	1	1		
<i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i>			2	2
<i>Ranunculus repens</i>	1	1		
<i>Rhynchosstegium riparioides</i>			1	1
<i>Rorippa palustris</i>	1	1		
<i>Rorippa sylvestris</i>	1	1		
<i>Rumex obtusifolius</i>	1	1		
<i>Salix</i> sp.	1	1		
<i>Scirpus sylvaticus</i>	1	1		
<i>Senecio aquaticus</i>	1	1		
<i>Solanum dulcamara</i>	1	1		
<i>Sparganium erectum</i>	1	2		
<i>Spergula</i> sp.	1	1		
<i>Stachys palustris</i>	1	1		
<i>Symphytum officinale</i>	1	1		
<i>Urtica dioica</i>	1	1		
<i>Valeriana</i> sp.	1	1		
<i>Vicia cracca</i>	1	1		

Site Number 50

Location Upstream of Heriot
Type of Work Culvert
Survey Plan No. 6a
Parliamentary Sheet 35
NGR u/s NT 39869 55315
NGR d/s NT 40252 54926
JNCC river type Too few species to accurately calculate
CB community type None matching
Surveyed length (m) 500

Overview

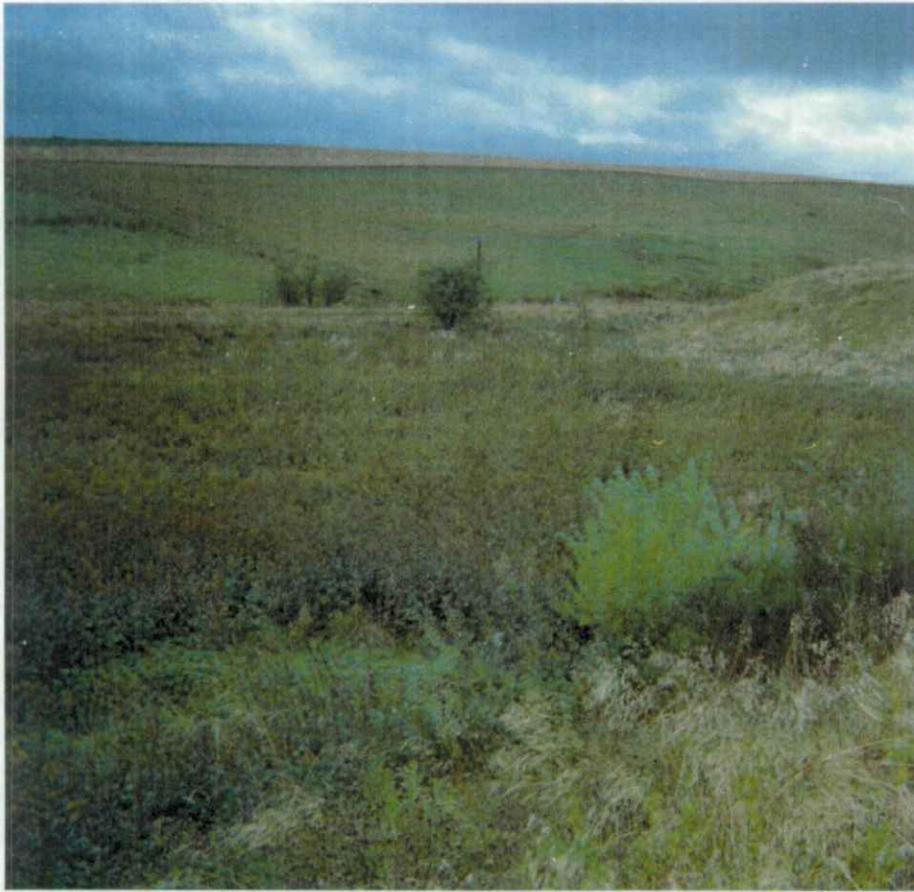
The site does not contain a macrophyte community of conservation interest but the Gala Water does pass through a wetland dominated by meadowsweet which is of minor interest. The site is in the head waters of the Gala Water. Here the river has become a minor stream and is a drainage ditch above the culvert. The stream is completely shaded by overhanging meadowsweet plants. Only at the entrance and exit of the culvert does the channel become open to the light and here *Mentha aquatica* and *Fontinalis antipyretica* can be found.

Species contributing to SAC CB Interest

Fontinalis antipyretica Rare

The Gala Water is a stream at this point and does not resemble any CB community.

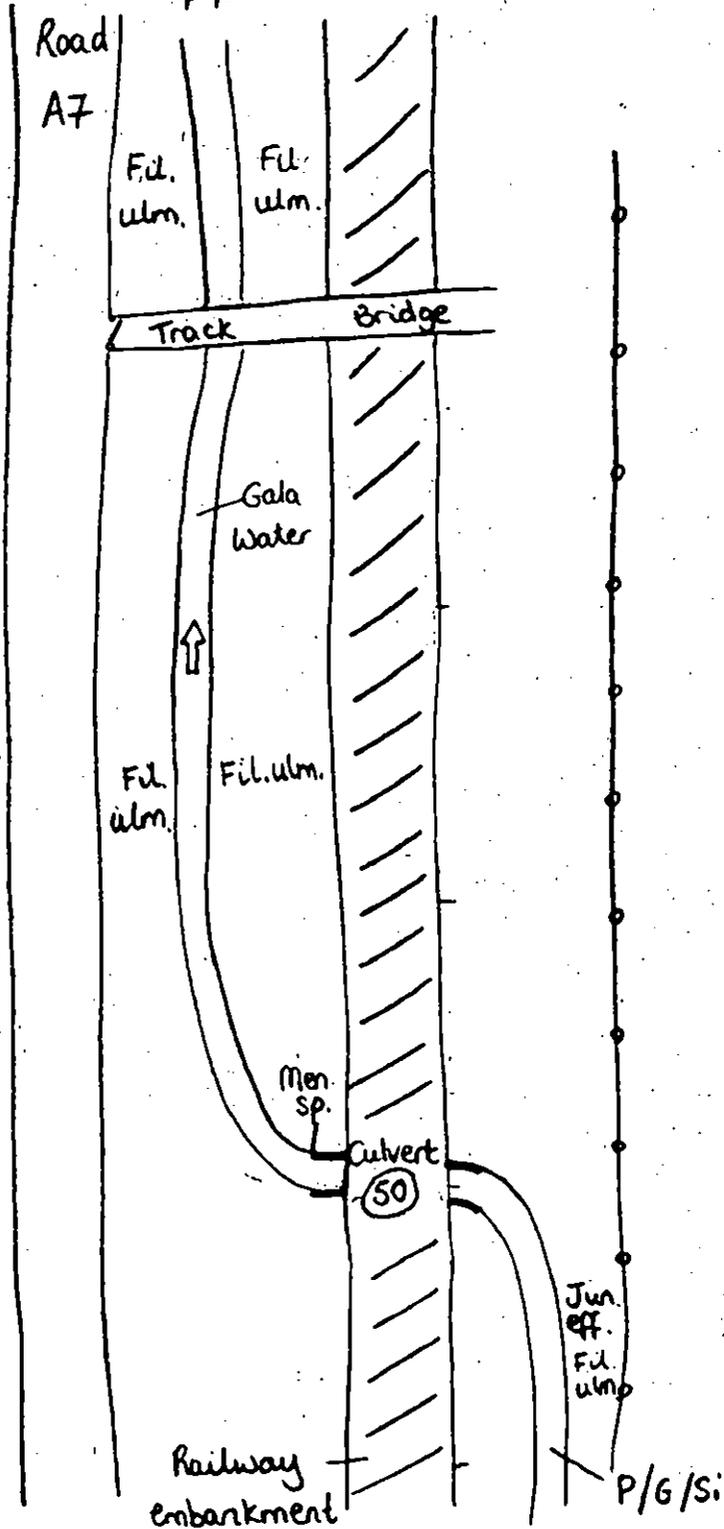
Photographs of site



Site sketch map

Site 50
500m reach

Continues on
map for sites 51 & 52



Species List

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Deschampsia cespitosa</i>	1	1		
<i>Epilobium palustre</i>	1	1		
<i>Filipendula ulmaria</i>	3	3		
<i>Fontinalis antipyretica</i>			3	1
<i>Galium cruciata</i>	1	1		
<i>Glyceria fluitans</i>	1	1		
<i>Juncus effusus</i>	2	3		
<i>Mentha aquatica</i>	1	1		
<i>Pellia epiphylla</i>	1	1		
<i>Ranunculus repens</i>	1	1		
<i>Rumex sp</i>	1	1		

Site Number 51

Location Upstream of Heriot
Type of Work Culvert
Survey Plan No. 6a
Parliamentary Sheet 35
NGR u/s NT 40252 54926
NGR d/s NT 4031 5469
JNCC river type Too few species to accurately calculate
CB community type None matching
Surveyed length (m) circa 400 (the bottom of this site abuts site 52)

Overview

This site has very limited conservation interest for macrophytes. This site is immediately downstream of site 50 and is very similar. Upstream of the culvert the stream passes through a *Phalaris arundinacea* wet meadow/bog. Downstream the site passes through more *P. arundinacea* and is flanked on its west side by rough pasture. Again the stream is covered for much of its length by terrestrial vegetation and there is no significant macrophyte interest.

Species contributing to SAC CB Interest

There are no species of CB interest.

Photographs of site

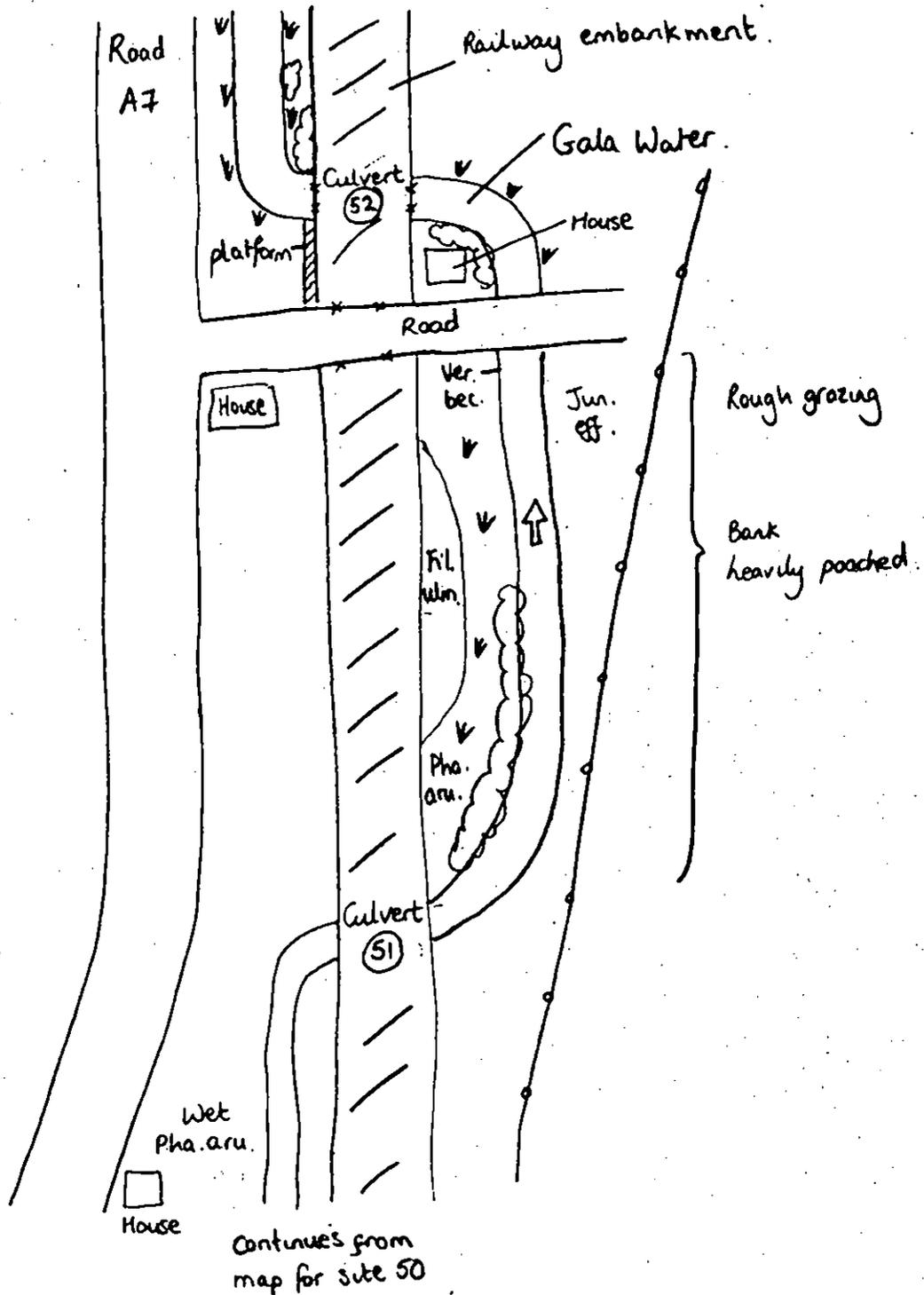


Site sketch map

Sites 51 & 52

400m reach

Continues on map for sites 4 & 5



Species List

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Filipendula ulmaria</i>	1	1		
<i>Juncus effusus</i>	2	1		
<i>Phalaris arundinacea</i>	3	3		
<i>Ranunculus repens</i>	1	1		
<i>Salix sp.</i>	2	1		
<i>Veronica beccabunga</i>	1	1		

Site Number 52

Location Heriot Station
Type of Work Culvert
Survey Plan No. 6b
Parliamentary Sheet 36
NGR u/s NT 4031 5469
NGR d/s NT 40405 54455

JNCC river type

CB community type

Surveyed length (m) circa 200 the site abuts sites 51 and site 4.

Overview

The site does not contain species of conservation interest. The stream is dominated and over-shadowed by *Phalaris arundinacea*.

Species contributing to SAC CB Interest

There are no species contributing to a CB interest.

Photographs of site

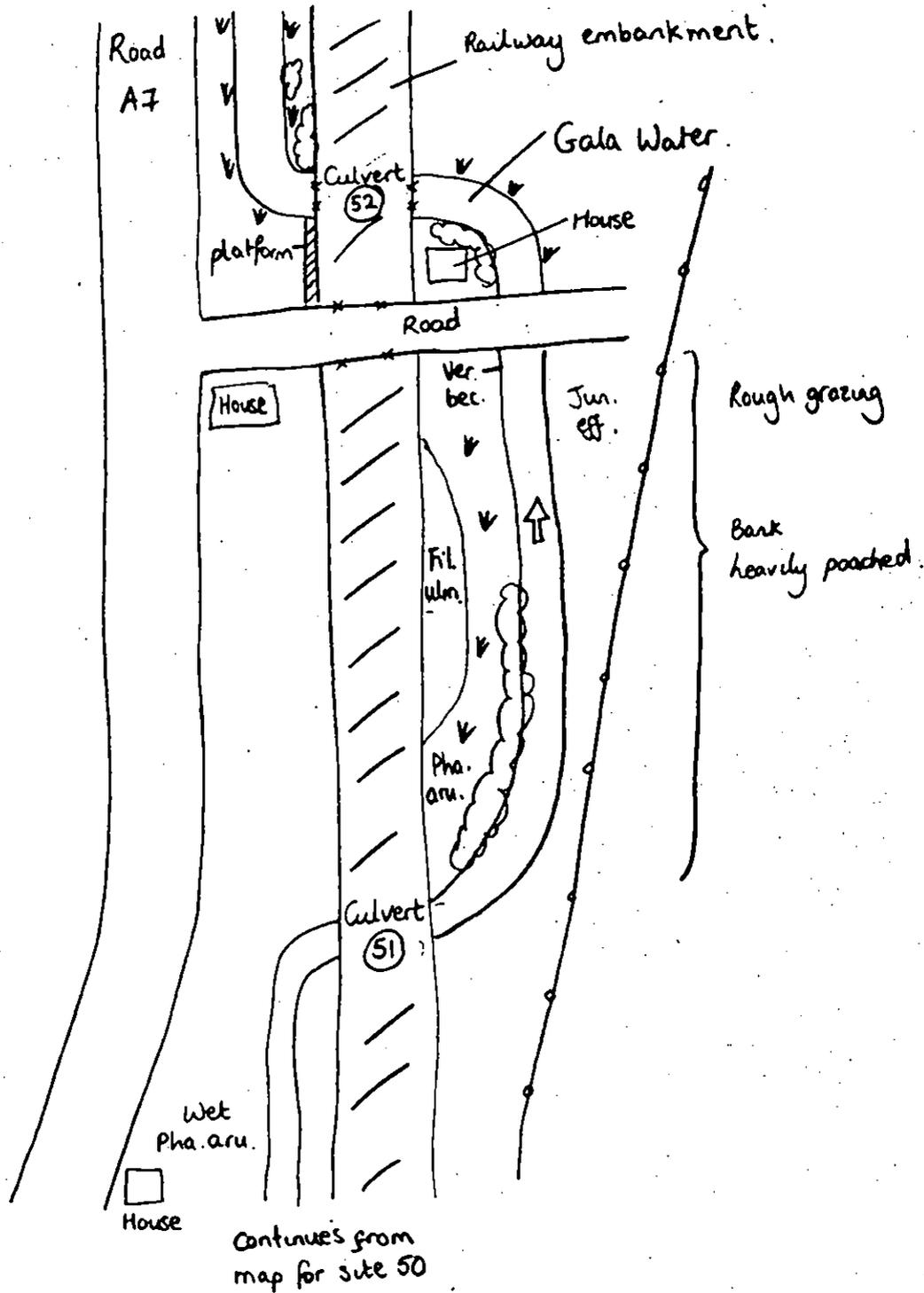


Site sketch map

Sites 51 & 52

400m reach

Continues on map for sites 4 & 5



Species List

MacrophyteName	Bank (relative)	Bank (%)	Aquatic (relative)	Aquatic (%)
<i>Filipendula ulmaria</i>	1	1		
<i>Juncus effusus</i>	2	1		
<i>Phalaris arundinacea</i>	3	3		
<i>Ranunculus repens</i>	1	1		
<i>Salix sp.</i>	2	1		
<i>Veronica beccabunga</i>	1	1		

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