

M25 junction 28 improvement scheme TR010029 6.3 Environmental Statement Appendix 7.5: River corridor survey

APFP Regulation 5(2)(a)
Planning Act 2008

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



Infrastructure Planning

Planning Act 2008

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

M25 junction 28 scheme Development Consent Order 202[x]

6.3 ENVIRONMENTAL STATEMENT 7.5: RIVER CORRIDOR SURVEY

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Appendix 7.5 River corridor survey

7. River corridor survey

7.1 Introduction

- 7.1.1 The purpose of this report is to detail the findings of the River Corridor Surveys (RCSs) undertaken on the Weald Brook and Ingrebourne River, near Brentwood Essex on 2 November 2017. These surveys were undertaken as part of the M25 junction 28 improvement scheme (the Scheme) for Highways England and provides baseline ecological and geomorphological data for the reaches surveyed.
- 7.1.2 These watercourses, in the south west corner of junction 28 of the M25 (junction with the A12) were identified as being potentially impacted by the improvement scheme. In addition to RCS other ecological surveys and assessments have been undertaken (including aquatic macro-invertebrate survey and electric fishing), details of which can be found in the Aquatic Survey Report, Appendix 7.6 of the Environmental Statement.
- 7.1.3 This report details the four RCSs undertaken on the Weald Brook and Ingrebourne River with the aim to provide baseline information to assess potential impacts from the Scheme.

7.2 Background

- 7.2.1 The survey area is located in the north west corner of junction 28 of the M25. The Ingrebourne River flows into the survey area underneath the M25 from its source in Brentwood, approximately 3 km to north east. The Weald Brook enters the survey area from the north west, originating in Navestock Common and South Weald Common approximately 3 km away. The confluence of the two rivers is in the south-eastern corner of the survey area, shortly before it flows beneath the A12 in a south easterly direction. Figure 7.1 shows the location of the Weald Brook and River Ingrebourne.
- 7.2.2 These watercourses are part of the Ingrebourne River Water Framework Directive (WFD) waterbody (Waterbody ID GB106037028130) and are not designated as artificial or heavily modified. The current overall WFD status for this waterbody is Moderate (Good for chemical elements, Moderate for biological elements)¹. The Ingrebourne River flows for 40 km before joining the River Thames at Rainham.
- 7.2.3 Underlying geology within the survey area is London Clay (consisting of clay, silt and sand) with superficial deposits alluvium (with clay, silt and sand)². No statutory designated sites of nature conservation interest are within the river corridor, although it is a part of the locally designated Ingrebourne Valley Site of Metropolitan Importance for Nature Conservation³ and the Manor Local Nature reserve (also known as Dagnam Park) is approximately 500 m west of the Weald Brook. The nature reserve comprises acid and neutral grassland along with ancient and secondary woodland.

¹ Environment Agency Catchment Data Explorer website <http://environment.data.gov.uk/catchment-planning/WaterBody/GB106039017890> accessed November 2017.

² British Geological Society website, accessed November 2017.

³ Within Greater London, Sites of Importance for Nature Conservation (SINCs) are sub-divided into Sites of Metropolitan Importance (SMI); Sites of Borough Importance (SBI) - Grade 1 or Grade 2; and Sites of Local Importance (SLI).

7.3 Method

7.3.1 The RCS's were undertaken as per the methodology within the National Rivers Authority "River Corridor Surveys – Technical Handbook No 1"⁴. For this scheme, three 500 m reaches were identified using Ordnance Survey mapping for the Weald Brook. The length of the the Ingrebourne River were surveyed between the culvert beneath the M25 and the confluence with the Weald Brook, a total of 270 m. The reaches surveyed for this Scheme are shown in Figure 7.2 and summarised in Table 7.1.

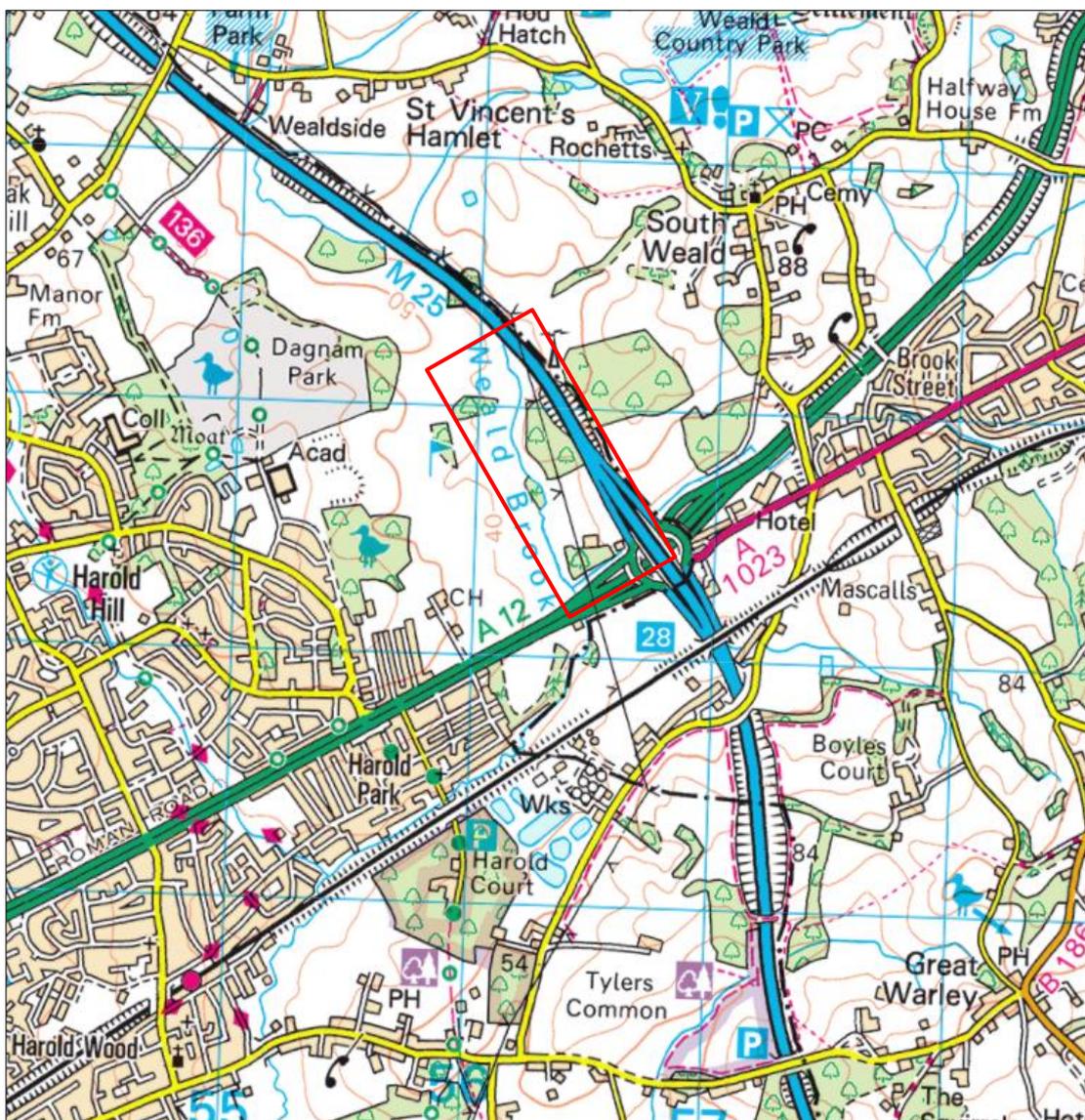
Table 7.1: List of reaches surveyed

Watercourse	Reach	Upstream NGR	Downstream NGR	Length
Ingrebourne River	1	TQ 56660 92385	TQ 56458 92211	270 m
Weald Brook	1	TQ 56108 93235	TQ 56132 92856	500 m
	2	TQ 56132 92856	TQ 56288 92572	500 m
	3	TQ 56288 92572	TQ 56458 92211	500 m

7.3.2 The survey methodology is a habitat based approach, recording details of the more dominant vegetation and physical structures identified within the reach, rather than comprehensive species accounts. This information is gathered and recorded in the form of a map using a set of standard symbols and abbreviations. The RCS maps produced for each reach are presented in this technical note with accompanying keys to identify the ecological and geomorphological features present (see Annex 1 for a key to the symbols and Annex 2 for plant species and abbreviations used in production of the maps), along with a summary description of the reach and information taken from a desk study prior to undertaking the survey.

⁴ NRA Technical Handbook 1 - River Corridor Surveys. (1991). National Rivers Authority.

Figure 7.1: Location of Ingrebourne River and Weald Brook nr. Romford (survey area in red)



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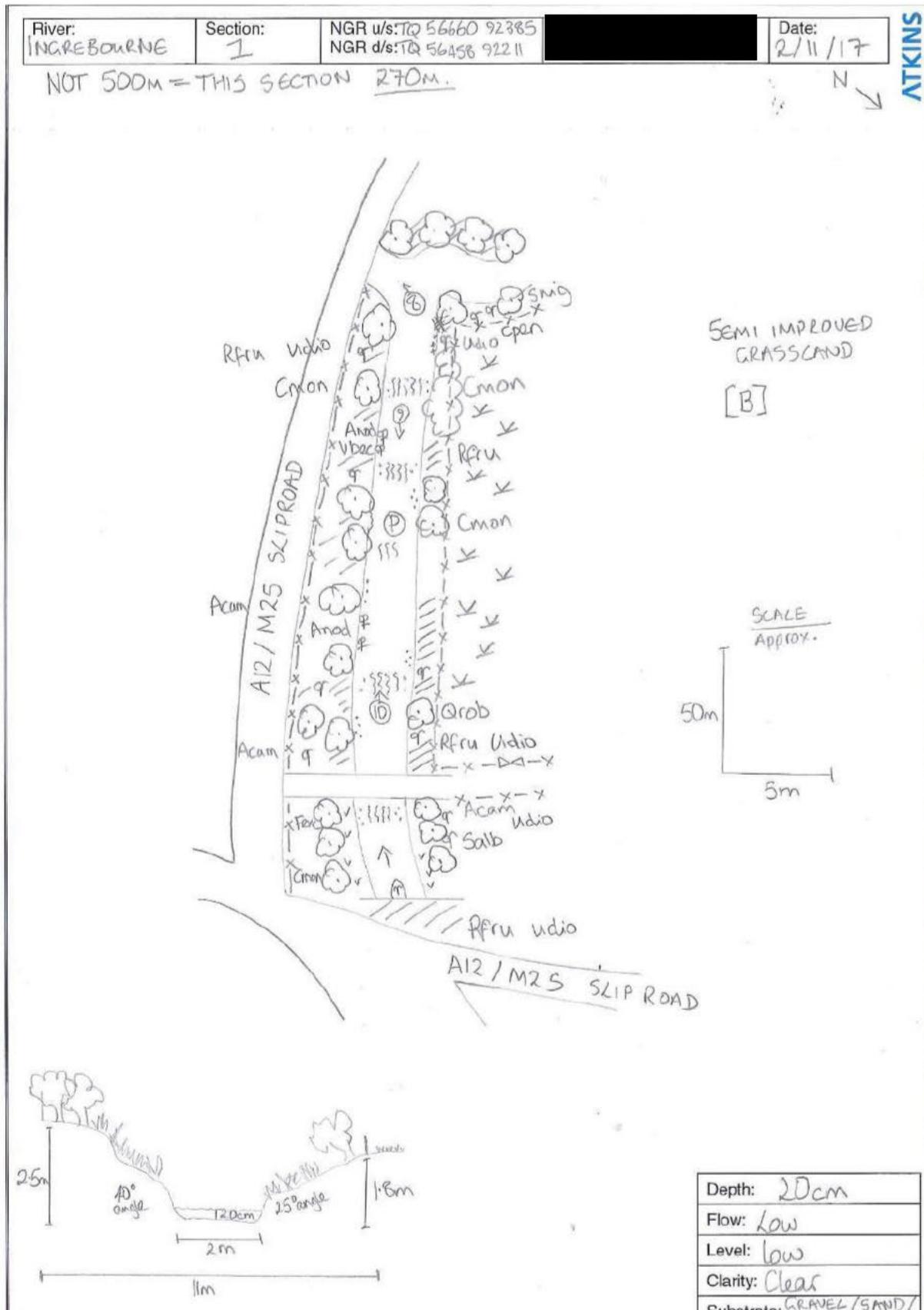
Figure 7.2: Reaches of the Weald Brook and Ingrebourne River surveyed



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7.4 Survey data –Ingrebourne River Reach 1

Figure 7.3: River Corridor Survey Map –Ingrebourne River Reach 1



7.5 Summary description of Ingrebourne River Reach 1

Broad nature

- 7.5.1 The Ingrebourne River in this reach has been historically straightened to run adjacent to the A12/M25 slip road. At the most upstream point the river flows beneath the M25 from a north-easterly direction through a double box culvert. As it flows adjacent to the slip road, it is shaded by a variety of tree species and hedgerows. While there is very little sinuosity within the channel, there are five riffles through the reach and areas of erosion and deposition occurring along the margins. The dominant flow type recorded was smooth glide. At the downstream end of the surveyed reach is the confluence with the Weald Brook which has resulted in a slow flowing, deeper section with increased sedimentation.

Dimensions

- 7.5.2 The wetted width of the channel varied little through the reach, and was at most 2.5 m wide with areas of riffles or gravel deposits being approximately 1.5m wide. Average depth throughout the reach was approximately 0.2 m with deeper areas at the downstream end, of approximately 0.4 m.

Substrate

- 7.5.3 Water clarity was good at the time of survey, with the bed visible throughout the survey reach. The substrate was predominantly gravel and pebble with some areas of silt, particularly in slow flowing areas such as the downstream end close to the confluence with the Weald Brook.

Bank structure and vegetation

- 7.5.4 An embankment flanks the left bank (A12/M25 slip road) for the entire length of the reach which is approximately 2.5 m high. There is an embankment along the right bank which at the upstream end is approximately the same height as the left. An access road crosses the river approximately 40 m from the upstream end of the reach. From here the embankment gradually reduces in height to bank top at the confluence. The left bank is steep, at approximately 40°. Downstream of the access road, the right bank is shallower at approximately 25°. Both banks are vegetated with a mixture of grass, tall herbs, shrubs and trees. The bank height is approximately 0.4 m on both banks. Bank material was earth with potential signal crayfish burrows identified at the downstream end.

Side channels / structures

- 7.5.5 An access road crosses the river approximately 40 m from the upstream end of the reach. At the downstream end the river is joined by the Weald Brook.

Instream / marginal vegetation

- 7.5.6 Aquatic vegetation within this reach was limited to fool's water-cress (*Apium nodiflorum*) and brooklime (*Veronica beccabunga*) in the margins, with most of the channel devoid of vegetation. Filamentous algae was also recorded. In places, the bankside vegetation such as grasses and herbs overhung the river channel.

Bank vegetation

- 7.5.7 Bankside vegetation was dominated by a mix of trees and shrubs, including field maple (*Acer campestre*), oak (*Quercus robur*) and alder (*Alnus glutinosa*), with extensive areas of hawthorn (*Crataegus monogyna*) hedgerows, particularly on the left bank. Where light and space was available below trees, the understory consisted of predominantly of bramble (*Rubus fruticosus*), nettle (*Urtica dioica*) and other tall herbs. A small amount of Himalayan Balsam (*Impatiens glandulifera*) was present at the culvert under the M25.

Adjacent land use

- 7.5.8 The left hand bank was flanked by the A12/M25 slip road, the right bank by semi-improved grassland/pasture.

Management recommendations and enhancement opportunities

- 7.5.9 This channel has a mix of habitats suitable for a variety of fish and aquatic macro-invertebrate species, with a number of riffles, tree roots and marginal vegetation present throughout.
- 7.5.10 However, it has been historically straightened and would benefit from restoration, including restoring sinuosity (e.g. through berm installation), creating backwaters and introduction of woody debris. Increasing the light entering the channel by selective removal of bankside trees and hedgerows is likely to act to improve ecological condition through improved distribution and abundance of in-stream vegetation.

Photos

- 7.5.11 Photo locations are indicated on the RCS map with the following symbol 

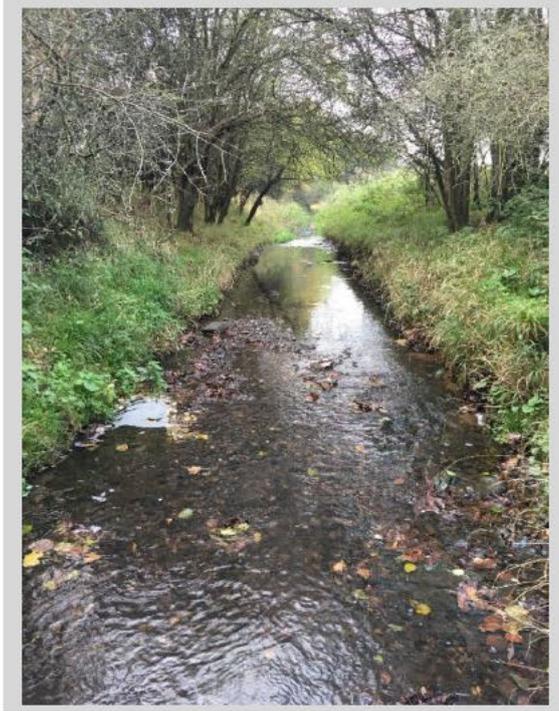
Photo 8



Photo 9

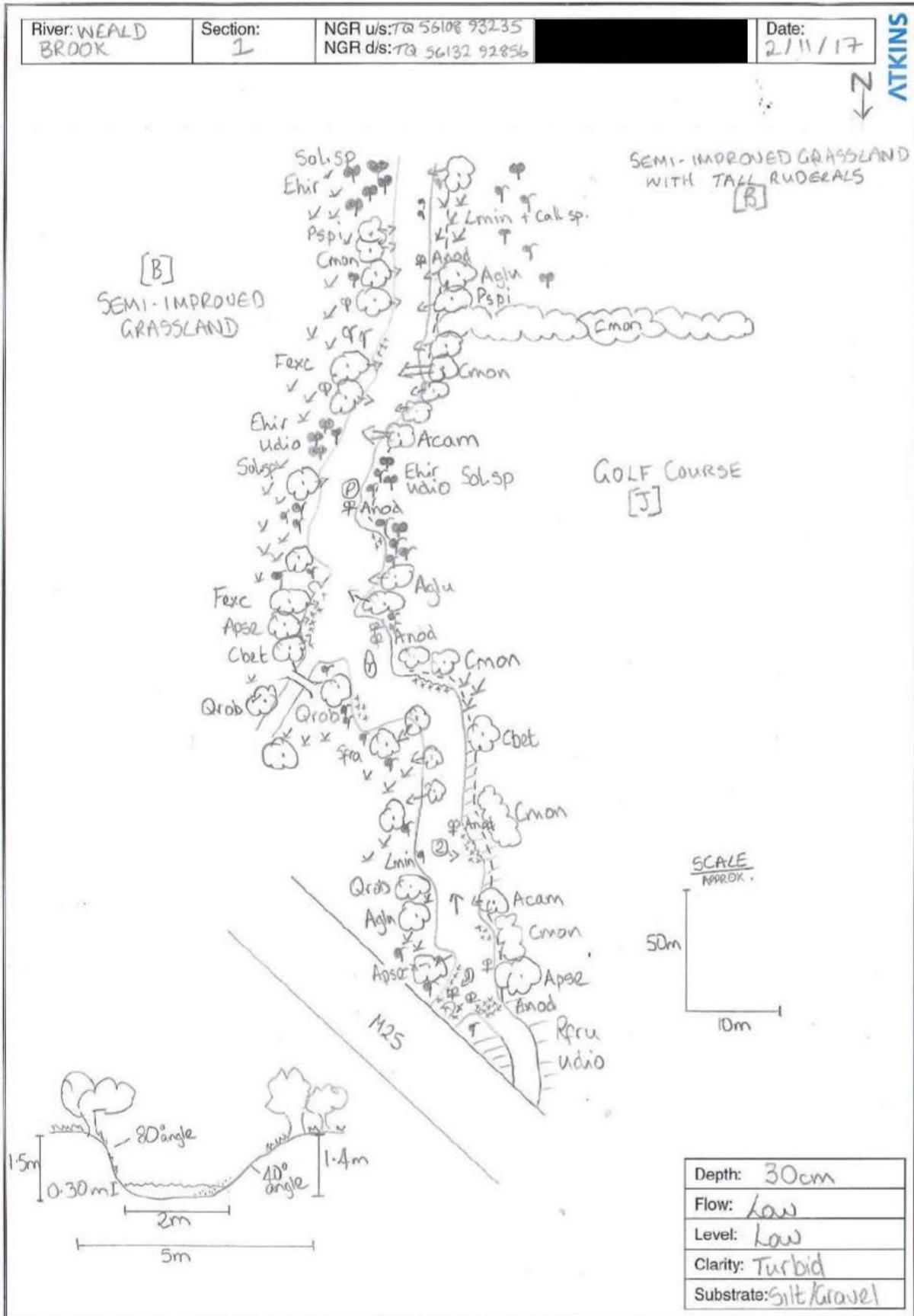


Photo 10



7.6 Survey data – Weald Brook - Reach 1

Figure 7.4: River Corridor Survey Map – Weald Brook Reach 1



7.7 Summary description of Weald Brook Reach 1

Broad nature

- 7.7.1 This reach was heavily shaded by mature trees and scrub along both banks, primarily consisting of alders and hawthorn. The watercourse flows from the north-east beneath the M25. The channel is wide at the most upstream end (approximately 3 m), with a vegetated mid-channel bar. The bed substrate at this location appears reinforced with cobble, although downstream the substrate quickly changes to silt with occasional areas of gravel. This reach meanders through a golf course on the right bank and rough pasture and scrub on the left bank with large amounts of woody debris and fallen trees within the channel. The wetted width is variable through the reach as a result of woody debris accumulations and silt deposition. Where the bankside canopy is open, small areas of aquatic vegetation are present.

Dimensions

- 7.7.2 The average bank top width was approximately 2 m with the wetted width varying greatly between 0.5 m and 1.5 m. Average depth was approximately 0.3 m with shallower areas caused by woody debris and silt deposition. There was no perceptible flow through much of the reach, with smooth flow evident in narrow sections of the channel.

Substrate

- 7.7.3 The reach was heavily sedimented with frequent silt marginal bars and occasional gravel/pebble accumulations. At the upstream end, where the river flows from beneath the M25, the bed is reinforced with cobbles.

Bank structure

- 7.7.4 Both banks consist of earth and are both approximately 1.5 m high. The right bank has a more gentle slope towards the golf course, while the left hand bank is at approximately 80°.

Side channels / structures

- 7.7.5 A small side channel is present at the most upstream end. It was discharging a small flow volume to the Weald Brook at the time of survey despite being blocked by debris. A larger side channel is present approximately half way down the reach, which is crossed by a footbridge. There is a large amount of woody debris and fallen trees within the reach which create natural obstructions to water flow and add habitat complexity.

Instream / marginal vegetation

- 7.7.6 Due to heavy shading, there was very little instream or marginal vegetation. Occasionally, where there was a break in the canopy shading, there were small patches of fool's water-cress, duck weed (*Lemna minor*), starwort (*Callitriche* species) and celery-leaved buttercup (*Ranunculus sceleratus*).

Bank vegetation

- 7.7.7 Large mature trees occurred along both banks (including dead specimens), with many overhanging the channel. Dominant tree species included hawthorn, ash (*Fraxinus excelsior*), field maple, oak, alders and sycamore (*Acer pseudoplatanus*). A dense understory consisted of nettle, willowherb (*Epilobium hirsutum*), goldenrod (*Solidago* species) and bramble. A small amount of Himalayan balsam was present at the culvert under the M25.

Adjacent land use

- 7.7.8 Beyond the mature trees and tall herbs, a golf course was on the right bank, with rough pasture at the most downstream end. Rough pasture with tall herbs occurred along the entire length of the left bank.

Management recommendations and enhancement opportunities

- 7.7.9 This reach is heavily shaded by bankside trees, hedgerows and scrub. Removing occasional trees from the bank top could improve the amount of in-channel and marginal vegetation present.

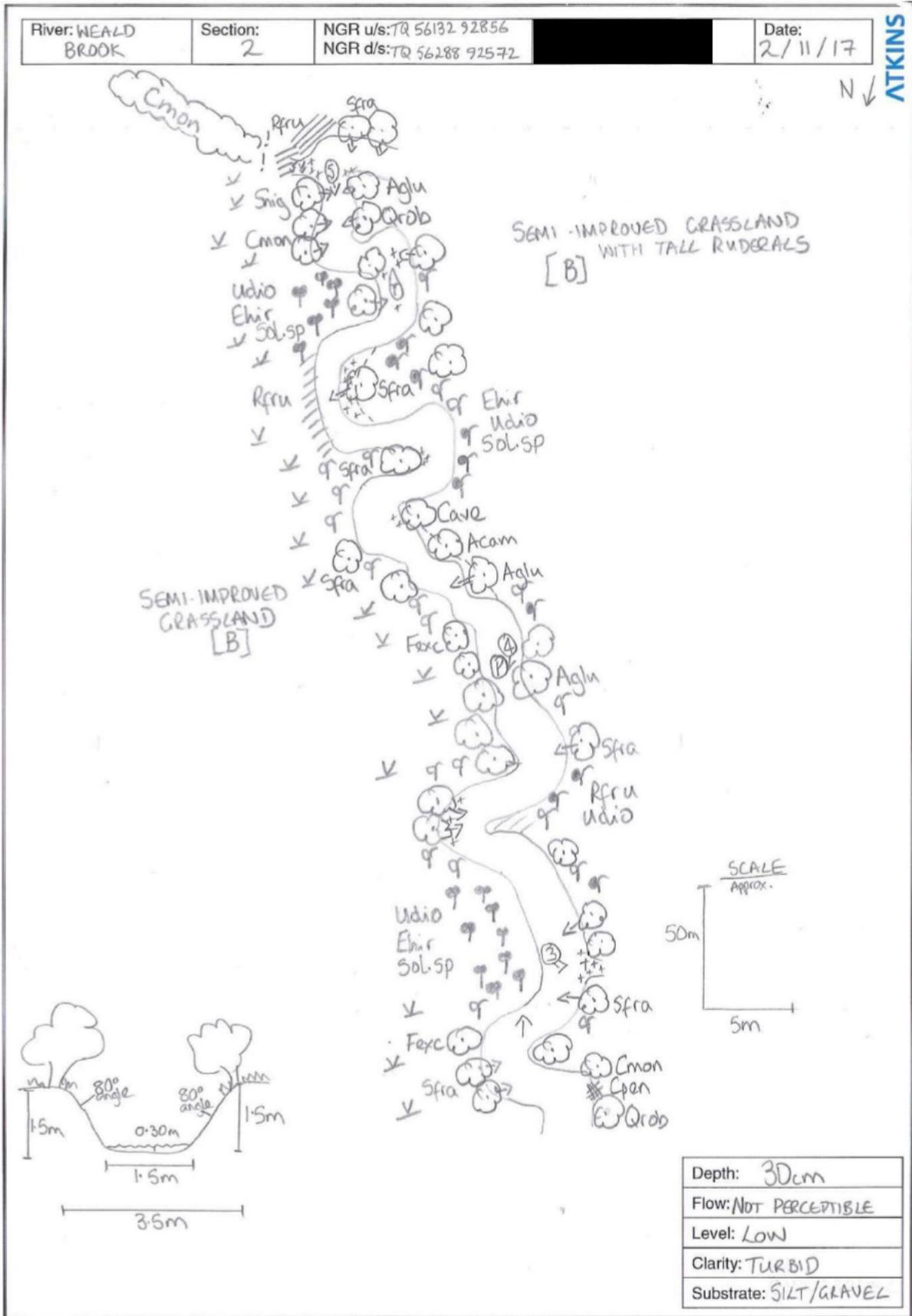
Photos

- 7.7.10 Photo locations are indicated on the RCS map with the following symbol 



7.8 Survey data – Weald Brook - Reach 2

Figure 7.5: River Corridor Survey Map – Weald Brook Reach 2



7.9 Summary description of the Weald Brook Reach 2

Broad nature

- 7.9.1 This reach was heavily shaded by mature trees and scrub along both banks, primarily consisting of crack-willow (*Salix fragilis*), with field maple, alders and hawthorn. The watercourse flows north to south through a naturally sinuous channel. The bed substrate consists of large amounts of silt with occasional gravel. Many of the trees overhang the channel with occasional instances of mature trees growing in the channel. The bank top width is narrower than upstream reach, at an average of 1.5 m. Wetted width ranged from 0.1 m to 2.5 m. Adjacent land use on both banks consisted of rough pasture with large stands of goldenrod and nettle.

Dimensions

- 7.9.2 The average bank to bank width was approximately 1.5 m with the wetted width varying greatly due to wide meanders and in-channel trees, between 0.1 m and 2.5 m. Average depth was approximately 0.3 m with shallower areas caused by woody debris and silt deposition. There was no perceptible flow through much of the reach, with smooth flow evident in narrower sections of the channel.

Substrate

- 7.9.3 The reach was heavily sedimented with frequent silt marginal bars and very occasionally gravel/pebble deposits.

Bank structure

- 7.9.4 Both banks consist of earth and are both approximately 1.5 m high. Both banks have a steep slope, at approximately 80°.

Side channels / structures

- 7.9.5 Three side channels were identified during the survey, all were dry at the time of survey, but are likely to act as field drainage discharge points during wet periods. There is a large amount of woody debris, fallen trees and in-channel trees within the reach, which create natural obstructions to water flow and add habitat complexity.

Instream / marginal vegetation

- 7.9.6 Due to heavy shading from trees no in-stream or marginal vegetation was present. A vegetated mid-channel bar was present with terrestrial grasses and herbs.

Bank vegetation

- 7.9.7 Large mature trees occurred along both banks (including dead specimens), with many overhanging the channel. The dominant tree species in this reach was crack-willow, with hawthorn, field maple and alders. A dense understory consisted of nettle, goldenrod, willowherb and bramble.

Adjacent land use

- 7.9.8 Rough pasture with tall herbs, ran the entire length of the left bank. Extensive stands of goldenrod and nettle were present on the left bank.

Management recommendations and enhancement opportunities

- 7.9.9 This reach is heavily shaded by bankside trees, hedgerows and scrub. Removing occasional trees could improve the amount of in-channel and marginal vegetation present.

Photos

- 7.9.10 Photo locations are indicated on the RCS map with the following symbol 

Photo 3



Photo 4

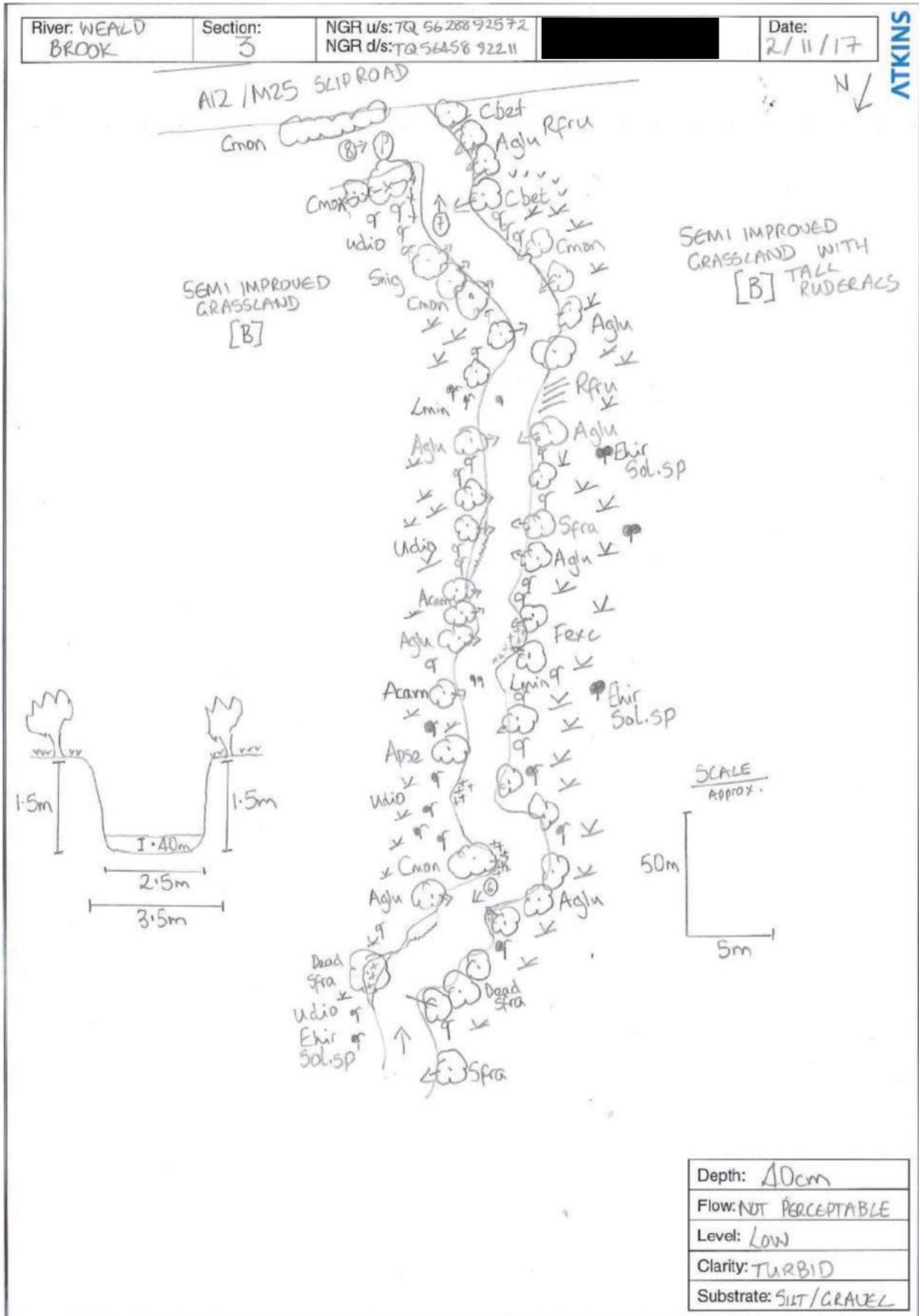


Photo 5



7.10 Survey data – Weald Brook - Reach 3

Figure 7.6: River Corridor Survey Map – Weald Brook Reach 3



7.11 Summary description of the Weald Brook Reach 3

Broad nature

- 7.11.1 In common with Reach 1 and Reach 2 this reach was also heavily shaded by mature trees and scrub along both banks, primarily consisting of alders, hawthorn and hornbeam (*Carpinus betulus*). The channel in this reach becomes less sinuous in the downstream direction, due in part to the impoundment caused by the confluence with the Ingrebourne River at the downstream end. Upstream, the channel is more sinuous with the wetted width varying due to silted side bars. Downstream the watercourse is deeper and consistently wider. Where the bankside canopy is open, small areas of aquatic vegetation were recorded.

Dimensions

- 7.11.2 At the most upstream end, the wetted width varies between and 1 m and 2 m with a depth of approximately 0.25 m. Soon the wetted width fills the entire channel which widens to approximately 2.5m with a depth of approximately 0.4m. There was no perceptible flow through this reach.

Substrate

- 7.11.3 The reach was heavily sedimented with occasional silt marginal bars. Moving downstream, the turbid water prevented visibility of the bed but it is presumed that silt substrate remains dominant.

Bank structure

- 7.11.4 Both banks consist of earth and are both approximately 1.5 m high and approximately 80°. Some liverworts were present on the bank face in the downstream section of the reach.

Side channels / structures

- 7.11.5 No side channels were present, other than the confluence with the River Ingrebourne. Woody debris in the upstream section creates some natural obstructions to water flow.

Instream / marginal vegetation

- 7.11.6 Where there was a break in the canopy shading, there were small patches of duck weed.

Bank vegetation

- 7.11.7 Large mature trees occurred along both banks (including dead specimens), with many overhanging the channel. Dominant tree species included hornbeam, alder and hawthorn. Upstream a dense mix of tall grass and herbs was present beneath and between trees on both banks. Growth became less dense further downstream.

Adjacent land use

- 7.11.8 Rough pasture with tall herbs, ran the entire length of both banks.

Management recommendations and enhancement opportunities

- 7.11.9 It is likely that heavy shading by the mature broadleaved woodland has limited the presence of any in-channel and marginal aquatic macrophytes. The removal of occasional trees and/or scrub to allow more light into the channel could encourage aquatic macrophytes to establish within this reach.

Photos

- 7.11.10 Photo locations are indicated on the RCS map with the following symbol 

Photo 6



Photo 7



Photo 8



7.12 Summary

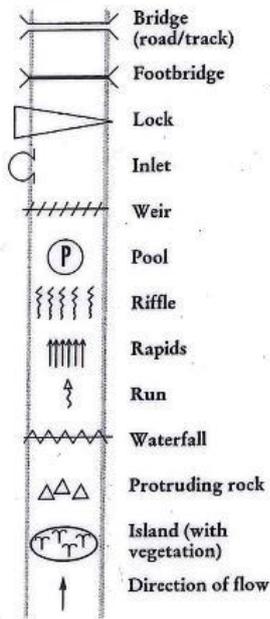
- 7.12.1 The four reaches surveyed as part of the Scheme were all heavily shaded by a mixture of mature trees and hedgerows. The Weald Brook is heavily sedimented and slower flowing than the Ingrebourne River. It contains large amounts of woody debris within the channel causing natural obstruction to flow. While this may provide refuge for some fish and aquatic macro-invertebrate species, the large amount of sediment is likely to be acting to limit the range of species that can be supported, this is despite the presence of a meandering planform and in-stream habitat complexity.
- 7.12.2 The Ingrebourne River, while historically straightened for the adjacent A12/M25 slip road, shows a greater variety of in-stream habitats and flow types for both fish and aquatic macro-invertebrates such as pools, riffles, underwater tree roots, and marginal vegetation.
- 7.12.3 Road crossings are proposed across both the Weald Brook and Ingrebourne River with realignments being required in all instances. It is suggested that any realignments include reintroduction of meanders/sinuosity to increase habitat diversity coupled with a reduction in trees and shrubs to reduce shading and enhance ecological condition through improved distribution and abundance of in-stream vegetation.

Annex 1: Symbols used in RCS maps

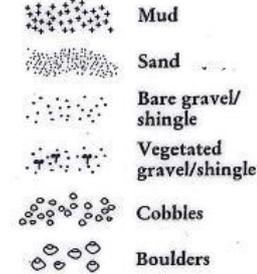
Standard Symbols for use in River Corridor Surveys

AQUATIC AND MARGINAL ZONES

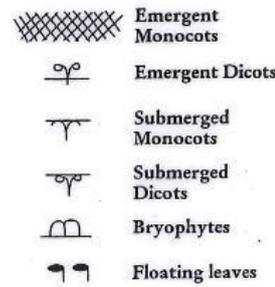
CHANNEL FEATURES



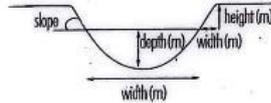
SUBSTRATE



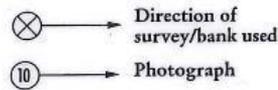
CHANNEL VEGETATION



CHANNEL CROSS-SECTION

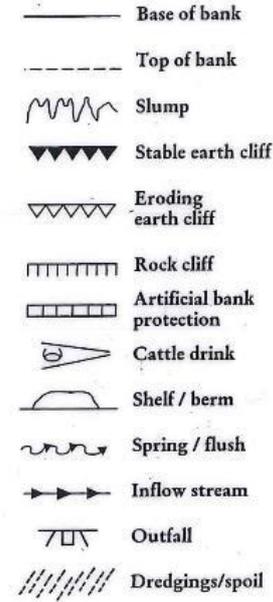


SURVEY INFORMATION

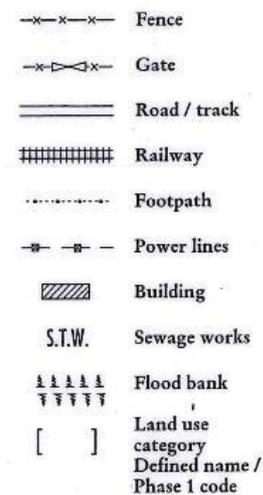


BANK AND ADJACENT LAND ZONES

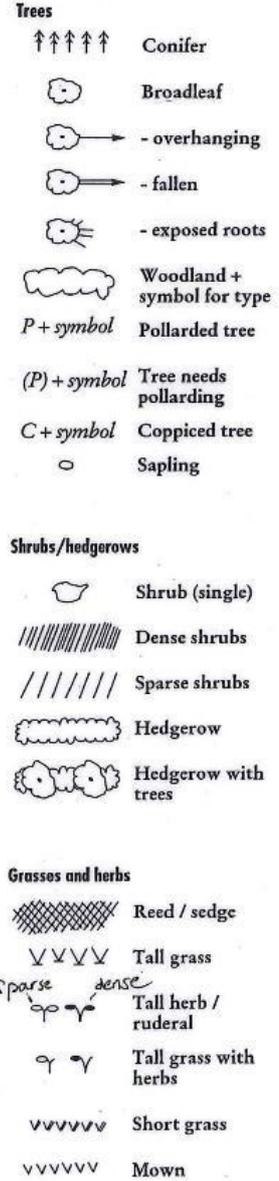
BANK FEATURES



ADJACENT LAND FEATURES



VEGETATION



Annex 2: List of plant species and abbreviations used in RCS maps

Abbreviation	Scientific name	Common name
Acam	<i>Acer campestre</i>	Field maple
Aglu	<i>Alnus glutinosa</i>	Alder
Anod	<i>Apium nodiflorum</i>	Fool's water-cress
Apse	<i>Acer pseudoplatanus</i>	Sycamore
Cal. Sp	<i>Callitriche species</i>	Water star-wort
Cave	<i>Corylus avellana</i>	Hazel
Cbet	<i>Carpinus betulus</i>	Hornbeam
Cmon	<i>Crataegus monogyna</i>	Hawthorn
Cpen	<i>Carex pendula</i>	Pendulous sedge
Ehir	<i>Epilobium hirsutum</i>	Great willowherb
Fexc	<i>Fraxinus excelsior</i>	Ash
Fsyl	<i>Fagus sylvatica</i>	Beech
Lmin	<i>Lemna minor</i>	Common duckweed
Pspi	<i>Prunus spinosa</i>	Blackthorn
Qrob	<i>Quercus robur</i>	Pedunculate oak
Rfru	<i>Rubus fruticosus</i>	Bramble
Salb	<i>Salix alba</i>	White willow
Sfra	<i>Salix fragilis</i>	Crack-willow
Snig	<i>Sambucus nigra</i>	Elder
Sol. Sp	<i>Solidago species</i>	Goldenrod
Udio	<i>Urtica dioica</i>	Common nettle
Vbec	<i>Veronica beccabunga</i>	Brooklime
Aglu	<i>Alnus glutinosa</i>	Alder

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