

The PlaceMarker Survey Technical Manual



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GLOSSARY

AQA – Amenity Quality Assessment (a high-level impression-based assessment of the amenity quality of the study area).

Data are recorded on a six-page survey form or four-page high-level assessment and are retained within a data base. The data are of two main types: measurements and key points.

Engineering type summarises the broad style of engineering that has been applied to a stretch of river, based on the channel planform, cross profile, and level of reinforcement.

HaQA – Habitat and Biodiversity Quality Assessment (a high-level impression-based assessment of habitat quality and potential biodiversity).

HeQA – Heritage Quality Assessment (a high-level impression-based assessment of the heritage quality of the study area).

Fringe – a visual envelope bounding the study area. In flat locations it may only extend to the order of 50m from the edges of the study area, but it may be more extensive in areas of significant vertical relief.

Impression-based Assessments reflect the surveyor's impressions and overview following data collection in relation to each of four themes: Habitat & Biodiversity, Landscape, Amenity, and Heritage.

Indices and **Index-based Assessments** are calculated from **measurements**.

Key points are text comments accompanied, where appropriate, by *images* (e.g. photographs or scanned documents / maps).

LQA – Landscape Quality Assessment (a high-level impression-based assessment of the landscape quality of the study area).

Measurements are quantitative or semi-quantitative measures / observations recorded on the survey and high-level assessment forms.

Project **site** is defined as the area likely to be directly influenced by the project.

Stretch is a length of river of a single engineering type which typically extends for 500m but should not be less than 300m or more than 800m in length.

Study area includes the project site and immediate surrounding area that is likely to be influenced by the proposed project.

SHQI – Stretch Habitat Quality Index (an index-based assessment of stretch habitat quality and potential biodiversity).

INTRODUCTION

1. Introduction to the PlaceMarker Survey

1.1. The PlaceMarker Survey is a field survey undertaken in relation to a river project.

This R&D Report summarises its main features.

- a. It is comprised of a Study Area Survey and one or more River Surveys, which provide information to support High-Level Assessments of Habitat & Biodiversity, Landscape, Amenity, and Heritage.
- b. It is designed to be a broad, high-level survey that is undertaken by a trained river scientist who has received PlaceMarker training and has a general appreciation of the issues surrounding river environment assessment. The surveyor will not be a specialist in all of the areas covered by the survey, but (s)he may be informed by specialists. The survey is designed to help identify the priorities for an area / potential scheme so that the relevant professionals can be brought in for further appropriate and more in-depth assessment.
- c. It does not include any desk-based assessments (e.g. designations).
- d. It is expected that the survey will be conducted on three main occasions: immediately pre-project, immediately post-project, and post-recovery from the project works (e.g. 5-10 years post-project). The pre-project survey precedes any commissioned, specialist surveys (e.g. Phase 1 Habitat Surveys).
- e. The PlaceMarker survey aims to give a broad overview and appreciation of the project **site** and the **study area** in which it sits, based on a broad field-based assessment which is combined with desk-based information to provide a firm basis for further project development, design, and pre- to post-project appraisal.
- f. The survey is supported by a web-based information system, which allows entry and retrieval of study area survey and river survey data, undertakes data analysis, and presents assessments in map and graphical formats. Data must be uploaded by the surveyor using a personal log in.

1.2. Two scales of spatial unit are used in assessing PlaceMarker:

- a. The **Study Area** and its **Fringe** are assessed in relation to the left and right bank areas (accessibility, land use) or the entire site to the top of the river banks or the river centre line, as appropriate. The **Study Area** includes the project **site** and the adjacent area that is indirectly affected by the project. For example, the study area

will often be the limit of open space on either river bank enclosing the project **site**. The **fringe** surrounds the study area and is a visual envelope (what you can see), typically to a distance of ca. 50m on flat sites. For example, in the case of open space, the fringe comprises a band of other land cover types such as housing, commercial or industrial buildings, transport infrastructure, or agricultural land along the margin of the study area. However, in areas of significant vertical relief, the fringe may be much more spatially extensive.

- b. The **River** and its margins (to ca. 5m from the bank top) are assessed in ca. 500m **stretches** (minimum 300m, maximum 800m) of a single ‘engineering type’. The entire length of the river does not always need to be surveyed (e.g. Figure 1), but enough representative stretches should be selected to capture the nature of the river within the study area. Where possible, and particularly when a large project is envisaged, surveys of a stretch immediately upstream and downstream of the study area can provide ‘controls’ when assessing changes within and downstream of the study area as a result of the project. This is important as other factors beyond the study area and project site may induce changes in the upstream river before, during, and following implementation of the project, and project implementation may induce some changes in the river downstream of the study area.

1.3. A PlaceMarker assessment considers four themes: **Habitat & Biodiversity**, **Landscape**, **Amenity**, and **Heritage** (Figure 2). Information assembled at the **river stretch** scale is mainly used to assess Habitat and Biodiversity, whereas information assembled at the **study area** and **fringe** scale is mainly used to assess Landscape, Amenity, and Heritage. In each case, information of the following types is assembled

- a. Quantitative and semi-quantitative **measurements** are recorded on a four-page river survey form, and a three-page study area form (available to trained PlaceMarker surveyors).
- b. Integrative **Indices** and **Index-based Assessments** are calculated automatically from the **measurements** once the field survey data have been entered into the PlaceMarker software.
- c. **Key Points** or text comments accompanied, where appropriate, by **images** (e.g. photographs, documents, maps) are assembled in the field after completing the river and study area forms. These are based on impressions gained by the surveyor while walking the study area as (s)he completes the river and study area surveys. *Key points are crucial for supporting impression-based assessments.*



Figure 1 (above) project setting, with (below) the project site (grey), river area (blue), study area (blue, grey and green areas) and fringe (pink) superimposed. Image obtained from Google Earth, Image © 2018 Bluesky

- d. **Impression-based assessments** reflect the surveyor's overview of the 'quality' of the study area and its river following his/her walking of the study site whilst completing the river and study area survey forms. These assessments indicate the surveyor's judgement of 'quality' in relation to four themes: Habitat & Biodiversity, Landscape, Amenity, and Heritage. These overview scores are accompanied by the surveyor's assessment of his / her level of confidence and are supported by the *Key Points*.

The **Index-based assessments** and **Impression-based assessments** are used to track changes in the character and quality of project sites through pre-, post-project, and post-recovery stages. They provide an indication of the degree and nature of any improvements achieved by the project. The **data, indices, and key points** allow a detailed interpretation of any changes that may occur in the assessments as a result of project implementation.

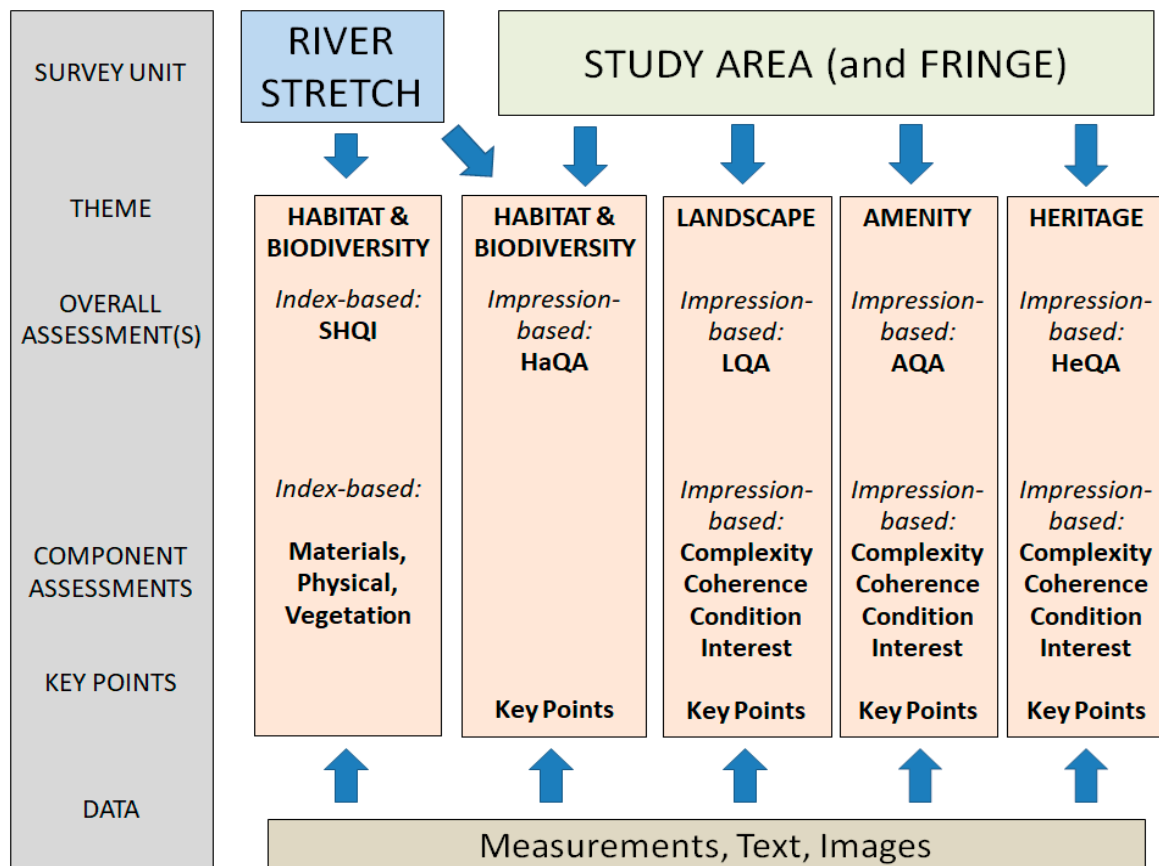


Figure 2: Structure of the PlaceMarker Survey and Assessments

- 1.4. All four themes are assessed at a high level through the surveyor's impressions of the river stretch or study area to provide four assessments (HaQA, LQA, AQA, HeQA). To allow for variations in the expertise of different surveyors, not only is guidance provided to support these assessments, but the surveyor is also able to express his/her level of confidence in each of the four assessments. Each of these high-level assessments is supported by four component assessments, which are **index-based** for Habitat and Biodiversity and **impression-based** for Landscape, Amenity and Heritage.
- 1.5. The Stretch Habitat Quality Index (SHQI) is an **index-based assessment** that supports the evaluation of Habitat and Biodiversity for the surveyed river stretch.
- 1.6. **IMPORTANT NOTES before conducting a PlaceMarker Survey:**

Health and Safety is extremely important. When working on rivers you must conform with all Health and Safety related guidance. You must ensure that you undertake a full risk assessment conforming to the Environment Agency's requirements BEFORE you go into the field. Also, please ensure that you take the recommended health and safety precautions as required by the Environment Agency during the field work. The survey is designed to be undertaken by one surveyor and there may be occasions where you are undertaking the survey alone. On these occasions you will need to register with the Environment Agency's lone working monitoring system (StaffCall). Please refer and adhere to current Environment Agency documentation on Health and Safety and lone working.

Biosecurity. You must ensure that you take appropriate measures to reduce the risk of spreading diseases, parasites, and invasive non-native species. You must apply the biosecurity advice provided by the following campaigns:

NNSS **Be Plantwise** : (<http://www.nonnativespecies.org/beplantwise/index.cfm>)
and

Check, Clean, Dry (<http://www.nonnativespecies.org/checkcleandry/index.cfm>)

THE RIVER SURVEY

2. Introduction to the River Survey

- 2.1 The **River Survey** is based on the River Habitat Survey (RHS) methodology, which was developed by the Environment Agency in 1997 to provide a simple, rapid assessment of physical habitat along 500m stretches of river (<http://www.riverhabitatsurvey.org/>). However, the PlaceMarker *River Survey* gives a fuller description of engineered rivers than RHS, providing greater detail on the style and extent of engineering modification as well as physical habitats. Since many different types of channel engineering are seen on rivers, may be incorporated in proposed project designs, and have a fundamental influence on river habitats, the river survey is applied to stretches of a single engineering type of approximately 500m in length.
- 2.2 A **stretch** is defined as a length of river (normally 500m, minimum 300m, maximum 800m in length) that is subject to any one **engineering type**. An engineering type is a unique combination of channel planform, cross profile, and level of reinforcement (see section 5, Table 1). For many projects, stretches may be best defined to fit the likely project engineering rather than the initial state of the river prior to the project.
- Where a project extends along the river for less than 800m, a single long stretch survey may be sufficient but for larger projects extending over longer river lengths, the river should be split into stretches of approximately 500m (no less than 300m and no longer than 800m).
 - For large projects, it is not necessary to survey the entire length of the river, but enough representative stretches should be surveyed to fully characterise the river.
 - Where more than one channel is present within the study area (e.g. where the original river channel is paralleled by a flood channel), each channel should be surveyed separately.
 - It is also good practice where possible, and particularly when a large project is envisaged, to survey at least one stretch immediately upstream and one stretch downstream of the study area. These surveys may provide ‘controls’ when assessing changes within and downstream of the study area as a result of the project. This is important as other factors beyond the study area and project site may induce changes in the upstream river before, during, and following

implementation of the project, and project implementation may induce some changes in the river downstream of the study area.

2.3 To undertake a River Survey, the surveyor needs:

- a copy of the River Survey forms for each stretch to be surveyed;
- a waterproof clip board (an A3 size is ideal for viewing form and guidance sheets simultaneously);
- a digital camera;
- a hand-held GPS (WSG84 co-ordinates);
- a range-finder, expanding metal or surveying tape, or some other means of linear measurement is also helpful for estimating channel dimensions;
- a ranging pole for stability and to aid assessment of depths;
- appropriate weatherproof clothing and footwear;

NOTE – a Smartphone can replace the camera and GPS (upload suitable software).

2.4 The survey should be undertaken by walking the stretch three times:

- (a) The first pass checks (i) the length of the stretch (approximated by pacing) so that the spacing of the 10 spot checks can be estimated, (ii) makes an initial assessment of the engineering type (survey sheet 1), and (iii) identifies a suitable site for estimating channel dimensions (survey sheet 1).
- (b) The second pass is used to complete the spot checks (survey sheet 2) and record the engineering type and river channel dimensions (survey sheet 1).
- (c) The third pass is used to complete the cumulative measurements (survey sheets 3 and 4). The survey may commence from the upstream or downstream end of the stretch and should be marked accordingly on Page 2 of the form.

The following sections (3 to 8, inclusive) describe and explain the information recorded in the River Survey following the order on the 3 River Survey sheets that are used by trained PlaceMarker surveyors.

3. Survey Details

- 3.1 Enter the **NEAS Project name / number / code**. These should be used consistently on all River and Study Area Survey forms since they will be used to extract all surveys for the same project from the PlaceMarker database. The **WFD water body ID**, the **river name** given on 1:50,000 scale maps (or more detailed scale if available) provide further fields that can aid information sorting and extraction from the database.

Unnamed headwater tributaries should be categorised as such but refer to the named mainstream watercourse (e.g. tributary of River Quaggy). For the **stretch name/number**, surveyors should enter their own unique reference number/name as appropriate for the site. Also enter the **date** and **time** of the survey, the **name of the surveyor**, and the **survey type** being conducted (i.e. pre-project, post-project, post-recovery).

4. Site Information

- 4.1 Stretch length:** For the purpose of the River Survey, stretches of river of 500m in length (minimum 300m, maximum 800m) are located in the field following identification of the limits of a single engineering type. Wherever possible, the stretch length should approximate 500m. More than one stretch can be surveyed within a length of river of single engineering type, but individual stretches should not span more than one engineering type. Where the survey is pre-project, it may be preferable to define stretches that approximate the proposed scheme, so that changes incorporated in the project can be characterised within appropriate river stretches in the subsequent surveys. The stretch length to the nearest 50m is determined by the surveyor (paces) and completed at the end of the survey when the actual length of the stretch has been estimated. The GPS readings (or estimates of the *NGR*) at the upstream and downstream ends of the stretch will also aid estimation of the stretch length. Where slight changes in the river's course are incorporated in a project, the GPS positions of the upstream and downstream ends of the stretch can be used to guide post-project stretch demarcation. Pre- and post-project stretches do not have to be in identical positions, but their actual GPS positions should be known, and the stretches should be defined to ensure a full assessment of any changes that have occurred as a result of the project or the river channel's recovery following the project.
- 4.2 Site surveyed from left or right bank?** For wide and deep rivers, surveys might need to be carried out from one bank only, although for best results observations are recorded from both banks. In addition, record whether **spot check 1 is at the upstream or downstream end of the stretch**.
- 4.3** At least one **photograph** (maximum 4) should be taken that is representative of the surveyed stretch, preferably at the site where channel dimensions are estimated. Use a **photo reference** that is informative to label the image (e.g. stretch name / number plus nearest spot check number; also record date and time of the photograph and whether taken looking upstream or downstream).

- 4.4 The sections of the survey concerning **bed visibility** and **adverse conditions** are completed by the surveyor on the day of the assessment. Whenever possible the river survey should be conducted during normal baseflow conditions. However, sometimes this is not possible and so these two fields indicate that some of the survey measurements may not be as accurate as they would be under baseflow and in the absence of other specified adverse conditions. Bed visibility is crucial to recording bed materials and bed features and is recorded as yes or no. If no, then there are adverse conditions because of ‘murky, polluted water’ or ‘high suspended sediment load’. Note that water clarity is also recorded on page 3 of the survey sheets under ‘extent of pollution’. Other commonly occurring adverse conditions are high or flood flows, limited access, high levels of riparian vegetation, and windy or poor light conditions.
- 4.5 The optional sections (**Distance from Source**, **Slope (m/km)**, **Solid geology code**, **Drift geology code**) are included to maintain compatibility with RHS. As GPS co-ordinates are obtained during the survey, these optional sections can be completed at a later date. Distance from source is best estimated from the Environment Agency’s Detailed River Network (DRN) or the Ordnance Survey’s Mastermap but the blue lines on 1:25000 scale Ordnance Survey topographic maps will also give an adequate estimate. Geology codes are obtained from British Geological Survey maps (<http://www.bgs.ac.uk/geoindex/>)

5. Stretch Engineering

Table 1 summarises the classifications used to describe stretch engineering.

- 5.1 **The engineering type** is representative of the surveyed stretch and is derived from a combination of the predominant planform, cross profile, and level of reinforcement present.
- 5.2 **Planform.** There are four planform types that refer to the predominant planform of the surveyed stretch: Semi-Natural (SN); Engineered–straight (ST); Engineered–sinuous (ME); Recovering (RC).
- 5.3 **Cross Profile.** There are six channel cross profile types that refer to the predominant channel cross profile of the surveyed stretch: Semi-natural (SN); Cleaned (CL); Restored (RE); Resectioned (RS); Enlarged (EN); Two-Stage (TS).
- 5.4 **Reinforcement.** The characteristic / predominant level of reinforcement along a stretch is defined as one of six categories (none, bed only, one bank only, bed and one bank only, both banks only, both banks and bed). Predominant bank reinforcement is

recorded where reinforcement to any vertical extent up the bank (full, upper bank or lower bank) characterises all or most of the bank length in the surveyed stretch.

Table 1: Planform, Cross Profile and Reinforcement Types and Codes

Planform	Cross-Profile	Level of Reinforcement
Engineered Straight, ST (engineered to a straight planform)	Enlarged, EN (cross section made substantially wider and/or deeper than a naturally-adjusted channel would be at the same site)	No reinforcement, NONE
Engineered Sinuous, ME (engineered to a sinuous planform)	Two-stage, TS (cross section includes a flood channel with an inset smaller channel to accommodate non-flood flows)	Bed reinforced, BED
Recovering, RC (engineered straight or sinuous but showing significant planform readjustment induced by fluvial processes)	Resectioned, RS (cross section reshaped to a more efficient trapezoidal form)	One Bank reinforced, ONE
Semi-natural, SN (no obvious sign of engineering of the planform)	Cleaned, CL (flow resistance reduced through removal of roughness elements such as trees and shrubs and minor morphological irregularities)	Bed and one bank reinforced, BEDONE
	Restored, RE (cross profile form designed as part of a restoration scheme)	Both banks reinforced, TWO
	Semi-natural, SN (cross profile form shows no obvious signs of engineered modification / has completely recovered from historical engineering)	Full reinforcement, FULL

6. Channel Dimensions (Once Only Measurements)

Recording of the channel dimensions should be undertaken **once** in the surveyed stretch and should be located at a riffle if one is present, or at a suitable shallow section of the river. Measurement accuracy is improved by using a ranging pole or other method of measurement. Channel dimension measurements are taken according to the RHS methodology as shown in Figure 3. Sometimes the river bed will be inaccessible, or the water will be too deep or dangerous to measure directly. In these cases, visually estimate the water depth if possible.

- **Banktop** = first major break in slope above which cultivation or development is possible.
- **Bankfull** = point where river first spills on to floodplain.

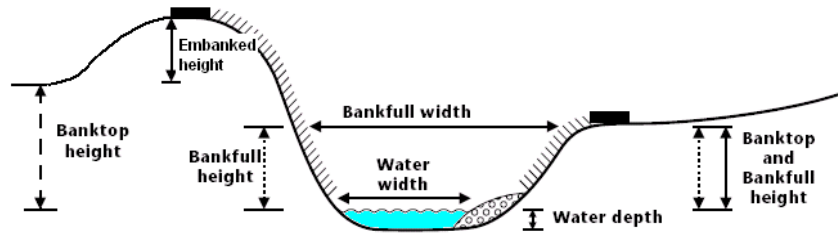


Figure 3: Channel dimensions

(source: RHS 2003 manual <http://www.riverhabitatsurvey.org/manual/rhs-manuals/>)

- 6.1 **Water width** (nearest m) is the distance across the wetted part of the channel. Use a ranging rod to make crossing the watercourse safer and to aid measurement of the width. If it is impossible to wade safely across the river, and you do not have a range-finder, a reasonably accurate estimate can be made by: placing a ranging pole on the bank and walking along the bank until the pole appears to be the same distance away as the far bank then pace the distance to the pole to estimate the channel width.
- 6.2 **Bankfull width** (nearest m) is the horizontal distance across the channel at the level where the river first spills out of the channel on to the floodplain.
- 6.3 **Left and right bank height** (nearest m). Banktop height is the vertical distance from the water surface, to the first major break in slope above which cultivation or development is possible
- 6.4 **Embanked height** (nearest m). Where present, record the extra height created by the embanked material, including setback embankments. This measurement also applies to permanent flood walls.
- 6.5 **Water depth** (nearest 10 cm) is the average depth of water in the channel at the time of survey. An average of 3 depths (at approximately 25%, 50%, and 75% of the river bed width) measured using the ranging pole is adequate. Visually estimate the depth when access is not possible or safe.

7. Spot-Check Measurements

- 7.1 **NOTE: Many of the spot-check measurements coincide with those collected during RHS surveys.** Summary definitions are provided here for convenience, but more detail can be obtained from the RHS handbook. 10 spot-check measurements are taken at equally-spaced distances (e.g. every 50m for a 500m stretch). The spot check measurements are usually estimated from the bank. The location of each spot check should be recorded using a GPS. Some of the measurements taken at each spot-check differ somewhat from the RHS manual but the general layout of the spot check

measurements corresponds to the RHS methodology as shown in the diagram below. **Sweep up (SW) measurements** differ from the RHS methodology. Any other feature seen throughout the stretch that has not been recorded previously in the spot-checks is recorded in the sweep up column for bed material and channel vegetation only (e.g. rarer macrophyte types).

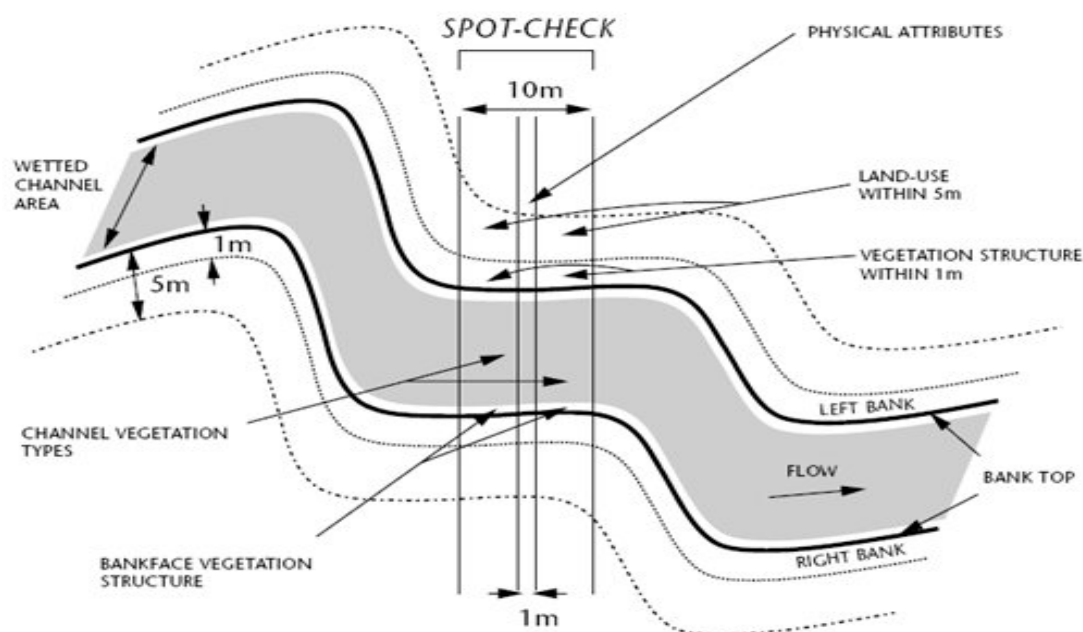


Figure 4: Dimensions for Spot Checks

(source: RHS 2003 manual <http://www.riverhabitatsurvey.org/manual/rhs-manuals/>)

7.2 Physical Attributes (observed within a 1m wide transect across the channel, as shown in Figure 4)

7.2.1 Bank Material: The bank material should only be recorded as **artificial** (AR) if this completely conceals the natural bank materials, since bank protection is recorded separately. If any part of the underlying bank materials are exposed then the predominant type should be recorded as: **bedrock** (BE), **boulders** (BO - >256mm diameter), **cobbles** (CO – 64-256mm), **gravel/sand** (GS - <64mm to <2mm but where are grains are clearly visible at the lower end and the particles are loose), **clay** (CL - cohesive fine material, sticky when moist, particles not visible), **earth** (EA - crumbly material of mixed fine particle size typically < 2mm). NV is used when the bank material is not visible.

7.2.2 Bank Protection: NO records an absence of bank protection (or the bank protection is not visible, for example because it is covered by sediment and/or vegetation). Where two protection types are present on the same bank, record the predominant type. Bank

protection types are: **washed out** (WO - bank protection materials that have been eroded or have collapsed into the channel so that they no longer protect the banks); **planted reeds** (RE – only record when obviously deliberately planted by their regular spacing along the bank toe); **biotex / coir** (BC – any woven fabric spread across the bank face to protect the underlying bank materials from erosion); **willow spiling / faggot bundles** (WS – cut stakes of willow driven into the bank toe or face, often linked by woven willow to create a living fence that roots into the bank / bundles of sticks or twigs); **wood piling** (WP – vertical or horizontal wood planks protecting the bank face – often confined to the bank toe); **builders' waste** (BW – loose hard core tipped at the bank toe or across much/all of the bank face); **gabions** (GA – stones in wire baskets); **rip-rap** (RR – boulders: normally quarried, roughly square stones, often similar size, purposely tipped or laid along the bankface and often confined to the bank toe - includes un-cemented blockstone and boulders compacted into the bank with soil between); **sheet piling** (SP – interlocking steel sheets, including corrugated iron, protecting the bank face); **brick / laid stone** (BR – areas of brick, breeze block or stone held together by mortar to produce a solid wall or bank facing sheet piling); **concrete and brick** (CB – comprised of bricks / blocks / stones and mortar separated above, below or laterally by concreted areas); **concrete** (CC – cemented reinforcement providing a solid reinforcement with no gaps).

7.2.3 Marginal and Bank Features: NO or NV are recorded, respectively, where there are no marginal or bank features or where features are not visible. Where two types of feature are present on the same bank, record the predominant one. The range of features that can be recorded are: **eroding cliff** (EC – Bank face profile is *predominantly* vertical, near vertical, or undercut, with a minimum height of 0.5m and largely bare of vegetation – i.e. <50% cover of mosses, ferns, other vegetation); **stable cliff** (SC – similar to eroding cliff but with higher vegetation cover (>50%), and no obvious signs of erosion); **unvegetated point bar** (PB – unconsolidated river bed material transported from upstream and deposited at the bank toe in a distinctive streamlined bar feature on the inside of river bends. Point bars are exposed at low flow and are unvegetated if <50% of their surface has vegetation cover); **vegetated point bar** (VP – identical to PB but with >50% of surface covered by vegetation); **unvegetated side bar** (SB – as PB but found along channel margins at locations other than the inside of bends); **vegetated side bar** (VS – as SB but with >50% of surface covered by vegetation); **natural berm** (NB – are the vegetated features which result from stabilisation and extension of PB, VPB, SB, VS features over time. A key

difference between a 'bar' and a 'natural berm' is the former is made up of similar material to the channel substrate and has a gradual slope into the water whereas the latter often has a distinct steep face at the water edge, is frequently composed of finer sediments than the adjacent river bed and often includes a transition towards terrestrial plant species).

7.2.4 Channel Substrate: The dominant substrate type is recorded and the sweep-up column is used to record a substrate type that is present but has not been recorded in any spot-checks. Where the bed material is not visible record NV. Artificial immobile substrates usually consist of **concrete**, **concrete/brick** or **laid stone** and are recorded as AR. It is important that both mobile and immobile substrates are recorded when they occur together, so record whichever dominates at each spot check to gain a representative picture. The definitions of **bedrock** (BE), **boulder** (BO), **cobble** (CO), **gravel/pebble** (GP) are the same as for bank materials (section 7.2.1). Other mobile substrate types are: **artificial** (AR – non-natural bed material such as concrete, bricks, tipped waste - but if the artificial materials have been ground down by the river so that they are of similar shape and size to any natural particles located near them, then they can be counted as natural and assessed simply by their size); **sand** (SA – particles <2mm and >0.06mm); **silt** (SI - very small loose particles (<0.06mm) - only record silt when >5mm deep and completely conceals any underlying coarser material); **clay** (CL – a very fine, sticky, cohesive bed material); **peat** (PE – very rare - only record if the river bed is formed of organic matter derived from decayed vegetation under water-logged conditions).

7.2.5 Flow (Patch) Type: Flow types represent flow patterns and flow directions on the water surface. The predominant flow type is recorded at each spot check. **Free fall** (FF - generally associated with water falls and artificial vertical structures - vertically-falling water separates from the 'back-wall' of the vertical structure); **chute** (CH – mainly associated with cascades - curving flow with substantial water contact with the substrate); **broken-standing wave** (BW - mostly associated with rapids but occasionally with riffles – recognised by white-water tumbling waves with an appearance that water is trying to flow upstream); **unbroken standing wave** (UW – mostly associated with major riffles but can be found on rapids - 'babbling' water with a disturbed 'dragon-back' surface, which has upstream facing wavelets that have not broken); **chaotic flow** (CF - a chaotic mixture of three or more of the BW, UW, CH, FF flow types with no predominant one obvious); **rippled** (RP – disturbed undulating (rippled) surface with ripples moving usually in a downstream direction); **upwelling**

(UP – water surface heaving as upwelling water breaks the surface, has the appearance of boiling water); **smooth** (SM – mostly associated with glides, smooth/flat water surface with downstream movement of water); **no perceptible flow** (NP – usually associated with pools, marginal deadwater areas, and areas ponded behind obstructions such as weirs - smooth/flat water surface with no obvious downstream movement of water); **dry** (DR – dry channel).

7.2.6 Channel Features. Where the bed is visible but featureless record NO. Where the bed is not visible record NV. Otherwise, the following features may be present and the predominant feature type should be recorded at each spot check so that the combined spot checks provide an overview of the features that are present in the stretch: **exposed bedrock** (EB – unvegetated bedrock protruding above the water surface at low flow); **exposed boulders** (RO – unvegetated boulders protruding above the water surface at low flow); **vegetated rock** (VR – exposed bedrock or boulders supporting established vegetation such as herbs, reeds, grasses, shrubs); **unvegetated mid-channel bar** (MB – accumulation of unconsolidated river bed material exposed above the water surface but surrounded by water at low flow with <50% exposed surface area covered by vegetation); **vegetated mid-channel bar** (VB – as for MB but with >50% exposed surface area covered by vegetation); **island** (MI – well vegetated mid-channel sedimentary feature, colonised by mature vegetation usually including shrubs or trees, with island surface at same level as bank tops); **trash** (TR – large items of rubbish such as shopping trolleys, traffic cones, vehicles or large vehicle parts such as bonnets, engines, loose bricks, etc.).

7.3 Bank top land use and vegetation structure (observed within 10m wide transects across the channel, Figure 4)

7.3.1 Land use: Land use/cover within 5m of the bank top is recorded using the level 2 codes listed in Table 2.

7.3.2 Bank Face and Bank Top Vegetation Structure: This is recorded as defined in the RHS Manual and illustrated in Figure 5.

Table 2: Land Use / Cover Types and Codes

Level 1 Codes	Level 2 Codes	Land Use Description
URBAN	Re	Residential
	Cm	Commercial
	In	Industrial
	Ic	Industrial / Commercial
	Tr	Transport infrastructure
	Fp	Pedestrianised / footpath
	Sw	Sewage Treatment Works
	Ld	Landfill/Refuse Deposits
	Sy	Scrap / recycling yard
	Dr	Derelict Land / Brownfield
AGRICULTURAL	Cr	Cropland
	Pa	Pasture
	Or	Orchard
	Fe	Intensive Animal Husbandry (e.g. battery hens / sheds)
	Al	Allotments
FORESTED	Co	Coniferous woodland
	Dd	Deciduous or Mixed woodland
	Ow	Open Woodland with grassy areas
OPEN SPACE	Op	Open Parkland (community grass)
	Rg	Rough grassland or herbs
	Fm	Formal parkland / gardens
	Rc	Recreational Land (playing fields)
	Ce	Cemeteries/Crematoria
	He	Heathland
	Sc	Scrub
OPEN WATER	La	Lake / Pond
	Rv	Reservoir
	Ca	Canal
	Qu	Reclaimed (flooded) Quarry
	Tb	Tributary / stream channel
WETLAND	Ma	Marina / Working Harbour
WETLAND	Wl	Wetland
OTHER	Ot	None of the above, please specify









bare	B	bare earth/rock etc.	vegetation types
uniform 	U	predominantly one type (no scrub or trees)	 bryophytes  short/creeping herbs or grasses
simple 	S	two or three vegetation types	 tall herbs/grasses  scrub or shrubs
complex 	C	four or more types	 saplings and trees

Figure 5: Codes for bank face and bank top vegetation structure

(source: RHS 2003 manual <http://www.riverhabitatsurvey.org/manual/rhs-manuals/>)

7.4 Channel vegetation (observed within 10m wide transects across the channel, as shown in Figure 4)

- 7.4.1 The channel vegetation types are the same as recorded in the RHS and percentage cover is recorded to approximately the nearest 5%. Brief definitions are: **none** (for area of bed with <1% vegetation cover, or where none is visible); **liverworts/mosses/lichens** (includes submerged vegetation or in the splash zone); **emergent broad-leaved herbs** (broad-leaved (leaf length no longer than four times breadth) plants rooted on the river bed or at the water's edge with foliage above the water surface); **emergent reeds/sedges/rushes/grasses/horsetails** (narrow-leaved plants rooted on the river bed or at the water's edge with foliage above the water surface); **floating-leaved** (plants rooted on the river bed with leaves floating on the water surface); **free-floating** (plants floating on, or just under, the water surface, and not rooted to the river bed); **amphibious** (plants rooted at the edge of the river, or on the bank, but shoots or leaves trail across the water surface); **submerged broad-leaved** (rooted submerged plants with underwater leaves whose leaf length is no longer than four times its breadth - some part of the plant, or some leaves, may reach the surface but the majority are submerged); **submerged linear-leaved** (rooted submerged plants with narrow, unbranched, laminar leaves that are either totally submerged or just have their tips or upper parts floating on the surface); **submerged fine-leaved** (rooted submerged plants with fine, branched, leaves); **filamentous algae**. Channel vegetation types observed in between spot-checks can also be recorded in the 'sweep-up' column to right of spot-checks 1-10.

NOTE that when you enter these into the PlaceMarker data base, the numbers may need to be adjusted to ensure they sum to 100%.

- 7.4.2 Optional records include **channel choked with macrophytes**, which implies that no moving water is visible within the entire stretch. In this case, the predominant macrophyte type (as described in 7.4.1) or species present within the entire stretch can also be recorded in the box provided.

8. Cumulative Measurements

Cumulative measurements provide an overall assessment of the character of the surveyed stretch and are recorded with a variety of measurement scales.

8.1 Bank Profile and Protection

- 8.1.1 **Bank Profile.** The character of bank profiles is recorded in relation to three different categories: natural / unmodified; artificial (reinforcement); artificial (bank profile). In

each case there is a ‘none’ class to ensure that percentages (nearest 5%) within any of the three categories sum to 100% over the stretch. Because river banks often show complex profiles containing both natural and artificial elements, **it is possible for banks to show elements of more than one of the three categories. For example, a bank might have a natural lower profile (e.g. undercut) but have an artificial (e.g. resectioned) upper profile and also be reinforced in the upper part of the bank.**

Figure 6 illustrates the classes within each of the three categories and gives the relevant codes (note – poached refers to heavy trampling by animals or humans).

8.1.2 Bank Protection is recorded using the same categories as for the spot checks (for definitions see section 7.2.2) and should be recorded in terms of the length of bank affected to the nearest 5%. The none class should provide a percentage of banks with no protection on any part of the bank profile.
















Natural / Unmodified	
Vertical (NV)	
Undercut /vertical undercut (NVU)	
Vertical with toe (NVT)	
Steep (>45 degrees) (NST)	
Gentle (<45 degrees) (NGT)	
Composite (NCT)	
Natural berm (NBE)	
Artificial (reinforcement)	
Reinforced – whole (ARF)	
Reinforced – top (ART)	
Reinforced – bottom (ARB)	
Artificial (bank profile)	
Resectioned / reprofiled (ARD)	
Artificial two-stage (ATS)	
Embanked (AEM)	
Set-back embankment (ASE)	
Poached bank (APC)	

Figure 6: Bank profile classes and codes

8.2 Indicators of Channel Dynamics are important because they provide an indication of whether the river channel is likely to be undergoing change and the nature of that change. Such dynamics are also important for the ecological condition of the river

channel because they drive habitat turnover and thus they reset habitats (e.g. bare gravel bars, eroding bank faces) used by some species and ensure that a full range of young to mature habitats are maintained. **Note that the following are simply indicators that changes *may* be taking place, a full analysis of their nature and causes requires a specialist geomorphological assessment.**

Channel dynamics are assessed as a proportion (%) of the stretch length as none, negligible (<5%), local (5-20%), extensive (20-30%), very extensive (>30%):

One bank eroding (i.e. showing vertical, vertical + toe, or undercut bank profiles on one bank – section 8.1);

Opposite banks eroding (i.e. showing vertical, vertical + toe, or undercut bank profiles on both opposing banks – section 8.1);

Opposite banks depositing (i.e. showing vegetated bars or berms on both opposing banks – section 7.2.3);

Berms on one or both banks totalling more than 25% channel width (one bank or both opposing banks with berm > 25% channel width - berm defined in section 7.2.3).

Channel dynamic features are assessed on an absent, present (<33% stretch affected), extensive (>33% stretch affected) scale relative to the stretch length or the extent of the features (e.g. bridge piers) that are involved.

Buried soil within bank profile (relatively organic-rich layers are present within the bank profiles and are overlain by sediment with a distinctly lower organic content).

Burial of river bed with fine sediment (the river bed sediment is buried by a finer sediment layer – usually the burial of a gravel bed by sand or silt that can be assessed by pushing a probe into the fine sediment to assess whether there is a coarser layer underneath).

Burial of base of structures (structures such as bridge piers, jetties show distinct signs of burial, usually by fine sediment but coarser bed material can also be deposited by floods to raise the river bed).

Burial of base of established vegetation (usually best indicated by the clear burial of the base of tree trunks).

River channel narrow relative to bridge openings (indicated where bridges have several openings and the outer openings are becoming closed or partly-closed by the accumulation of sediment).

Bed sediment exposed within bank profile (sediments of similar size and texture to the bed material (e.g. gravel layers that are coarser than the upper bank profile) are exposed in the lower river banks above current bed level).

Trees with exposed roots or collapsing / leaning into the channel on both (opposing) banks (bankside trees are heavily undercut to expose their root structures and/or are collapsing and/or are leaning into channel).

Exposure of foundations of structures (e.g. foundations of bridge or jetty piers).

Heavily compacted and armoured bed (the river bed sediments are strongly compacted (individual particles are not easily removed) and armoured (there is a distinctly coarser layer of particles at the bed surface with finer sediments immediately underneath)).

8.3 Artificial Influences

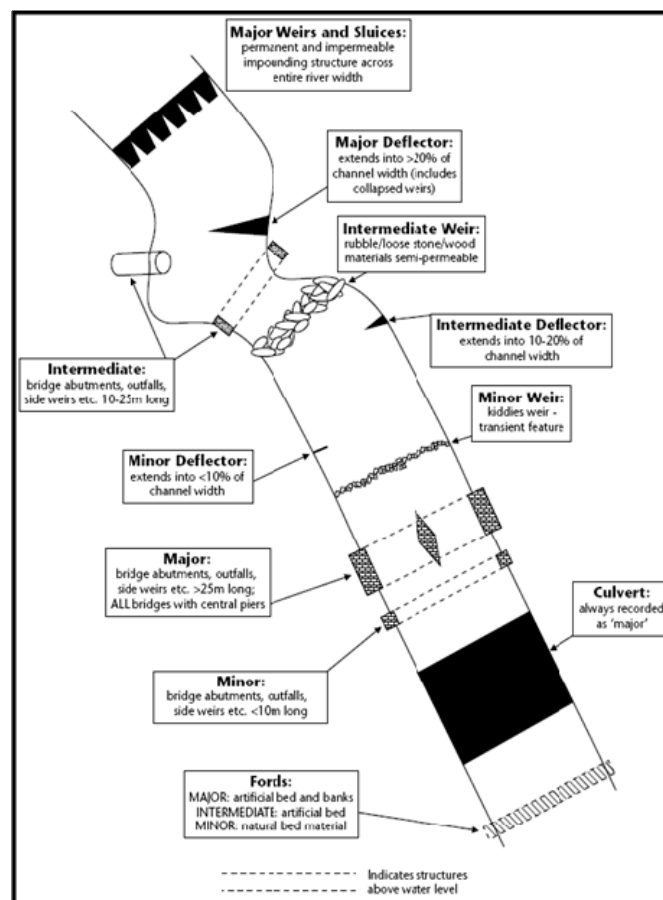


Figure 7: Types of artificial features and their impact level (minor, intermediate, major)
(source: RHS 2003 manual <http://www.riverhabitatsurvey.org/manual/rhs-manuals/>)

8.3.1 Artificial Features are recorded in the same way as for the RHS and are illustrated in Figure 7 according to type and impact. In addition, for bridges record the number of foot/cycle, road, and rail bridges in each category.

8.3.2 Recent Management. Recording is optional and relates to obvious, recent activities in the listed classes. Briefly describe other activities as appropriate. Record whether each listed activity is absent (A - none), present (P - <33% cover), or extensive (E - >33% cover) along the length of the stretch. If nuisance plant species are identified it is recommended that evidence is captured and reported via PlantTracker:

<http://planttracker.naturelocator.org>.

8.3.3 Nuisance Plant Species. The abundance along the surveyed stretch of the seven species listed in this category is recorded (i.e. Himalayan balsam, Japanese knotweed, Giant hogweed, Floating pennywort, Australian swamp stonecrop, Parrot's feather, Creeping water primrose). These are the seven non-native species identified by the Environment Agency (2010) in their document entitled '*Managing invasive non-native plants*' (https://www.gov.uk/media/62585/ea_invasive_plants.pdf). Here 'Individuals' means isolated plants occupying <1% cover; 'Isolated clumps' indicates distinct clumps of plants but with low cover (<5%); 'Frequent' indicates a cover of between 5 and 33%; and 'Extensive' indicates a cover of >33%. The percentage cover should be related to available bank area (Himalayan balsam, Japanese knotweed, Giant hogweed) or available channel area (the other 4 species). Record other nuisance species in the space provided.

8.4 Extent of Pollution

8.4.1 Pollution Sources. **Input pipes** are counted and include sewage outfalls, industrial effluent pipes, and surface runoff pipes. **Leach points** are also counted and include natural leaching and small land drains <10cm with signs of active seepage. If you identify failures to an asset during the survey, please capture evidence (ideally a photograph) and report to the relevant Environment Agency contact.

8.4.2 Pollution Indicators are recorded on the APE (absent – none; present <33%, extensive > 33%) scoring system according to the length of the stretch affected. **Water odour** typically refers to sewage effluent odours, but also includes industrial chemical aromas such as ammonia. **Sediment odour** describes the characteristic 'rotten egg' odour due to the presence of hydrogen sulphide emitted by anoxic sediments and can easily be tested by inserting a ranging pole into the channel sediments. Usually **Oil** is

seen floating on the water surface but may also be released from toxic sediments when their surface is disturbed (e.g. during testing for sediment odour). **Surface scum** consists of foams caused by the presence of phosphate detergents during surface mixing. It is usually seen by sewage outfalls but may also refer to floating mats of small particles of debris and thin foams formed in slow flowing waters. **Gross pollution** includes larger items of urban trash including shopping trolleys, mechanical parts, and anthropogenic litter. If you identify a pollution incident while undertaking the survey it should be reported to the Environment Agency's hotline 0800 80 70 60.

8.4.3 Water Clarity is assessed for the whole stretch as either Good (i.e. clear), Average (fairly clear or patchy), or Poor (difficult to see the channel bed).

8.5 Habitat Features and Flow Types

8.5.1 Habitat Features are discrete features that are recorded as a count for the entire stretch. Definitions of **bedrock** (BE) and **rock/boulder** (RO) are given in section 7.2.1. Definitions of **island** (MI), **unvegetated mid-channel bar** (MB), **vegetated mid-channel bar** (VM), **unvegetated point bar** (PB), **vegetated point bar** (VP), **unvegetated side bar** (SB), **vegetated side bar** (VS) are given in sections 7.2.3 and 7.2.6. Definitions of **riffle** (RI) and **pool** (PO) are given below in section 8.5.2. The remaining categories relate to organic matter or areas of still water. A **discrete organic matter deposit** (OM) is comprised of wood pieces less than 1m length and 10cm diameter, twigs, leaves, and smaller organic material and forms a distinct patch within the river channel. **Wood debris accumulation** (WD) is a discrete deposit similar to OM but contains one or more pieces of wood greater than 1m length and 10cm diameter. A **wood jam** (WJ) is similar to WD but extends across the entire channel width. **Marginal backwater** (MBW), **connected backwater** (CBW), and **disconnected backwater** (DBW), are areas of imperceptible flow located in the positions shown in Figure 8.

8.5.2 Flow (habitat) types are recorded according to the percentage (nearest 5%) of the water area affected by each type. They represent areas of the channel predominantly affected by the flow (patch) types described in 7.2.5. Brief definitions of each type are as follows: **cascade** (CC - distinct series of 'stepped' flow features occurring over boulder substrate or bedrock outcrops); **boil** (BL – area of channel where discrete areas of the water surface heave as upwelling water breaks the surface); **rapid** (RP – area with water surface dominated by broken standing waves); **riffle** (RI – area of channel dominated by unbroken standing waves); **run** (RU – area of channel with no

waves, flow direction generally downstream with disturbed rippled surface); **glide** (GL – area of channel dominated by a smooth water surface and discernible downstream movement of water); **pool** (PO – discrete area of (usually) imperceptible flow over a low area in the channel bed); **marginal deadwater** (MD – discrete area of imperceptible flow associated with marginal and connected backwaters, see figure 8); **ponded** (PR – area of slow to imperceptible flow upstream of a channel obstruction such as a weir).

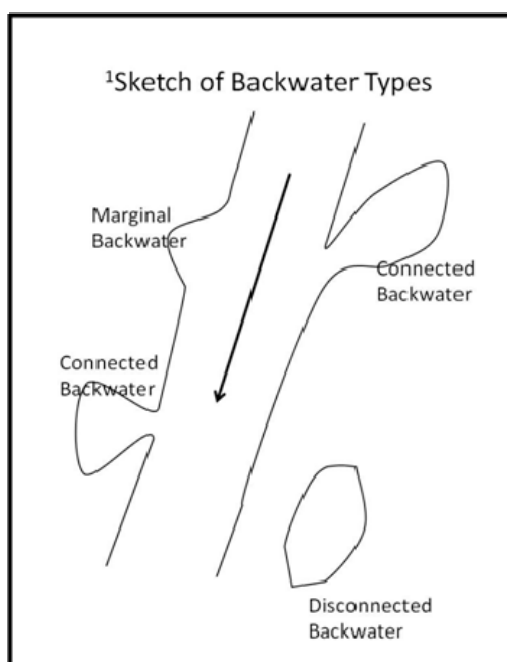


Figure 8: Backwater types

8.6 Special Features

8.6.1 Special Features are rare features. They are fully described in the RHS manual but the following are brief summaries: **side channels** are discrete additional channels to the main channel, separated from the latter by a vegetated area but connected to it, and they may be dry in periods of low-flow; **fens** are comprised of wetland vegetation, often growing over peat, where the water table is at, or just below, the ground surface (water is derived from both rainfall and drainage of surrounding land); **marsh / bogs** are comprised of vegetation growing on wet peat where the water table is at, or just below, the ground surface and the water source is primarily direct rainfall; **carr** is wet woodland comprised of riparian tree species such as willows and alders, usually with an understorey of wetland herbs, reeds and mosses; **water meadows** are floodplain meadows, primarily associated with chalk streams, and traditionally flooded via

constructed feeder channels; **floating mats / reed beds** form a distinct floating ‘ledge’ or shelf of vegetation extending into the channel.

8.6.2 Tree features are recorded on the APE (absent – none; present <33%, extensive > 33%) scale according to the length of the stretch affected. Record ‘present’ even if cover is only 1%. **Channel shading** and **overhanging boughs** are recorded according to their cover of the low flow channel area. **Exposed bankside roots, underwater roots, fallen trees, and large wood debris** (wood pieces and accumulations containing at least one piece longer than 1m and with a diameter greater than 10cm) are recorded according to their presence on / along either bank along the length of the stretch.

8.6.3 Tree distribution is recorded separately for each bank according to a range of self-explanatory classes (Figure 9)

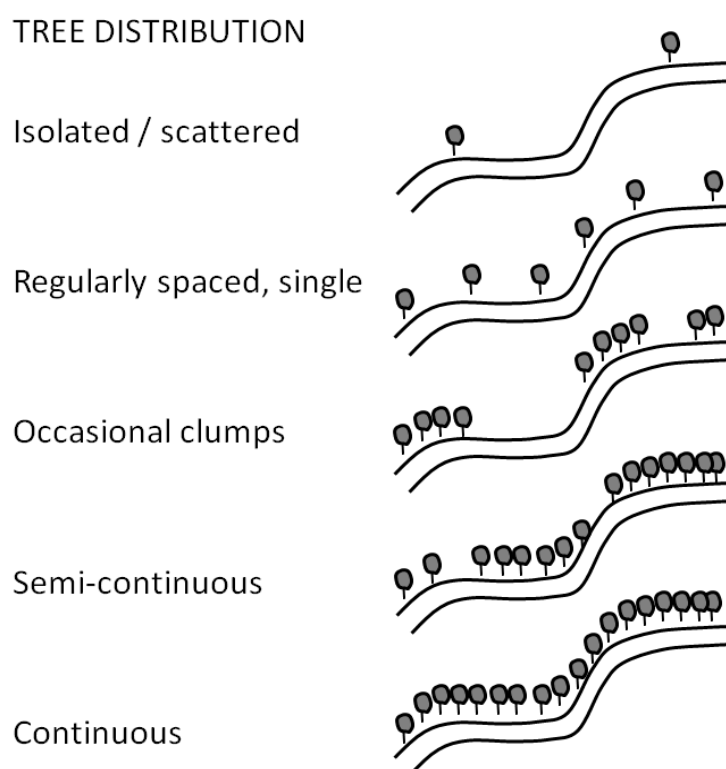


Figure 9: Tree distribution categories

(source: RHS 2003 manual <http://www.riverhabitatsurvey.org/manual/rhs-manuals/>)

8.6.4 Evidence of Protected Species This section provides the opportunity to record the presence (observed), physical signs, or suitable habitat for a list of protected species. These should also be highlighted in the key points of the High-Level Assessment of Habitat and Biodiversity.

8.6.5 Ecological characteristics. This optional section allows the surveyor to list any species observed during the survey.

THE STUDY AREA SURVEY

9. Study Area Survey Measurements

- 9.1 The **study area** survey includes the project **site** that is (likely) to be directly influenced by the proposed project plus nearby areas that are likely to be significantly indirectly affected. It is surrounded by a **fringe**, which is a visual envelope of the surrounding area (typically up to 50m in flat areas but may be far more extensive in areas of significant relief) (Figure 1 and repeated as Figure 10). These areas, whenever possible, should be delimited prior to the site visit for the survey, and may take account of other factors that could influence the project (e.g. designations). Measurements may refer to the entire **study area** when it only extends along one bank of the river. However, if the study area extends along both banks, Land Use / Cover (see 10.3) and Accessibility / Connectivity for people (see 10.4) are surveyed separately for the left and right bank areas of the **study area** with observations taken to the river centre line. *Note that the left bank of the river is on the left side of the channel when facing downstream in the direction of flow.*
- 9.2 Study area survey measurements are recorded on a 3-page survey form. These measurements contribute mainly to Landscape, Amenity, and Heritage assessments. As with the river survey, once the surveyor has entered the survey into the PlaceMarker software, the software calculates indices from the measurements to aid comparison between study areas and survey dates for the same study area. Where possible, semi-quantitative measurements of features have been incorporated into the study area survey, since these provide a baseline record against which the results of other PlaceMarker surveys of the same area can be compared. Furthermore, completion of the study area survey ensures that the surveyor walks the area thoroughly and views it from different angles.
- 9.3 **NEAS Project name / code / survey type, WFD water body ID, and River name** are the same as for any River Surveys conducted in relation to this study area. They all provide codes by which the data base can be queried to assemble information for both the area and river surveyed. **Surveyor name, Date and Time of survey** provide further important information relating to the survey.



Figure 10: The upper image shows a site for a river scheme within a park. The lower diagram indicates: the extent of the project site (grey) that will be directly affected by the scheme; the additional area (green) that will be significantly indirectly affected (visually or in terms of connectivity with water-related activities, features and habitats); and a fringe around these areas, which on this flat site extends only a short horizontal distance (approximately 50m). The first line of housing at the park edge is included in the fringe (affected through potential visibility). Playing fields are included in the fringe for the same reasons. By including these in the fringe, the potential broader benefits and impacts are considered. Image obtained from Google Earth, Image © 2018 Bluesky.

- 9.4 **Study area extent.** The first measurements record whether the study area is on the left, right, or both river banks and the GPS positions for the upstream and downstream ends of the river as it crosses the study area. The software allows up to five (sketch) maps of the study area to be uploaded to act as a reference for other material in the survey. One of these must show the extent of the study area and fringe. The others could be used to record the position of features of interest – up to four additional maps are allowed in case the surveyor wishes to record habitat and biodiversity, landscape, amenity, and heritage features on separate maps. In addition, photographs can be uploaded.
- 9.5 **Land Use / Cover.** Percentage area (to nearest 5%) covered by the level 2 land use types listed in Table 2 are recorded for the study area. These are determined separately for the left and/or right bank areas as appropriate. The percentage length (to nearest 5%) of the study area's fringes (left and/or right bank areas) occupied by these land use types are also recorded. Only fill in the relevant columns. For example, if the study area is only on one bank then complete the relevant right or left bank column. However, most study areas will have both left and right bank fringe areas and so both left and right bank columns need to be completed for the fringe.
Note: the percentages can be checked using Google Earth or other remotely-sensed sources. For preference, estimate percentages from these secondary sources prior to the survey and then check that all land cover types are included and that percentages are approximately correct while in the field.
- 9.6 **Accessibility and Connectivity (for people).** The Environment Agency would like to encourage more people from all backgrounds to enjoy the natural environment and its benefits. Where you identify *access for all* as being important to an area or potential scheme, further assessment can be undertaken while you are on site. Further information on access can be obtained from the [Environment Agency's guidance:
http://www.environment-agency.gov.uk/research/library/publications/141756.aspx](http://www.environment-agency.gov.uk/research/library/publications/141756.aspx).
- 9.6.1 **Study Area Ownership and Access.** Tick the appropriate boxes for study area ownership (public, private, mixed) and whether access to the study area is allowed (yes, no).
- 9.6.2 **Getting into the study area.** Provide an overall assessment of provision for access into the study area for all potential users (restricted, appropriate, extensive). Provide an assessment of the signage to and through the study area (absent, present, extensive). Further information on getting to / into the study area for different users is then provided by the following (with the stated measurement scale): **Pedestrian**

roadways (None, One, >One); **Bus services** (None, One, >One); **Car parks** (None, One, >One); **Cycle racks** (None, One, >One); **Horses** (None, One, >One); **Wheel chair access points** (None, One, >One); **Rail / Underground Station** (> 1km, 200-1000m, < 200m).

9.6.3 Access / Connectivity within and through the study area

Bridge crossing measurements are recorded in the river survey and so are not recorded on this survey sheet.

For the remaining measurements, within-site connectivity is assessed separately for the left and right banks, whereas through study area links (connecting beyond the study area) are also assessed but for the entire study area.

Footpaths:

Left Bank: A (absent), P (partial-present), E (good-extensive);

Right Bank: A (absent), P (partial-present), E (good-extensive);

Links to through-study area pedestrian networks: A (absent), P (partial-present), E (good-extensive);

Cycle paths:

Left Bank: A (absent), P (partial-present), E (good-extensive);

Right Bank: A (absent), P (partial-present), E (good-extensive);

Links to through-study area cycle networks: A (absent), P (partial-present), E (good-extensive);

Wheel chair access:

Left Bank: A (absent), P (partial-present), E (good-extensive);

Right Bank: A (absent), P (partial-present), E (good-extensive);

Through study area links to external paths suitable for wheel chairs: A (absent), P (partial-present), E (good-extensive).

Other (e.g. Bridleway, Multi-modal track) Specify the type:

Left Bank: A (absent), P (partial-present), E (good-extensive);

Right Bank: A (absent), P (partial-present), E (good-extensive);

Links to through-study area cycle networks: A (absent), P (partial-present), E (good-extensive).

Barriers to access (e.g. surfaces, obstructions –the type can be noted as ‘key points’):

Left Bank: A (absent), P (partial-present), E (good-extensive);

Right Bank: A (absent), P (partial-present), E (good-extensive);

Through study area links to external paths suitable for wheel chairs: A (absent), P (partial-present), E (good-extensive).

Visual connectivity:

River visibility from left bank area of the study area (A (absent), P (partial-present), E (good-extensive));

River visibility from right bank area of the study area (A (absent), P (partial-present), E (good-extensive));

Visibility of fringing urban (commercial, industrial, residential, transport infrastructure) land use from left bank study area (A (absent), P (partial-present), E (good-extensive));

Visibility of fringing urban land use from right bank study area (A (absent), P (partial-present), E (good-extensive));

Platforms for river viewing (none, one, >one).

9.7 Recreation / Leisure / Education

9.7.1 Recreational uses are recorded from a coded list (Table 3) and their condition is recorded using the following 5-point scale:

1. appears to be used and cared for;
2. appears to be intensively use (would benefit from some attention);
3. appears moderately used (would benefit from some attention);
4. misused or vandalised;
5. does not appear to be used.

9.7.2 Educational Facilities

The presence, quality, and condition of **information boards** (e.g. wildlife information), are recorded qualitatively as follows:

Presence (A - absent, P - present, E - extensive);

Quality of information (good, moderate, poor);

Condition of boards (good, moderate, poor).

The presence and condition of **formal education facilities** (e.g. outdoor classroom or centre?) are recorded qualitatively as follows:

Presence (A - absent, P - present, E - extensive);

Condition of facility (poor, moderate, good).

Table 3. List of codes for recreation / leisure facilities within the study area

Code	Facility
Se	Public seating
Cp	Children's play area
Do	Dog exercise area
Pc	Picnic area
Sf	Sports fields (e.g. soccer, rugby, cricket)
Te	Tennis court
Ru	Running / jogging track
Sp	Skate park
Gy	Outdoor gym
Sw	Swimming / paddling (formal provision such as pools, access points and changing areas)
Bo	Boating (formal provision such as boat access points)
Fi	Fishing (formal provision such as fishing stations)
Wi	'Wilderness' (in an urban setting) – i.e. suitable for observing nature and may be formally set aside for this purpose
Np	Natural play areas
Na	Natural art
Cf	Café + Restaurant
Other (specify)	

9.8 Health and Safety

9.8.1 Air and Noise Pollution (Note: water and sediment pollution are recorded in the river survey):

Air Pollution across the study area – level of airborne odours, particles, dusts from adjacent land uses (A - absent, P - present, E – extensive);

Noise Pollution across the study area – level of background noise from transport and nearby urban activities (A - absent, P - present, E - very intrusive).

9.8.2 Litter – is recorded as A - absent, P - present, E – numerous / extensive in relation to:

Presence of litter: large litter (e.g. shopping trolleys, fly tipping); small litter (paper, cans, plastic bottles); dog waste.

Litter disposal: litter bins; dog waste bins.

9.8.3 Personal Safety – indicators are recorded as follows:

CCTV (A - absent, P - present, E - extensive);

Emergency float aids (A - absent, P - present, E – plentiful / extensive);

Social issues (e.g. evidence of alcohol /drug abuse; sexual activity; vandalism; rough sleeping etc.);

Main footpaths: extent of lighting (A - absent, P - partial, E - good);

Main footpaths: visibility (i.e. degree to which they are open and can be seen for a reasonable distance such that it increases the safety of using them) (A - absent, P - partial, E - good);

Emergency contact numbers (A - absent, P - present, E - very accessible).

9.8.4 **Hygiene** – indicators are recorded as follows:

Toilets with hand washing facilities (none, one, > one);

Drinking water fountains/taps (none, one, > one).

9.8.5 **Hazards.** Are there hazards relating to health and safety within the study area? Record Yes or No, and if Yes comment on the nature of the hazard(s).

9.9 **Economic and Social Value** (evidence that the Study Area and River are an **asset**)

Do residential or commercial properties within the study area or fringe face on to the river (directly or across the study area)? (None, Some, Many)

Have properties within the study area or immediate fringe been designed and constructed to enjoy the views into / across the study area? (None, Some, Many)

Do properties benefit in terms of screening from vegetation within the study area? (None, Some, Many)

Is there evidence of public involvement in the study area (e.g. posters detailing events, on-going organised activities, park use groups). (None, Some, Many)

Are there businesses that depend on the study area (e.g. cafes, boat hire) (None, 1, > 1) and record the types of business that are present.

9.10 **Heritage Features**

9.10.1 Heritage features are recorded across the study area and fringe under two headings (Buildings or Structures of Cultural, Symbolic, or Historical Importance; Other Heritage Features) and the following condition scoring is used:

1. appears to be used and cared for;
2. appears to be intensively use (would benefit from some attention);
3. appears moderately used (would benefit from some attention);
4. misused or vandalised;
5. does not appear to be used.

9.10.2 Recording of **‘Buildings or Structures of Cultural, Symbolic, or Historical Importance’**. Name of building or structure / description of building or structure, such as building type (e.g. terraced, semi-detached, detached, large block housing, commercial industrial, church).

Reference number – this provides (i) part of a tag for associated photographs, (ii) a reference that can be used in the key points on the HQA Assessment Sheets, and (iii) it can indicate location on a study area map that can be scanned and entered as one of the maps of the study area (maximum 5 maps – see section 10.4) and that will be visible when viewing the High-Level Assessments and key points.

GPS position of the relevant building or structure.

Location – is it in the fringe or the study area?

Condition on the above 1 to 5 condition scale (section 9.10.1).

Period (e.g. Victorian, Georgian, Medieval – or say if you are not sure).

Comments – any additional information that you want to add, including photo identifiers for photos uploaded into the database with the above information.

9.10.3 Recording of **‘Other Heritage Features’** (e.g. historic hedgerows, trees, weirs, sluices, leats, bridges...):

Name or description of feature;

Reference number – this continues the numbering from 9.10.2 and so provides (i) part of a tag for associated photographs, (ii) a reference that can be used in the key points on the HQA Assessment Sheets, (iii) it can indicate location on a study area map that can be scanned and entered as one of the maps of the study area (maximum 5 maps – see section 10.4) and that will be visible when viewing the High-Level Assessments and key points.

GPS position of the feature.

Location – is it in the fringe or the study area?

Period (e.g. Victorian, Georgian, Medieval or say if you are not sure).

Condition on the above 1 to 5 condition scale (section 9.10.1).

Comments – any additional information that you want to add, including photo identifiers for photos uploaded into the database with the above information.

HIGH-LEVEL ASSESSMENTS

10. Introduction

Following the completion of the field measurements, the surveyor makes *Impression-based assessments* of the habitat and potential biodiversity, landscape, amenity, and heritage of the study area including its river. Each of these assessments is supported by the surveyor's assessment of his/her level of confidence in each assessment (High, Medium, Low). The **assessments are supported by key points** which provide crucial explanatory information for the assessment scores that are selected including text descriptions and photographs. As noted in section 9.4 the software allows up to five (sketch) maps of the study area to be uploaded to provide reference locations for other material in the survey. One of these must show the extent of the study area and fringe but the others could be used to record the position of key features. Up to four additional maps are allowed in case the surveyor wishes to record habitat and biodiversity, landscape, amenity and heritage features on separate maps. All maps are visible when viewing any of the High-Level Assessment data pages of the online data management system.

11. Impression-Based High-Level Assessment of Habitat and Biodiversity

11.1 Based upon impressions gained from the river surveys and from walking the study area, the surveyor provides a single high-level assessment of habitat and potential biodiversity – the **Study Area Habitat Quality Assessment (HaQA)** supported by a list of key points with accompanying photographs, as necessary. These are all entered on the ‘High-Level Assessment: Habitat & Biodiversity’ assessment sheet.

11.2 The impression-based HaQA is assigned a score of 1 to 5 as follows:

HaQA = 1 The habitat assemblage of the study area and contained river stretch(es) is as naturally-functioning and complex as is realistically achievable within the natural environment constraints at this location and is in very good condition (no pollution indicators, nuisance species or signs of channel modification / reinforcement).

HaQA = 2 Although the habitat assemblage of the study area and contained river stretch(es) is largely naturally-functioning and complex within the natural environment constraints at this location, it is degraded to some extent. However, modest interventions (e.g. litter removal, minor reinforcement removal, management of early stages of non-native plant invasion) would achieve important improvements.

HaQA = 3 The habitat assemblage of the study area and contained river stretch(es) has some natural function and is moderately complex within the natural environment constraints at this location but the habitat structure and naturalness is constrained by engineering interventions, particularly widespread patches of bank reinforcement, and / or, the presence of extensive gross pollution (oil drums, car parts, shopping trolleys etc.). Significant improvements could be achieved at moderate cost.

HaQA = 4 The habitat assemblage of the study area and contained river stretch(es) has low complexity and its naturalness is heavily constrained by significant engineering interventions, particularly extensive (> 50%) bank length reinforcement of the lower or entire bank face. Nevertheless, significant improvements could be achieved by removal or redesign of engineering interventions, in some cases coupled with other interventions (planting, invasive species control, litter removal, pollution control). Although relatively expensive, such interventions would yield major benefits.

HaQA = 5 The habitat assemblage of the study area and contained river stretch(es) has low complexity and function as a result of severe engineering intervention (e.g. full or both banks completely reinforced) and/or extreme pollution. Either the site constraints prevent improvements, or the costs would be extremely high with the opportunities of only small improvements.

11.3 The **Key Points** should:

1. support the HaQA assessment;
2. identify the positive and negative aspects of the study area's Habitat / potential Biodiversity;
3. identify important features (that should, for example, be incorporated into the project design at the pre-project stage);
4. identify specific measures (particularly during the pre-project survey) that could enhance the study area's Habitat / potential Biodiversity;
5. make use of information drawn from the river survey assessments in addition to observations from the broader study area.

These can be illustrated using photographs or other scanned image material and can be located on a sketch map of key features related to habitat and potential biodiversity.

11.4 The above impression-based high-level assessments are supported by several classifications generated for each surveyed river stretch by the information system (Figure 2, section 1). These include the **Stretch Habitat Quality Index (SHQI)**, which is based on three separate classifications of the stretch **Materials**, **Habitat** and **Vegetation**. For information on these classifications and the indices that support them,

refer to the document entitled '*PlaceMarker Classifications and Indices*' (available to trained PlaceMarker surveyors).

12. **Impression-Based High-Level Assessments of Landscape, Amenity, Heritage**

- 12.1 These are based upon impressions gained from walking the study area and completing the study area survey. The surveyor makes three separate *Impression-based assessments* of Landscape, Amenity, and Heritage quality and potential of the study area (**LQA, AQA, HeQA**) (Figure 2, section 1). Each of these overall quality and potential assessments are supported by:
- a. *Impression-based assessments* of the study area's **Complexity, Coherence, Interest, and Condition**, in relation to Landscape, Amenity, and Heritage. These assessments are made on a 1 to 5 (e.g. very good to very poor) scale and are qualified by a *Level of Confidence* (High, Medium, Low).
 - b. *Key points* provide support for all of the above assessments and are accompanied by photographs and/or other images (e.g. sketch maps locating important features). Features of particular importance are mentioned and numbered within the list of Key Points and their location is fixed by GPS. A sketch map locating features mentioned in the key points can also be uploaded into the information system (see section 9.4)
- 12.2 The **Landscape Assessment** is heavily based on the impressions and study area-specific observations (and *key points*) made by the surveyor. Landscape is 'the appearance of the land' and so Landscape assessment is concerned with the assemblage of land cover types from semi-natural to entirely human-constructed. Study area and river survey data that can support the assessment include: the river engineering type and SHQI for the river stretches incorporated within the study area; observations relating to physical and visual connectivity and land cover of the study area and its fringes. To avoid double-counting, man-made features should only be included in the assessments to the extent that they form important components of the landscape and not because of their heritage value.

Landscape Quality Assessment (LQA) scores range from 1 to 5 (very good to very poor) and provide an integrated impression of the quality of the study area at the time of survey based upon the component scores for Complexity, Coherence, Interest, and

Condition and the Key Points (to be accompanied by a level of surveyor confidence: High-H, Medium - M, Low - L).

Complexity assessment reflects the variety / diversity in the land cover assemblage of natural and man-made features.

Coherence assessment reflects the way that the landscape elements are arranged – do they complement one another, flow from one to another, integrate into a coherent whole?

Interest assessment reflects the degree to which the landscape assemblage is stimulating and interesting.

Condition assessment reflects the level of sympathetic maintenance of the landscape and its elements.

Complexity, Coherence, and Interest assessment scores should focus on the landscape of the study area within the context of the visual envelope of the fringe, should be supported by the key points, and accompanied by a level of confidence: High-H, Medium - M, Low - L).

1. Very good: The landscape elements and assemblage of the study area within the context of the visual envelope of the fringe offer as much **complexity, coherence** or **interest** as is realistically possible at this location.
2. Good: The landscape elements and assemblage of the study area within the context of the visual envelope of the fringe offer high **complexity, coherence** or **interest** (potential for modest improvements should be apparent from the *key points*).
3. Average: The landscape elements and assemblage of the study area within the context of the visual envelope of the fringe offer moderate **complexity, coherence** or **interest** (potential for improvements should be apparent from the *key points*).
4. Poor: The landscape elements and assemblage of the study area within the context of the visual envelope of the fringe offer limited **complexity, coherence** or **interest** (the nature / potential / difficulty of potential improvements should be apparent from the *key points*).
5. Very Poor: The landscape elements and assemblage of the study area within the context of the visual envelope of the fringe offer negligible **complexity, coherence** or **interest** (the nature / potential / difficulty of potential improvements should be apparent from the *key points*).

Condition assessment score should focus on the study area:

1. Very good condition in the context of the character of the landscape under study;
2. Good condition in the context of the character of the landscape under study;
3. Average condition in the context of the character of the landscape under study;
4. Poor condition in the context of the character of the landscape under study;
5. Very poor condition in the context of the character of the landscape under study.

Key Points should:

1. support the LQA, Complexity, Coherence, Interest, and Condition Assessments;
2. identify the positive and negative aspects of the study area's landscape and important landscape features (that should, for example be incorporated into the project design at the pre-project stage);
3. identify specific measures that could enhance the study area's landscape (particularly during the pre-project survey).

- 12.3 The **Amenity Assessment**. Amenity relates to the convenience, comfort and pleasure provided by the study area for humans and relates to both informal and formal human activities. A significant body of field measurements from the study area survey supports the assessment of amenity. The measurements relate to accessibility and connectivity, recreation, education, health and safety, and economic value.

Amenity Quality Assessment (AQA) scores range from 1 to 5 (very good to very poor) and provide an integrated impression of the quality of amenity provision within study area based upon the component scores for Complexity, Coherence, Interest, and Condition; the Key Points; and the field measurements collected (accessibility and connectivity, recreation, education, health and safety, and economic value).

Assessment is accompanied by a level of confidence: High-H, Medium - M, Low - L).

Complexity assessment reflects the variety / diversity of formal and informal activities that are supported by the study area.

Coherence assessment reflects the way that the activities are arranged – are related activities arranged together or do they conflict with one another; where relevant, do activities on the study area relate to activities beyond the study area; do the activities integrate into a coherent whole that is more than the sum of the individual elements; is the study area sufficiently connected both internally and externally to support the activities that are available and to make them accessible?

Interest assessment reflects the degree to which the amenities provide a stimulating and interesting environment in which to spend time.

Condition assessment reflects the state of repair as well as the general condition of the amenity facilities in the study area.

Complexity, Coherence and Interest assessments use the following score definitions:

1. Very good: The study area offers as much complexity, coherence or interest in amenity provision as is realistically possible at this location.
2. Good: The study area offers high complexity, coherence or interest in amenity provision (potential for modest improvements should be apparent from the *key points*).
3. Average: The study area offers moderate complexity, coherence or interest in amenity provision (opportunities for improvement should be apparent from the *key points*).
4. Poor: The study area offers low complexity, coherence or interest in amenity (opportunities / limitations in relation to improvement should be apparent from the *key points*).
5. Very Poor: The study area offers negligible complexity, coherence or interest in amenity provision (opportunities / limitations in relation to improvement should be apparent from the *key points*).

Condition assessment scores:

1. The facilities available for supporting informal and formal human activities in the study area are typically in very good condition;
2. The facilities available for supporting informal and formal human activities in the study area are typically in good condition (but some may need attention);
3. The facilities available for supporting informal and formal human activities in the study area are typically in average or variable condition (but would benefit from some attention);
4. The facilities available for supporting informal and formal human activities in the study area are typically in poor condition (they are in need of significant attention);
5. The facilities available for supporting informal and formal human activities in the study area are typically in very poor condition (possibly including significant vandalism).

Key Points should:

1. support the AQA, Complexity, Coherence, Interest and Condition Assessments;
2. identify the positive and negative aspects of the study area's amenity assemblage in terms of quality, condition, safety;
3. identify important opportunities for adding, enhancing, and connecting amenity features that could be incorporated into the project design (in a pre-project survey);
4. identify specific measures that could enhance the study area's amenity appeal, condition and accessibility (also in a pre-project survey).

12.4 The **Heritage Assessment** is also heavily based on the impressions and study area-specific observations (and key points) made by the surveyor but formal data gathering is also a crucial aspect of this assessment. Heritage relates to the historic environment of the study area. This includes designated structures but, importantly, any other (potentially) historic features that are observed during the survey. Study area data collected in support of the heritage assessment include: (i) a record of buildings or structures of cultural, symbolic, or historical importance within the study area or fringe; (ii) a record of other heritage features within the study area or fringe.

Heritage Quality Assessment (HeQA) scores range from 1 to 5 (very good to very poor) and provide an integrated impression of the heritage quality of the study area (and, where relevant, related features in the fringe) based upon: the component scores for Complexity, Coherence, Interest, and Condition; the Key Points; and data collected on individual heritage features during the study area survey (to be accompanied by a level of surveyor confidence: High-H, Medium - M, Low - L).

Complexity assessment reflects the variety / diversity of heritage features within the study area or fringe.

Coherence assessment reflects the way that the heritage features are arranged – do they complement or relate to one another, integrate into a coherent whole that is more than the sum of the individual elements?

Interest assessment reflects the degree to which the heritage is stimulating and interesting.

Condition assessment reflects condition relative to what might be expected given the age of the features and the nature of the environment in which they are located.

Complexity assessment scores focus on heritage features within the study area.

1. Very good: The study area offers an extremely complex suite of heritage features (these should be apparent from the *key points*).
2. Good: The study area offers a complex suite of heritage features (these should be apparent from the *key points*).
3. Average: The study area offers a moderately complex suite of heritage features (these should be apparent from the *key points*).
4. Poor: The study area offers low complexity in relation to heritage features (any significant heritage features should be apparent from the *key points*).
5. Very Poor: The study area offers negligible heritage features.

Coherence and Interest assessments could incorporate complementary features within the fringe as well as the study area.

1. Very good: The study area offers very high coherence or interest relating to heritage features with little opportunity for improvement.
2. Good: The study area offers high coherence or interest relating to heritage features (potential for modest improvements should be apparent from the *key points*).
3. Average: The study area offers moderate coherence or interest relating to heritage features (opportunities for improvement should be apparent from the *key points*).
4. Poor: The study area offers limited coherence or interest relating to heritage features (any opportunities for improvement should be apparent from the *key points*).
5. Very Poor: The study area offers negligible coherence or interest relating to heritage features (reasons for low score and any opportunities for improvement should be apparent from the *key points*).

Condition assessment: the scores should be interpreted in relation to what might be expected for the age of the historic features and the environment in which they sit:

1. The heritage features are typically in very good condition;
2. The heritage features are typically in good condition;
3. The heritage features are typically in average or variable condition;
4. The heritage features are typically in poor condition;
5. The heritage features are typically in very poor condition.

Key Points should:

1. support the HeQA, Complexity, Coherence, Interest and Condition Assessments
2. identify the positive and negative aspects of the study area's Heritage features in terms of their quality and condition;
3. identify important heritage features that could be enhanced and connected to one another (including connection to features in the fringe), and / or (in a pre-project survey) should be incorporated into the project design;
4. identify specific measures that could enhance the study area's Heritage appeal and condition.