

PORTISHEAD BRANCH LINE PRELIMINARY
ENVIRONMENTAL INFORMATION REPORT
VOLUME 4

APPENDIX 9.10

Flora Survey: Avon Gorge Woodlands SAC / Avon Woods SSSI



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Acronyms and Abbreviations

BAP	Biodiversity Action Plan
BRERC	Bristol Regional Environmental Records Centre
ES	Environmental Statement
HRA	Habitats Regulations Assessment
IEEM	Institute of Ecology and Environmental Management
JNCC	Joint Nature Conservation Committee
MAGIC	Multi-Agency Geographic Information for the Countryside website
NPPF	National Planning Policy Framework
NERC Act	Natural Environment and Rural Communities Act
NNR	National Nature Reserve
NSDC	North Somerset District Council
RLP	Replacement Local Plan
SAC	Special Area of Conservation
SNCI	Site of Nature Conservation Importance
Sp.	Species (singular)
Spp.	Species (plural)
SSSI	Site of Special Scientific Interest
WCA	Wildlife and Countryside Act

Executive Summary

CH2M was commissioned by North Somerset District Council (“NSDC”) to undertake a flora survey and report of the Avon Gorge Woodlands Special Area of Conservation (“SAC”) and Special Scientific Interest (“SSSI”) section of the Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme (“the DCO Scheme”). Potential works are required to realign and widen the railway track through the SSSI/SAC. A botanical survey was conducted to identify; SAC/SSSI qualifying habitats, protected, rare and scarce plants, along with recording the occurrence of invasive plant species.

The survey identified a number of internationally important SAC habitats within Network Rail land, in particular broad-leaved semi-natural ancient woodland, dry calcareous grassland, and calcareous cliff and rock exposures.

A total of 23 notable plant species are present, including two on Schedule 8 of the Wildlife and Countryside Act (“WCA”) protected plants (spiked speedwell and Bristol rockcress) and seven rare endemic whitebeams.

Twenty-one non-native and potentially invasive plant species were recorded on Network Rail land, including six species listed on Schedule 9 of the WCA which must not be allowed to spread.

As works are required within the SAC/SSSI, a Habitats Regulations Assessment (“HRA”) will be required with SSSI assent from Natural England.

SECTION 1

Introduction

1.1 Background to the DCO Scheme

- 1.1.1 The Portishead Branch Line was built in the 1860s. Passenger services continued between Portishead and Bristol until 1964, and freight services continued to 1981. The Royal Portbury Dock opened in 1978 and in 2002 the currently operational part of the former Portishead Branch Line was re-opened to service the port for freight only. The owner of the Royal Portbury Dock, Bristol Port Company, has commercial rights to run up to 20 freight trains per day in each direction along the operational railway line. The current volume of freight trains operating is substantially less than this.
- 1.1.2 MetroWest Phase 1 proposes to re-open the disused section of the Portishead Branch Line from Portishead to Pill and operate an hourly passenger service between Portishead and Bristol Temple Meads. In order to reintroduce passenger services the remaining section of disused railway between Portishead and Pill has to be rebuilt including a new station at Portishead and the re-opening of the former Pill station. The project is a nationally significant infrastructure project ("NSIP") as defined by the Planning Act 2008 and therefore a Development Consent Order ("DCO") is required for powers to build and operate the railway, as well as to acquire land, where it cannot be acquired by negotiation.
- 1.1.3 The DCO Scheme also comprises a number of associated improvements to the rail network from Pill to Ashton Vale (Ashton Junction) to enable the operation of an hourly train service (or an hourly service plus) between Portishead and Bristol Temple Meads.
- 1.1.4 The NSIP as defined under the Planning Act 2008, is a permanent railway of approximately 5,450 metres long from Quays Avenue, Portishead, North Somerset (OSGR ST471765) to Pill in North Somerset (OSGR ST520762). It comprises of the reconstruction of 4,750 metres of disused railway from Quays Avenue in Portishead to the existing operational railway (the Portbury freight line) to the east of the M5 Motorway. The NSIP then comprises 750 metres of new track through Pill village parallel to the operational railway line from Portbury Dock. The NSIP terminates at a new junction east of Pill Viaduct (Pill Junction), where it connects with the existing operational railway.
- 1.1.5 The associated permanent works in summary include:
- A new station, station building, forecourt, car parks and highway modifications in Portishead,
 - New Trinity Primary School footbridge in Portishead,
 - A new maintenance compound and road rail access point off the highway of Sheepway near Portishead,
 - A new access for agricultural purposes to the west of Station Road, Portbury from the Portbury Hundred,
 - Minor works to bridges and structures along the disused railway,
 - Works to widen and strengthen the embankment where the disused railway meets the operational railway at Lodway Close, Pill,

- Replacing an existing rail bridge over the Avon Road / Lodway Close pedestrian and cycle underpass (to the west of Pill station) with a new wider bridge to support a new double track section of railway,
- Minor alterations to the Bridleway (LA8/66/10) and National Cycle Route 26 south of Royal Portbury Dock,
- Extension of bridleway LA8/67/10 north of the M5 underbridge to connect with the National Cycle Route 41 to the east of the M5 that connects with Pill,
- Construction of a new station at Pill on the site of the existing southern platform, with new access, forecourt and car park located on Monmouth Road,
- A new emergency and maintenance accesses to Pill Tunnel eastern portal,
- A new vehicular maintenance road rail access point from the highway of Clanage Road, Bower Ashton to the Portishead Branch Line Railway,
- Various improvement works along the operational railway line between Pill and Ashton Junction,
- Whilst the Ashton Vale Road (Ashton Junction) level crossing will remain operational, the following works are proposed to reduce the highway traffic from the increased use of the level crossing:
 - Extension of the left turn flare lane on Winterstoke Road,
 - Optimisation of the Ashton Vale Road signals, and upgrade of signals to “MOVA”, and
 - Provision of a ramp to the north of the level crossing to connect pedestrians and cyclists from Ashton Vale Road to Ashton Road.
- In light of the possibility that Baron’s Close pedestrian level crossing may not be closed permanently before MetroWest Phase 1 opens, MetroWest Phase 1 is proposing to close it as part of the DCO Scheme. Alternative pedestrian access will be provided, using a pedestrian and cycle path (currently under construction by the MetroBus scheme) linking to the Ashton Vale Road level crossing and the proposed MetroWest Phase 1 pedestrian / cycle ramp.
- Improvements are also required along the operational railway line between Pill Junction and Ashton Junction, including replacement of ballast, minor works to bridges and structures, minor modifications to the vertical and horizontal alignment of the railway and new signalling, telecommunications including a mast in Avon Gorge and aerials at Pill Tunnel and Portishead station and new fencing for the entire branch line, where natural boundaries are not sufficient.

1.2 Habitat and Flora Survey

- 1.2.1 In 2017, CH2M HILL was commissioned by North Somerset District Council (“NSDC”) to update a previous Ecological Appraisal Report (Halcrow, 2011) and to undertake an ecological appraisal for the DCO Scheme.
- 1.2.2 Due to potential works required to widen the railway track through the Avon Gorge Site of Special Scientific Interest (“SSSI”) and Avon Gorge Woodlands Special Area for Conservation (“SAC”), floristic data were compiled and surveys carried out of the track and adjacent habitats under Network Rail ownership (Figure 1).

- 1.2.3 The Avon Gorge is one of the most outstanding nature conservation sites in Britain and is designated as a SAC and a SSSI (designation details and schedules for these are given in the Phase 1 Survey report (CH2M, 2017)). The gorge is floristically very diverse, supporting old ancient woodlands, grasslands and rocks which support rare plants, such as the Bristol Rock-cress *Arabis scabra* in its only native locality in Britain. The Avon Gorge is probably the richest site for whitebeam (*Sorbus*) diversity in the world. These features are protected under the European legislation - the Habitats Directive - and national legislation - the Wildlife and Countryside Act.

1.3 Purpose and Structure of this Report

- 1.3.1 The purpose of this report is to identify the location and distribution of important habitats, notable plants and indicate invasive plant species within the Avon Gorge Woodlands SAC/SSSI.

- 1.3.2 The report is structured as follows.

- Section 2 - Methods. This section summarises the methods used for undertaking the data collection.
- Section 3 - Legislation. This section sets out the considerations made while undertaking the ecological appraisal.
- Section 4 - Results. This section describes the findings of the survey for habitats, rare plants, and invasive species.
- Section 5 - Evaluation. This section sets out the importance of the features.
- Section 6 - Conclusion. An overall conclusion from the data collected through flora surveys.

SECTION 2

Methods

2.1 Study area

2.1.1 The study area comprises the land owned by Network Rail within the Avon Gorge Woodlands SAC/SSSI and small area adjacent under different ownership which may be affected during construction. The study area is shown in Figure 1 and the proposed works associated with the DCO Scheme are shown in the PEI Report, Volume 3, Figure 4.2 Sheets 11 to 17.

2.2 Desk Study

2.2.1 A desk study was conducted as part of the Phase 1 survey report (CH2M, August 2017). A search area encompassing the study area, along with a 0.5 km buffer for all records and a 2 km buffer for statutory nature conservation designations. Data sources consulted during the desk study were:

- The Multi-Agency Geographic Information for the Countryside website ("MAGIC"); and
- Bristol Regional Environmental Records Centre ("BRERC"), for protected, notable species data

2.2.2 This review exercise was valuable in identifying past records and nature conservation designations. Understanding nature conservation issues within the wider area helps in the assessment of the ecological value of a site and the habitats and species that a site supports. Where applicable, information supplied by these organisations has been incorporated into the following account with due acknowledgement where they are particularly informative or relevant.

2.3 Field Surveys

2.3.1 Field surveys were undertaken by Libby Houston, Dr Tim Rich and Richard Thompson. Libby Houston is a botanist with extensive, specialist knowledge of the flora of Avon Gorge and a member of the Bristol Naturalists' Society, the Botanical Society of Britain and Ireland ("BSBI") and the Somerset Rare Plants Group. Dr Tim Rich is a national botanical expert, and a specialist in whitebeam taxonomy. Richard Thompson is an ecologist with nearly 20 years of professional experience of botanical and habitat survey at CH2M. Dr Tim Rich and Libby Houston are co-authors of the key *Sorbus* publications relating to the Avon Gorge (Rich *et al.*, 2010, 2014).

2.3.2 Field surveys were undertaken in 2015, 2016 and 2017. The initial survey was carried out by Richard Thompson and Libby Houston on 25th July 2015. The bulk of the fieldwork mapping whitebeams was undertaken by Libby Houston on numerous occasions during 2015-2017, also drawing on her previous knowledge. Surveys along the railway line by Dr Tim Rich and Libby Houston were carried out on 27th October, 15th December 2016, 18th May and 18th July 2017.

2.3.3 The field surveys incorporated visual searches for protected, notable and invasive plant species, using the look-see approach (Chapter 15, Hill *et al.*, 2005). Notable vascular plant species were recorded and mapped during the field surveys in accordance with the following criteria:

- Species referred to in the Avon Gorge Woodlands SAC and the Avon Gorge SSSI citations;

- Species protected under Schedule 8 of the Wildlife and Countryside Act 1981 (as amended) (“WCA”);
 - Species listed as Nationally Rare (found in 1-15 10x10 km squares of National Grid); Nationally Scarce (16-100 10x10 km squares); or Nationally Uncommon (101-250 10x10 km squares);
 - Species listed as Critically Endangered (“CR”), Endangered (“EN”), and Vulnerable (“VU”), on the Vascular Plant Red Data List for Great Britain (Cheffings & Farrell, 2005); or on the Vascular Plant Red List for England (Stroh *et al.*, 2014); and
 - Species of principal importance for the preservation of biodiversity under Section 41 of the Natural Environment and Rural Communities Act (2006).
- 2.3.4 A full list of plant species of importance in the Avon Gorge is given in Annex A, assessed using national status.
- 2.3.5 Detailed whitebeam (*Sorbus*) surveys were carried out by Houston, with a survey conducted in 2015, with updates and additions in 2016 and 2017. In total, 1,150 individual trees belonging to 14 different *Sorbus* species were recorded. Survey results are included within this data set.
- 2.3.6 *Sorbus* trees along the railway were mapped using laser surveying equipment; trees were located and identified by Libby Houston and digitised to provide a detailed record of locations and distance from the track; the methods and results are summarised in Annex B.
- 2.3.7 Whitebeams identified during the surveys were classified in accordance with the species conservation statuses detailed in the “*World List of Threatened Trees*” published by IUCN in 2017 (Table 2-1). Dr Tim Rich is a contributing author as the UK specialist to this document. Species classifications in the updated document calculate population status on the number of mature reproducing individuals (i.e. those flowering and fruiting), consistent with the IUCN (2001) guidelines, but no longer include mature (non-reproducing) or juveniles.

Table 2-1: IUCN status of Sorbus species potentially affected by the DCO Scheme in the Avon Gorge

Avon Gorge Sorbus species	2016 IUCN threat status
<i>Sorbus aria</i> , Common whitebeam	Least concern
<i>Sorbus aucuparia</i> , rowan	Least concern
<i>Sorbus avonensis</i> , Avon Whitebeam	Critically Endangered
<i>Sorbus bristoliensis</i> , Bristol whitebeam	Endangered; Red data book; Section 41; SSSI citation
<i>Sorbus eminens</i> , round-leaved whitebeam	Vulnerable; Red data book; Section 41
<i>Sorbus intermedia</i> , Swedish whitebeam	Least concern (non-native); SSSI citation
<i>Sorbus leighensis</i> , Leigh Woods whitebeam	Endangered
<i>Sorbus porrigentiformis</i> , Grey-leaved whitebeam	Vulnerable; SSSI citation
<i>Sorbus sellii</i> , Sell's whitebeam	Least concern (non-native)
<i>Sorbus spectans</i> , Observatory Whitebeam	Critically Endangered
<i>Sorbus torminalis</i> , wild service tree	Least concern; SSSI citation
<i>Sorbus wilmottiana</i> , Wilmott's whitebeam	Endangered; Red data book; Section 41; SSSI citation

2.3.8 Non-native and potentially invasive species include those listed on Schedule 9 of the WCA, together with those which have the potential to encroach upon the condition of qualifying habitats of the Avon Gorge Woodlands SAC and SSSI. Non-native species previously recorded within Avon Gorge are listed in Annex A.

2.3.9 Potential sites for replanting whitebeams were surveyed on 18th May 2017. Sites which were safe, practical, have minimal impact upon other nature conservation interests and suitable, for whitebeams, were initially identified. The criteria for site selection was:

- On Network Rail land;
- Whitebeams will not affect safety of the railway (e.g. on the embankments below the railway);
- Sites where competing vegetation can be managed safely in the short term until the trees are established;
- Where whitebeams can be monitored safely;
- Where no other significant nature conservation interest will be affected;
- Must have sufficient light and not shaded out by other trees (in short to medium term);
- Where non-native invasive species have been removed;
- Where soil conditions are suitable (basically calcareous soils over limestone, or limestone rubble on embankments; some sandstones at the north end may be suitable but not if acidic);
- Close to existing Common whitebeam *S. aria* populations so *pseudogamous* pollination can be facilitated; and
- Close to the existing whitebeams populations so they can contribute to metapopulation.

2.3.10 After the assessment, four transplant sites were selected. The main vegetation type, and dominant species, were noted using the DAFOR (Dominant, Abundant, Frequent, Occasional, Rare) scale.

2.4 Consultation

- 2.4.1 Formal consultation with Natural England was held on the 28th November 2016 and 4th July 2017, and informally during a site walkover on 15th December 2016. Outlines of the surveys were presented, comments incorporated, and management issues were discussed. Further details on consultation with Natural England and other interest bodies are presented in the PEI Report, Chapter 9 Ecology and Biodiversity.

2.5 Limitations

- 2.5.1 Populations of plants are often transient in nature and single survey visits can only provide a general indication of species present on site. Surveys have been carried out at various times of year so the majority of plant species should have been apparent. Populations of some species also vary from year to year (e.g. *Cardamine impatiens*) and can vary from place to place with metapopulation dynamics (e.g. *Arabis stricta*).
- 2.5.2 *Sorbus* identification usually requires mature leaves on short, sun-lit shoots; unfortunately, many small whitebeams were immature and/or heavily shaded and may be impossible to identify with certainty under current circumstances without DNA; Libby Houston has used all her expertise and knowledge to identify them to the best standard possible. Dr Tim Rich has seen and agreed many of the leaf samples and supports her identifications.
- 2.5.3 GPS readings used to map individual trees had an accuracy of 10-12 m.
- 2.5.4 Some trackside cliffs are unstable or covered with dense scrub which prevented full access or surveying.

2.6 Evaluation

- 2.6.1 The habitats and species evaluations are based on the guidance from the Institute of Ecology and Environmental Management (CIEEM, 2016). The value of specific ecological receptors is assigned using a geographic frame of reference, i.e. international value being most important, then national, regional, county, district, local and lastly, within the immediate zone of influence of the proposals only.
- 2.6.2 Value judgements are based on various characteristics that can be used to identify ecological resources or features likely to be important in terms of biodiversity. These include site designations (such as SSSI), or for undesignated features, the size, conservation status (locally, nationally or internationally), and the quality of the ecological resource. In terms of the latter, 'quality' can refer to habitats (for instance if they are particularly diverse or a good example of a specific habitat type), other features (such as wildlife corridors or mosaics of habitats), or species populations / assemblages.

SECTION 3

Legislative Context

3.1 Legislative Framework

3.1.1 Specific habitats and plant species receive legal protection in the UK under various pieces of legislation, including:

- The Wildlife and Countryside Act 1981 (as amended) (“WCA”);
- Natural Environment and Rural Communities Act 2006 (“NERC Act”); and
- The Conservation of Habitats and Species Regulations 2010 (as amended).

3.1.2 Where relevant, this document takes account of the legislative protection afforded to specific habitats and species.

Avon Gorge Woodlands SAC

3.1.3 Special Areas of Conservation (“SAC”) are strictly protected sites designated under the EC Habitats Directive. Article 3 of the Habitats Directive, transposed into UK Legislation by Conservation of Habitats and Species Regulations 2010 (as amended) requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the habitat species identified in Annexes I and II of the Directive (as amended). The listed habitat types and species are those considered to be most in need of conservation at a European Level.

3.1.4 The Avon Gorge Woodlands SAC is important for the small-leaved lime *Tilia cordata* woodland and the associated species-rich transitions to scrub and herb-rich calcareous grasslands. The open limestone grassland and cliff ledges support a high number of uncommon species, including rare whitebeams *Sorbus* spp., with at least two unique to the Avon Gorge, *S. bristoliensis* and *S. wilmottiana*, and other important plants, such as Bristol rock-cress *Arabis scabra* and honewort *Trinia glauca*. Small groves of yew *Taxus baccata* also occur on some of the stonier outcrops.

3.1.5 The nature conservation objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of the two qualifying features:
 - H6210. Semi-natural dry grasslands and scrubland facies: on calcareous substrates *Festuco-Brometalia*; Dry grasslands and scrublands on chalk or limestone.
 - H9180. *Tilio-Acerion* forests of slopes, screes and ravines; Mixed woodland on base-rich soils associated with rocky slopes.
- The structure and function (including typical species) of qualifying natural habitats, and
- The supporting processes on which qualifying natural habitats rely.

3.1.6 The SAC designation states “*The Avon Gorge is in south-west England. Natural cliffs, quarries and scree of Carboniferous limestone dramatically rise about 100 m either side from the tidal River Avon, with grassland and woodland where slopes are less sheer. The site is important because of the small-leaved lime Tilia cordata woodland and the associated species-rich transitions to scrub and herb-rich calcareous grasslands. The open limestone grassland and cliff ledges support a high number of uncommon species,*

including rare whitebeams *Sorbus spp.*, with two unique to the Avon Gorge, *S. bristoliensis* and *S. wilmottiana*, and other important plants, such as Bristol rock-cress *Arabis scabra* and honewort *Trinia glauca*. Small groves of yew *Taxus baccata* also occur on some of the stonier situations.”

- 3.1.7 In the event works are required within the SAC/SSSI which may affect any of these features, a Habitats Regulations Assessment (“HRA”) will be required and SSSI assent obtained from Natural England.

Avon Gorge SSSI

- 3.1.8 Sites of Special Scientific Interest (“SSSI”) are designated under the WCA. The government has a duty to notify as an SSSI any land which in its opinion is of special interest by reason of any of its flora, fauna, geological or physiographical features.
- 3.1.9 The designation is primarily to identify those areas worthy of preservation. An SSSI is given certain protection against damaging operations, which are listed in the citation for the site and any such operations must be authorised by the designating The Countryside and Rights of Way Act 2000 strengthened the law giving greater power to the designating body to enter into management agreements, to refuse consent for damaging operations, and to take action where damage is being caused through neglect or inappropriate management. Local Authorities and other public institutions now also have a statutory duty to further the conservation and enhancement of SSSIs both in carrying out their operations, and in exercising their decision-making functions, which includes planning decisions.
- 3.1.10 Key features of the Avon Gorge are the geological interest of the natural cliffs and quarry exposures of Carboniferous limestone, and the screes, scrub, pockets of grassland and woodlands which support an exceptional number of nationally rare and scarce plant species including many endemic whitebeam species.
- 3.1.11 All the SSSI management units with Network Rail ownership (SSSI units 2, 6, 7, and 10) are currently in unfavourable to recovering condition¹.

Schedule 8 Plants

- 3.1.12 Plant species listed on Schedule 8 of the WCA receive protection under Section 13. Three of these species, round-headed leek *Allium sphaerocephalon*, Bristol rock-cress *Arabis scabra* and spiked speedwell *Veronica spicata* are known to occur in Avon Gorge. Section 13 of the WCA makes it an offence to:
- intentionally pick, uproot or destroy (Section 13 1a);
 - sell, offer for sale, possess or transport for the purpose of sale (live or dead, part or derivative) (Section 13 2a); and
 - advertise (any of these) for buying or selling (Section 13 2b).

Schedule 9 plants

- 3.1.13 Section 14 (2) of the WCA prohibits planting or otherwise causes to grow in the wild any plant which is included in Part II of Schedule 9. Species listed on Schedule 9 include Japanese knotweed *Fallopia japonica*, Himalayan balsam *Impatiens glandulifera*, various cotoneaster species *Cotoneaster spp.* and Virginia creeper *Parthenocissus quinquefolia*.

1

<https://designatedsites.naturalengland.org.uk/SiteUnitList.aspx?SiteCode=S1003073&SiteName=avon&countyCode=&responsiblePerson=>
(accessed 21/10/2016)

NERC Act 2006

- 3.1.14 The NERC Act 2006 states that "*Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*" (Section 40).
- 3.1.15 Section 41 of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. These are all the habitats and species in England that were identified as requiring action in the UK Biodiversity Action Plan ("UK BAP") and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework.

SECTION 4

Baseline Conditions

4.1 Designated Sites

International (European) Designations

- 4.1.1 The study area covers part of the Avon Gorge Woodlands SAC (Figure 1). The SAC is located on both sides of the River Avon on the western outskirts of Bristol. The 152 ha site is predominantly broad-leaved deciduous woodland (70%), with areas of rocks and scree (10%), coniferous (5%) and mixed (5%) woodland, heath (4%), dry grassland (4%), and humid grassland (2%). The site is designated for the following features.
- Annex I Habitats: (a) Semi-natural dry grasslands and scrubland faces on calcareous substrates Festuco-Brometalia and, (b) Tilio-Acerion forests of slopes, screes and ravines.
- 4.1.2 The SAC citation does not identify any significant threats to the Annex I habitat, but does note the need to assess the presence of non-native trees throughout the site and the scrub invasion on the calcareous grasslands. The Site Improvement Plan (Natural England, 2015) prioritises six threats: invasive species, under-grazing, public access and disturbance, disease, changes in species distribution, and air quality. The site lies close to the major city of Bristol, the Portbury Freight Line passes through the SAC for approximately 3.8 km and there are nearby heavily trafficked roads including the Portway, and industrial areas in Avonmouth and Severnside. According to the SIP, NE is working work with landowners and other parties to improve the condition of the site (Natural England, 2015).

National Designations

- 4.1.3 There are three nationally designated sites within a 2 km radius of the survey area:
- Avon Gorge Site of Special Scientific Interest (“SSSI”), which includes part of the survey area;
 - Leigh Woods National Nature Reserve (“NNR”), which lies within the Avon Gorge SSSI and includes part of the survey area (as above);
 - Ashton Court SSSI, approximately 170 m to the south-west.
- 4.1.4 Avon Gorge SSSI is co-incident with the international SAC designation described above. The Gorge exhibits natural cliffs and quarry exposures of Carboniferous limestone, which are of great geological interest and, together with the scree, scrub, pockets of grassland and adjacent woodland, support an exceptional number of nationally rare and scarce plant species. The Leigh Woods NNR is an area of ancient woodland, archaeological features and flower rich limestone grassland set within the Avon Gorge SSSI. The woodland includes pedunculate and sessile oak *Quercus robur* and *Q. petraea*, with ash *Fraxinus excelsior*, wych elm *Ulmus glabra*, small-leaved lime *Tilia cordata*, birch *Betula sp.* and whitebeams *Sorbus spp.* Various tree species have been planted, including beech *Fagus sylvatica*, hornbeam *Carpinus betulus* and sweet chestnut *Castanea sativa*. The shrub layer is discontinuous and includes hazel *Corylus avellana* and occasional field maple *Acer campestre*, privet *Ligustrum vulgare*, hawthorn *Crataegus monogyna*, spindle *Euonymus europaeus*, dogwood *Cornus sanguinea* and yew *Taxus baccata*. The ground flora is very diverse, the main species including Atlantic ivy *Hedera hibernica*, male fern *Dryopteris filix-mas*, bluebell *Hyacinthoides non-scripta*, ramsons *Allium ursinum*, dog's mercury *Mercurialis perennis* and bramble *Rubus fruticosus* agg.. The citation notes that the woods

and gorge have an exceptional diversity of whitebeams including two which are unique to the Avon Gorge; *Sorbus bristoliensis* and *S. wilmottiana*, but since the production of the citation more whitebeam species endemic to the gorge have been named: *S. avonensis*, *S. leighensis* and *S. spectans*. National rarities *S. anglica*, *S. whiteana* and *S. eminens*, and the nationally scarce *S. porrigentiformis* also occur. Other species of note include wild service tree *S. torminalis*.

4.1.5 The survey area falls partially within Unit 1 of the Avon Gorge SSSI which primarily consists of ash woodland. The management status of the unit is described as unfavourable recovering due to the cover of non-native woody species.

4.1.6 Ashton Court SSSI is a 210 ha site designated for its rich saproxylic (deadwood) invertebrate fauna. Clarkencombe Wood supports the richest variety of saproxylic Coleoptera (beetles) due to the significant concentration of ancient oak pollards. Ancient trees also occur as open parkland trees either singly or in small groups and as single trees within relatively modern plantations. The ancient trees include pedunculate oak, ash, wych elm and beech. The continuity of parkland and woodland cover over centuries with large over-mature timber has enabled a specialised saproxylic invertebrate fauna to survive. Such habitats are now very rare in the UK.

Local Designations

4.1.7 Two non-statutory Sites of Nature Conservation Interest (“SNCI”) lie adjacent to or partially within the survey area:

- BC137 River Avon (part of): Running water and marginal habitat. The site lies immediately adjacent to the survey area.
- NS9 Avon Gorge and Leigh Woods: Ancient semi-natural and semi-natural broad-leaved woodland, with mixed broad-leaved plantation, unimproved and semi-improved calcareous and neutral grasslands. The site falls partially within the survey area and overlaps with the Avon Gorge SSSI.

4.2 Habitats

Woodland

Ancient semi-natural woodland

4.2.1 The woodland canopy is dominated by small-leaved lime *Tilia cordata* with beech *Fagus sylvatica*, ash *Fraxinus excelsior* and wych elm *Ulmus glabra*, with yew *Taxus baccata* associated with the more natural slopes, rocky outcrops and cliffs. Much of this is diverse Ancient Woodland of fairly typical composition but with occasional uncommon species in the ground flora such as lily-of-the-valley *Convallaria majalis*. This woodland occurs on the natural rocks and slopes, for example around Clifton Tunnel No. 1, Pill portal, and small widths within land bordering the railway. Other than small scraps on the steepest slopes and cliffs, it has been extensively managed.

4.2.2 Some woodland areas appear to have been heavily managed in the past and, as such, been replanted with a canopy of beech, ash, and sometimes non-native species such as sweet chestnut.

4.2.3 The Ancient Woodland Inventory (MagicMap, 2017) indicates that Leigh Woods is a mixture of Ancient Semi-natural Woodland and Replanted Ancient Woodland. Other areas are not included, suggesting there is documentary evidence that they are not ancient woodland. Small scale mapping of vegetation along the railway corridor identifies minor

discrepancies in classification. For example, the woods located between Quarries 3 and 4, display relic signs of ancient woodland. The finer details of vegetation along the railway corridor where we have used smaller scale mapping indicates some discrepancies, such as the wood by the railway between Quarries 3 and 4 has come clear ancient woodland.

Secondary woodland

- 4.2.4 Secondary woodland (taller than 5 m) is the main woodland type along the railway cuttings, in quarries, and between the the railway, the River Avon Towpath and the river. Species consist of small-leaved lime, oak, ash, English elm, wych elm, hazel, hawthorn, traveller's joy, bramble and invasive non-native species such as holm oak, sycamore and Norway maple. Much of this woodland is not diverse, but the more open areas are a key habitat for some of the rare whitebeams, whilst the woodland is young.
- 4.2.5 Woodland between the River Avon Tow Path and river are in Network Rail ownership, such as between Quarry 6 Underbridge and the Sandstone Tunnel. These have presumably grown up since the River Avon Tow Path fell out of use, and are relatively diverse, including lime, wych elm and rare whitebeams.
- 4.2.6 Areas of secondary woodland form a continuum grading into scrub.

Scrub

- 4.2.7 Scrub (less than 5 m tall) varied in composition, based on location. Generally, scrub consisted of hawthorn, bramble, dogwood, birch, privet, ivy and traveller's joy which was widespread in the quarries, railway cuttings and open rock faces. Areas of butterfly bush, young holm oak and other non-native plants were also recorded. The scrub varies from areas of open continuous, to discontinuous canopies, with some isolated locations of scattered small trees and shrubs.
- 4.2.8 There are extensive cuttings and embankments along the railway, often vegetated with secondary woody vegetation (woodland and scrub), which may include rare whitebeam species and the common whitebeam (*S. aria*) in some places.

Neutral Grassland

- 4.2.9 One small area of neutral grassland was identified to the immediate east of the River Avon Tow Path, with dominant red fescue *Festuca rubra*, abundant common knapweed *Centaurea nigra* and locally abundant meadowsweet *Filipendula ulmaria*.

Calcareous Grasslands

- 4.2.10 There are large areas of calcareous grassland on the west side of the gorge, and are mainly associated with the quarries and over the Clifton Tunnel No. 2. These typically have upright brome *Bromopsis erecta* with species such as Gloucester hawkweed *Hieracium glevense* and fly orchid *Ophrys insectifera*.
- 4.2.11 Small areas of grassland occur within the study area and these grade into the rocky habitats (see below) whilst others are being invaded by scrub but have potential for restoration. There are also small areas of grassland scattered along the River Avon towpath (some of which is owned by Network Rail) which are mostly being colonised by scrub species, such as dogwood and ivy. Occasional patches remain with rare plants such as spring cinquefoil *Potentilla tabernaemontani*.

Tall Herb / Ruderal

- 4.2.12 Small patches of tall herb habitat, typically dominated by nettle, are present in places along the peripheries of the railway corridor. Towards the southern end of the survey area, patches of Japanese knotweed are present within the woodland and scrub, adjacent to the railway corridor. Small patches of tall herb adjacent to the bridleway are typically more diverse, including such species as hemp agrimony *Eupatorium cannabinum* and hemlock water-dropwort *Oenanthe crocata*.

Saltmarsh

- 4.2.13 The saltmarshes along the River Avon are subject to large changes in water levels with the tides, and typically have sea couch *Elytrigia atherica*, saltmarsh grass *Spartina anglica* and sea aster *Aster tripolium*. The saltmarshes are a qualifying feature for the SSSI designation.
- 4.2.14 There are only small areas of saltmarsh within Network Rail land.

Inland Cliffs and Exposures

- 4.2.15 The rock outcrops are a major feature within the gorge, many with significant nature conservation value for both geology and biodiversity. The larger cliffs south of Quarry 4 are limestone, whereas those to the north are Old Red Sandstone which are limited in extent.
- 4.2.16 There are a few natural cliffs present within the railway corridor, but most are in man-made cuttings or quarries. These were occasionally covered with ivy and are an important location for rare whitebeams. The cliffs are a qualifying feature for the SSSI designation.
- 4.2.17 The low, partially-vegetated rocky outcrops, which grade into *Festuco-Brometalia* grassland (NVC type CG1), and thus are qualifying features of the SAC, provide habitat for rare plants such as Bristol rock-cress and spiked speedwell.

Ephemeral / Short Perennial

- 4.2.18 Ephemeral, or short perennial, habitat is a common feature amongst the railway ballast of the existing railway corridor, supporting such species as herb Robert *Geranium robertianum*, black medick *Medicago lupulina* and creeping buttercup *Ranunculus repens*, grading into dense ivy and/or bramble on the edges of the cess. The edges of the ballast provide a habitat for narrow-leaved bittercress *Cardamine impatiens*, Pale St John's-wort *Hypericum montanum* and small teasel *Dipsacus pilosus*. A narrow band of the habitat dominated by great horsetail *Equisetum telmateia* occurs at a single point along the railway's western boundary.

Introduced Shrub

- 4.2.19 Small patches of butterfly bush are present adjacent throughout the River Avon Tow Path. Cotoneaster is recorded on occasional rock exposures.

Railway

- 4.2.20 The railway retaining walls support some species of interest, including many round-leaved whitebeam saplings.

4.3 SAC habitats

- 4.3.1 The Avon Gorge SAC is designated for two habitat types, the semi-natural dry grasslands and scrubland faces on calcareous substrates, *Festuco-Brometalia* and the *Tilio-Acerion* forests of slopes, screes and ravines.

Festuco-Brometalia dry grasslands

- 4.3.2 The *Festuco-Brometalia* grassland is a qualifying feature for which the SAC is designated, which is defined as being composed of NVC types CG1 to CG9 (European Commission, 2007). Within the Avon Gorge, these comprise NVC types CG1 *Festuca ovina-Carlina vulgaris* grassland, CG2 *Festuca ovina-Avenula pratensis* grassland and CG3 *Bromus erectus* grassland.
- 4.3.3 The cliff ledges, whilst not supporting grasslands *per se*, are cited in the SAC designation as supporting a high number of uncommon species, such as Bristol rock-cress. The NVC type for these is OV39 *Asplenium trichomanes - A. ruta-muraria* community.
- 4.3.4 These communities are present at two locations along the railway corridor; immediately south of Clifton Tunnel No. 1, and immediately north of Clifton Tunnel No. 2 (Figure 2). Both include cliffs and ledges within the railway boundary, and grasslands on the associated River Avon Tow Path. These areas are of key importance for maintaining the interest of the SSSI/SAC.

South of Clifton Tunnel No. 1

- 4.3.5 There is a very diverse important area on the 'ramp' (an area of SW facing limestone ledges) above the south end of the cutting by the tunnel. This has supported CG1 *Festuca ovina-Carlina vulgaris* /CG3 *Bromus erectus* grassland in the past but is now partly scrubbed over with; privet *Ligustrum vulgare*, hawthorn *Crataegus monogyna*, traveller's joy *Clematis vitalba*, Cotoneaster species and dogwood *Cornus sanguinea*. The Schedule 8 species include Spiked speedwell *Veronica spicata* is abundant, with red valerian *Centranthus rubra*, sheep's fescue *Festuca ovina* and Southern polypody *Polypodium cambricum*.
- 4.3.6 On the adjacent cutting cliff face there is more spiked speedwell in very sparse OV39 *Asplenium trichomanes - A. ruta-muraria* community to within 20 m of the tunnel entrance.
- 4.3.7 On the limestone rocks between the River Avon Tow Path and the railway there is another area of diverse vegetation which includes the OV39 *Asplenium trichomanes - A. ruta-muraria* community, small areas of CG2 *Festuca ovina-Avenula pratensis* grassland and more CG1 *Festuca ovina-Carlina vulgaris* grassland heavily invaded by scrub. These rocks support many rare plants including spiked speedwell, basil thyme *Clinopodium arvensis* and dwarf mouse-ear *Cerastium pumilum*.

North of Clifton Tunnel No. 2

- 4.3.8 The north portal of the tunnel has open ledges which support rare plants in the OV39 *Asplenium trichomanes - A. ruta-muraria* community. There is a small population of the Schedule 8 Bristol rock-cress *Arabis stricta*, about 5-10 m south of the tunnel exit on the ledges, growing with fingered sedge *Carex digitata*. This area is threatened by invasion of scrub, especially by different Cotoneaster species.

- 4.3.9 Between the railway wall and the River Avon Tow Path there is a narrow band of rocks, which has fingered sedge and used to support Bristol rock-cress but is currently covered with open scrub with ash, dogwood, privet and bramble.
- 4.3.10 On the east side of the River Avon towpath on Network Rail land is a narrow strip of CG3 *Bromus erectus* grassland which supports spring cinquefoil *Potentilla tabernaemontani* and field garlic *Allium oleraceum*. It is currently being colonised by open scrub.

Tilio-Acerion forests

- 4.3.11 *Tilio-Acerion* forests of slopes, screes and ravines is a qualifying feature for which the SAC is designated, which is defined as being composed of NVC types W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland and W9 *Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis* woodland (European Commission, 2007). Within the Avon Gorge, this comprises the NVC type W8 *Fraxinus - Acer - Mercurialis* woodland.
- 4.3.12 The *Tilio-Acerion* forests are broadly defined as being mixed forests of secondary species (*Acer pseudoplatanus*, *Fraxinus excelsior*, *Tilia cordata*, *Ulmus glabra*) on slopes of coarse screes, rocky slopes or colluvions comprising calcareous or siliceous substrates (European Commission, 2007). Much of the Avon Gorge woodland, both ancient woodland and secondary woodland, clearly meets this definition.
- 4.3.13 The SAC quality woodlands are shown in Figure 2.
- 4.3.14 The scrub (mainly NVC types W21d *Crataegus-Hedera* and W24 *Rubus* scrub) is not a qualifying habitat of the SAC, but is cited in the designation as important for the species-rich transitions to scrub and herb-rich calcareous grasslands associated with the small-leaved lime woodland.

4.4 Notable Plant Species

- 4.4.1 There are many notable plant species present in the Avon Gorge which is one of the top 5 richest botanical sites in Britain. It is the most diverse site for whitebeams (*Sorbus* spp.) in the world, with 21 taxa recorded, the diversity resulting from a series of on-going evolutionary events related to the occurrence of sexual diploid species crossing with apomictic polyploid species giving rise to new species (Rich *et al.*, 2010). A summary of all the rare species is summarised in Annex A and those present on Network Rail land.
- 4.4.2 Within the survey area, a total of 23 notable plant species are present. The locations of these notable species (excluding *Sorbus*) are mapped on Figure 3.
- 4.4.3 The whitebeams (*Sorbus*) were surveyed in detail as part of a separate study (Houston, 2017), with the results summarised here. In total, approximately 1131 individuals belonging to 15 species were recorded. Seven species of rare whitebeam were recorded, of which 5 are endemic to the Avon Gorge. In addition, the following species were also recorded but are not considered to be of conservation interest in their own right and are not dealt with further: Common whitebeam *S. aria* (354 recorded), rowan *S. aucuparia* (20 recorded), Orange whitebeam *S. croceocarpa* (not native: 1 recorded), Swedish whitebeam *S. intermedia* (not native: 2 recorded), Fontainebleau whitebeam *S. latifolia* (not native: 1 recorded), Sell's Whitebeam *Sorbus sellii* (not native: 1 sapling recorded), wild service tree *S. torminalis* (45 recorded). Whitebeams are mapped in Figure 4 Sheets 1 to 4.

Field Garlic, *Allium oleraceum*

- 4.4.4 This Nationally Uncommon perennial of scrub edges and grasslands on calcareous soils is scattered in Britain. In the Avon Gorge it is known at 4 sites on the Bristol side, but on the

Somerset side it is known only by the River Avon Tow Path south of the Blockhouse slope, and opposite Quarry 1 Underbridge on Network Rail land (Figure 3).

Compact Brome, *Anisantha madritensis*

- 4.4.5 Within the Avon Gorge this annual grass is scattered through the gorge and varies in abundance from year to year. On the North Somerset side, it is restricted to very small populations on the river bank near Clifton Tunnel No. 2, Quarries 1, 2 and 4, and the railway. On the railway line it occurs by Clifton Tunnel No. 1 (Bristol side), and on Miles Dock underbridge (Figure 3); no plants were seen in July 2017 at either site.

Bristol Rockcress, *Arabis scabra*

- 4.4.6 This Schedule 8 listed species only occurs as a native in Britain in the Avon Gorge, its most northerly site in the world - a long distance from its nearest sites in the mountains of southern Europe. It is a short-lived perennial whose populations can vary from year to year and which moves around within suitable areas of habitat (Figure 3).
- 4.4.7 Throughout the Avon Gorge, Bristol rockcress is showing a steady decline, the reasons for which are not fully understood. On the Somerset side it is very restricted to the area between Clifton Tunnel No. 2 and Quarry 2, with a small population recently discovered in Quarry 4. On the railway it occurs on the rocks around the northern (Pill) portal of Clifton Tunnel No. 2 (5 plants have been recorded on 4 separate ledges), and on the rocks and grassland adjacent to the River Avon Tow Path there on Network Rail land (Figure 3). It has occurred sporadically on the trackside cliff adjacent to Quarry 1 behind the safety fence.

Narrow-leaved Bittercress, *Cardamine impatiens*

- 4.4.8 This species is Nationally Scarce and is scattered widely in Southern Britain typically in calcareous woodlands and sometimes on riverbanks. It is a biennial whose populations respond markedly to coppicing and management. The Avon Gorge has one of the largest populations in Britain, and is an important site for it but surprisingly it only occurs on the Somerset side and is absent from the Bristol side.
- 4.4.9 On the railway it is locally frequent and occurs south of Clifton Tunnel No. 2, south of Quarry 3, and from Miles Dock underbridge northwards. There are occasional patches on the River Avon Tow Path (Figure 3).
- 4.4.10 The immediate track sides had been sprayed with herbicide in May 2017 and only a few new seedling plants (approximately 20 in total) were seen on the railway track at chainages 123 68, 123 77 and 123 42 in July 2017.

Fingered Sedge, *Carex digitata*

- 4.4.11 This Nationally Scarce sedge is scattered in western and northern Britain and the Avon Gorge is one of its most southerly sites. It is a long-lived, shade tolerant woodland plant and can also become abundant in open grassland and rocks. It only occurs in the Gully on the Bristol side of the gorge, but is scattered along the North Somerset side from Nightingale Valley to Quarry 5.
- 4.4.12 On the railway line it occurs on rocks at the Clifton Tunnel No. 2, north (Pill) portal, and on and above the cutting cliff by Quarry 3 (Figure 3).

Dwarf Sedge, *Carex humilis*

- 4.4.13 This Nationally Scarce sedge is an ancient open calcareous grassland indicator species. It is locally abundant in Wiltshire, but is very scarce elsewhere and is at its northern limit in Britain in the Avon Gorge and Wye Valley. There are some good populations on the Bristol

side, but only two very small populations on the Somerset side. There is a small population on open grassland over Clifton Tunnel No. 2 which has been subject to conservation work by Bristol University, and on the railway, about 100 m to the south, there is a single, heavily shaded, relict plant above the south (Bristol) portal of Clifton Tunnel No. 2 (Figure 3).

Dwarf Mouse-ear, *Cerastium pumilum*

4.4.14 This Nationally Scarce annual of open calcareous grasslands and screes is scattered in southern Britain northwards to North Wales. The Avon Gorge is one of its longest and best known localities, but it has shown a marked decline over the last decade. On the Bristol side it is known at several sites on St Vincent's Rocks, the Gully and Sea Walls, but only in very small numbers. There are 3 extant populations on the North Somerset side, and a number of old sites where it has not been seen in recent years.

4.4.15 It occurs on the rocks by the River Avon Tow Path at Clifton Tunnel No. 1 south (Bristol) portal where it is threatened by scrub growth, and used to occur above the cutting on the steep rocks on the west side; both sites are Network Rail land (Figure 3).

Basil thyme, *Clinopodium acinos* (*Acinos arvensis*)

4.4.16 This Section 41 species is a locally uncommon plant of open ground on calcareous soils and is widely scattered in Britain but declining. In the Avon Gorge it is locally frequent on rocks, grassland and scree on both the Bristol and North Somerset sides, but has never been fully documented. By the railway, it occurs on the rocks at Clifton Tunnel No. 1 (Bristol side) (Figure 3).

Little Robin, *Geranium purpureum*

4.4.17 This Nationally Scarce annual of open calcareous grasslands and screes is scattered in southern Britain. Within the Avon Gorge this species is scattered on the Bristol side, but has only one site on the North Somerset side at Clifton Tunnel No. 1.

4.4.18 It has been recorded above the Clifton Tunnel No. 1 south (Bristol) portal in the past but has not been seen recently due to scrub development. It also used to occur here beside the River Avon Tow Path by the tunnel. As it responds to disturbance and has a long-lived seed bank, suitable conservation management work may result in its reappearance (Figure 3).

Gloucester hawkweed, *Hieracium glevense*

4.4.19 Gloucester hawkweed is a scarce species recorded from about 30 sites nationally, but the Avon Gorge is the only site in North Somerset, where it is scattered on rocks and in the old quarries. On the railway it occurs in small quantity on the rocks over the Clifton Bridge No. 2 Tunnel north (Portishead) tunnel exit (Figure 3).

Hutchinsia, *Hornungia petraea*

4.4.20 This Nationally Scarce annual of open calcareous grasslands and screes is more typical of upland sites than lowland rocks. In lowland Britain it is very rare, and the Avon Gorge has had good populations but it has shown a considerable decline in recent years. It is scattered throughout the Bristol side but on the North Somerset side has only been known around the Clifton Tunnel No. 1 south (Bristol) portal (Figure 3).

4.4.21 The population above the River Avon Tow Path just north of the portal is one of the three largest and most important remaining in the Avon Gorge. It may still occur by the *Veronica*

spicata on the ramp on the west side above the cutting. The population above the River Avon Tow Path was lost following railway wall repointing works near the tunnel in 2009.

Pale St John's-wort, *Hypericum montanum*

- 4.4.22 This Nationally Uncommon perennial of scrub edges and grassland on calcareous soils is scattered in Britain. It occurs throughout the Avon Gorge which is an important site nationally, but on the Somerset side it is known only on the Blockhouse Slope, in Quarry 4, beside the River Avon Tow Path at Q3, and 11 plants on the railway cess north and south of Quarry 3 underbridge (Figure 3). In July 2017, an additional 7 of these plants appeared to have been killed by herbicide spray.

Ivy Broomrape, *Orobanche hederæ*

- 4.4.23 This perennial parasitizes ivy and is Nationally Uncommon, mainly occurring around the coast to North Wales with occasional populations inland. In the Avon Gorge it is widespread and locally abundant where there is lots of ivy for it to grow on. It is locally frequent along the River Avon Tow Path, some populations of which are on Network Rail land; this species is not mapped as it occurs throughout the gorge and is locally abundant along the River Avon Tow Path.

Angular Solomon's-seal, *Polygonatum odoratum*

- 4.4.24 This Nationally Scarce perennial of calcareous woodlands and scrub is scattered mainly in western and north-west Britain. In the Avon Gorge it only occurs on the North Somerset side in 2 places. One population occurs in and above Quarry 4, and another very small population occurs on Network Rail land above the Quarry 3 cliff (Figure 3).

Spring Cinquefoil, *Potentilla tabernaemontani*

- 4.4.25 This Nationally Scarce perennial of calcareous grasslands is scattered in Britain, and the Avon Gorge and Mendip populations are amongst the most southerly. Within the Avon Gorge there are 8 populations on rocks and in relict grasslands on the Bristol side, and 3 on the North Somerset side.
- 4.4.26 On the railway it occurs on the ramp above the cutting at the Clifton Tunnel No. 1 south (Bristol) portal, on the rocks and grassland adjacent to the River Avon Tow Path below (some of which is Network Rail land), and beside the River Avon Tow Path at Quarry 1 on Network Rail land (Figure 3).

Avon Whitebeam, *Sorbus avonensis*

- 4.4.27 This Nationally Rare Avon Gorge endemic is IUCN 'Critically Endangered'. Although first described as a hybrid (*Sorbus* × *avonensis* T.C.G. Rich) when only 2 plants were known. It is now treated as a species *Sorbus avonensis* T.C.G. Rich, and now known to have a clonal population of approximately 42 individuals; no formal taxonomic publication is required to effect this change.
- 4.4.28 Most of the world population of c. 42 trees is found beside the railway between Clifton Tunnel no 1 and Clifton Tunnel no 2 where 31 trees were recorded in the survey (Figure 4). One tree has since died in 2017.

Bristol Whitebeam, *Sorbus bristoliensis*

- 4.4.29 This Nationally Rare, Red Data Book-listed Avon Gorge endemic is IUCN 'Endangered'. 37 trees were recorded in survey which represents about 12% of the total world population of about 300 trees. It is widespread along the gorge on both limestone and Old Read

Sandstone. Along the railway it occurs in roughly three areas - Nightingale Valley to Clifton Tunnel No. 2, from Quarry 3 to Quarry 4, and from Quarry 6 Underbridge to Sandstone Tunnel (Figure 4).

Round-leaved Whitebeam, *Sorbus eminens*

- 4.4.30 This Nationally Rare, Red Data Book-listed British Endemic is IUCN 'Vulnerable' and is a UK BAP priority species/Section 41 species. The total world population is over 800+ trees scattered from Cheddar to the Wye Valley, with most in the Avon Gorge. Detailed surveys in the gorge have now shown more plants than previously known, especially along the River Avon Tow Path-railway wall at the north end of the SSSI, however most plants are less than 1 m tall. Along the railway there are four main sites - Clifton Tunnel No. 1 to Quarry 3, Q5 to Q6 Underbridge (the main population) with a secondary band from Quarry 6 Underbridge to the Sandstone Tunnel, Bristol portal, and one isolated tree on the embankment overhanging the River Avon Tow Path just north of Miles Dock Underbridge (Figure 4). There were 414 trees recorded in a survey, which represents around 50% of the total world population. Unfortunately, 33 trees of this species had died by 2017, 25 having been removed by an unknown member of the public along the River Avon Tow Path and railway retaining wall.

Leigh Woods Whitebeam, *Sorbus leighensis*

- 4.4.31 This Nationally Rare, Avon Gorge endemic is IUCN 'Endangered'. Most of the world's c. 300 trees occur on the Leigh Woods side of the gorge, with 3 or 4 on the Bristol side. Along the railway most of the plants occur between Quarry 2 and Quarry 6 Underbridge with the main concentration north of the Quarry 3 underbridge (Figure 4). There were 184 trees recorded in a survey which represents around 61% of the total world population.

Grey-leaved Whitebeam, *Sorbus porrigentiformis*

- 4.4.32 This Nationally Scarce, British endemic tree is scattered in SW England and S Wales with a total world population of about 500 plants. There are 50-60 trees in the Avon Gorge. Along the railway, it occurs on the trackside cliff at Quarry 3 (7 trees) and one the slope above (4 trees) (Figure 4).

Observatory Whitebeam, *Sorbus spectans*

- 4.4.33 This Nationally Rare, Avon Gorge endemic is IUCN 'Endangered'. It was only known from the Bristol side of the gorge until 3 poorly grown and shaded trees were discovered along the railway between Quarry 1 and Quarry 2 during the surveys (Figure 4). Over 60 trees occur on the rocks cliffs and slopes of St Vincent's Rocks, so these represent about 5% of the total world population.

Wilmott's Whitebeam, *Sorbus wilmottiana*

- 4.4.34 This Nationally Rare, Red Data Book-listed Avon Gorge endemic is IUCN 'Endangered'. It is scattered on both sides of the Avon Gorge with a total population of 97 trees in 2013, mostly on the North Somerset side; some of these have succumbed to disease and/or been recently vandalised. Along the railway 14 trees were found between Quarry 1 and Quarry 2 (Figure 4), 4 had died by 2017.

Spiked Speedwell, *Veronica spicata*

- 4.4.35 This Schedule 8-listed species is very scattered in western Britain, and rare in East Anglia. The-Avon Gorge populations are one of the biggest in Britain. On the Bristol side it occurs

around St Vincent's Rocks, and only occurs on the Somerset side at Clifton Tunnel No. 1 south (Bristol).

- 4.4.36 On the railway it occurs on the ramp, the rock face of the cutting at the Clifton Tunnel No. 1 (south), and on the rocks adjacent to the River Avon Tow Path on Network Rail land below (Figure 3). Both sites are threatened by scrub invasion.

4.5 Non-native invasive plants

- 4.5.1 21 non-native and potentially invasive plant species were recorded within the survey area, including six species listed on Schedule 9 of the WCA which must not be allowed to spread. There are also other non-native species throughout, most of which occur in small quantity and are not invasive.

Acer platanoides, Norway maple

- 4.5.2 This deciduous tree which has escaped from gardens is widespread in the Avon Gorge and along the railway.

Acer pseudoplatanus, Sycamore

- 4.5.3 Although a typical component of the Tilio-Acerion forests of slopes, screes and ravines SAC habitat in its native range in Europe, this deciduous tree is very widely naturalised in Britain, often dominating woodland. It is common and widespread in the Avon Gorge as both mature trees and regenerating seedlings and saplings and is very frequent along the railway line.

Allium carinatum, Keeled garlic

- 4.5.4 This garden escape is invasive in grassland habitats, and has been recorded in several sites along the railway River Avon Tow Path (e.g. between ST5644473023 to ST5646472946, and north of Clifton Tunnel No. 2).

Buddleja davidii, Butterfly bush

- 4.5.5 This garden shrub is widely invasive. It occurs in many places in the gorge, especially along the railway River Avon Tow Path and embankments and can form some dense patches or be mixed amongst other shrubs.

Castanea sativa, Sweet chestnut

- 4.5.6 This tree has been widely grown for the edible fruits and is occasionally naturalised. In the Avon Gorge there are trees along the lower edge of the wood between Quarry 5 and Quarry 6, perhaps where originally planted.

Centranthus ruber, Red valerian

- 4.5.7 This garden plant is extensively naturalised on calcareous rocks throughout Britain and is hard to control. It occurs widely on the exposed limestone rocks where it competes with rare plants such as spiked speedwell and Bristol rockcress. It is widespread along the limestone exposures of the railway line in the Avon Gorge, and sometimes on the ballast.

Cotoneaster species (*C. simonsii*, *C. microphyllus*), Cotoneaster.

- 4.5.8 Cotoneaster species, which include the Schedule 9 species *C. simonsii* and *C. microphyllus* and possibly *C. integrifolius*, are widespread in the gorge on rocks and scrub edges, and are frequent along the railway on rock outcrops. *Cotoneaster microphyllus* can form dense

patches which over-grow the native plants, and is being extensively controlled on National Trust land.

Fallopia japonica, Japanese knotweed

- 4.5.9 This is a widely invasive Schedule 9 species. There are several stands in woodland along the railway's western boundary south of Clifton Tunnel No. 1, one of which has been treated with herbicide and shows significant dieback, but several other stands in the area, along both boundaries of the railway corridor have not been treated.

Impatiens glandulifera, Himalayan balsam

- 4.5.10 Himalayan balsam is a widely invasive Schedule 9 species. There is a small population in woodland west of the railway in the old quarry south of Clifton Tunnel No. 1.

Parthenocissus quinquefolia, Virginia creeper

- 4.5.11 A few small shoots of this Schedule 9 species were seen growing out of ballast along the railway's eastern boundary at ST5658272423.

Prunus laurocerasus, Cherry laurel

- 4.5.12 This evergreen shrub can form dense thickets which shade out ground flora species. It is widespread in the gorge and frequent on the railway land (e.g. at the old Nightingale Valley station, Miles Dock, etc.). It has been controlled on National Trust land.

Quercus cerris, Turkey oak

- 4.5.13 This deciduous oak is invasive in woodland and scrub habitats, and may have escaped from former cultivation in the Leigh Woods forests. It is scattered along the railway in small quantity, but is locally frequent in the sandstone tunnel area.

Quercus ilex, Holm oak

- 4.5.14 This evergreen tree is probably the biggest invasive species problem in the Avon Gorge. The dense shade and large size results in shading out of many species and it is tolerant of drought on shallow soils so colonises open limestone rocks where rare plants grow. Along the railway it can form dense stands, for example around the Clifton Tunnel No. 2 portal. It has been controlled on National Trust land.

Quercus rubra, Red oak

- 4.5.15 This deciduous oak has been cultivated in Leigh Woods and is locally frequent in the sandstone tunnel area and rarely elsewhere.

Rhododendron ponticum, Rhododendron

- 4.5.16 This Schedule 9 invasive species is an evergreen which can form dense stands and shades out ground flora. It is locally frequent in the sandstone tunnel area, and requires coordinated control.

Rosa rugosa, Japanese rose

- 4.5.17 This Schedule 9 invasive garden rose can form dense thickets, and is invasive in some habitats such as sand dunes. In the Avon Gorge there is one white-flowered clump by the River Avon Tow Path at Clifton Tunnel No. 2 north portal (ST56217379).

Smyrnium olusatrum, Alexanders

- 4.5.18 This winter-green ancient pot herb is widespread in Britain and has increased markedly over the last 40 years as the climate has warmed. In the Avon Gorge it forms dense stands in winter and spring and smothers native vegetation. It is widespread along the River Avon Tow Path on Network Rail land.

Sedum album, White stonecrop

- 4.5.19 This garden escape is very drought tolerant and can form dense stands on open calcareous soils and rocks. In the Avon Gorge it is occasional on limestone rocks.

Symphoricarpos albus and hybrids, Snowberry

- 4.5.20 This rhizomatous shrub can spread to form dense thickets which are hard to eliminate. It is occasionally naturalised in the Avon Gorge, especially along the railway (for example, it is dominant in woodland between the railway and River Avon Tow Path, extending 30 m northwards from just north of the bridge at ST5657372471 and is locally dominant along the western railway boundary ST5652672630).

Viburnum tinus Laurustinus

- 4.5.21 This evergreen garden shrub or small tree is occasionally naturalised in Britain and forms dense shade. In the Avon Gorge it occurs on both sides, and along the railway mainly as isolated trees or shrubs.

SECTION 5

Evaluation

5.1 Designated Sites

- 5.1.1 The Avon Gorge Woodlands SAC/SSSI is of **International** value for nature conservation and the railway runs through these sites.

5.2 Habitats

Woodland and Scrub

- 5.2.1 The ancient broad-leaved woodland within the SAC falls within the definition of the Annex I habitat *Tilio-Acerion* forests of slopes, screes and ravines (European Commission, 2007) and is of **International** value.
- 5.2.2 The secondary woodland often has an abundance of non-native species, but incorporates some floristic features characteristic of the adjacent Annex I habitat and serves as a valuable buffer, in addition to providing connectivity to the wider landscape. Following the definition in European Commission (2007) it is also considered to have **International** value as part of the SAC.
- 5.2.3 Scrub in the survey area is fragmented, species-poor and often encroaching on more valuable grassland habitats. Botanically, it is considered to have value within the **Immediate zone of influence**.

Calcareous Grassland, Inland Cliffs and Rock Exposures

- 5.2.4 Collectively, these habitats fall within the Annex I habitat Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometalia*, a qualifying feature of the Avon Gorge Woodlands SAC. They also support several plant species listed in the Avon Gorge SSSI citation. For these reasons, they are considered to be of **International** value.

Neutral Grassland, Semi-improved

- 5.2.5 Only one small and isolated area of this habitat was found. It is considered to have **Immediate zone of influence** value.

Tall Herb / Ruderals

- 5.2.6 Stands of this habitat are small and fragmented and readily replaceable in the short term. They are considered to have value within the **Immediate zone of influence** only.

Ephemeral/Short Perennial

- 5.2.7 This habitat is confined to railway ballast within the existing railway corridor. Most species the habitat supports are common and ubiquitous, though several notable plant species occur in it (narrow-leaved bittercress, pale St John's-wort). Overall, the habitat is considered to have value within the **Immediate zone of influence** of the proposed scheme.

Saltmarsh

- 5.2.8 The band of saltmarsh is an integral part of the SSSI and is mentioned in the citation. It is therefore considered to be of **National** value.

5.3 Notable Plant Species

- 5.3.1 Collectively, the assemblage of recorded notable plant species associated with calcareous grassland, cliff and rock exposures are considered to be of **National** value.
- 5.3.2 The diversity of whitebeams is noted in the SAC citation, and, as part of the richest site in the world for *Sorbus*, is of **International value**.

Important sites for notable plants

- 5.3.3 There are three key localities for notable plants: within 50 m of the southern entrance to the Clifton Tunnel No. 1, the northern end of Clifton Tunnel No. 2 and the trackside near Quarry 3.
- 5.3.4 Two localities for the Schedule 8 spiked speedwell are present on a rock face to the immediate west of the railway and on rock exposures between the railway and the River Avon Tow Path.
- 5.3.5 One locality for the Schedule 8 Bristol rockcress is present on the rocks at the northern end of Clifton Tunnel No. 2.

5.4 Invasive Plant Species

- 5.4.1 Invasive plant species are widespread within the survey area and, in places, are compromising the value of habitats detailed above, including the conservation status of the SAC and SSSI.

SECTION 6

Conclusions

- 6.1.1 The surveys have identified internationally important broad-leaved semi-natural ancient woodland, dry calcareous grassland and calcareous cliff and rock exposures SAC habitats within the study area. A total of 23 notable plant species are present, including two Schedule 8 of the WCA protected plants (spiked speedwell and Bristol rockcress) and 7 rare endemic whitebeams. 21 non-native and potentially invasive plant species are present, including six species listed on Schedule 9 of the WCA which must not be allowed to spread.
- 6.1.2 Losses of *Sorbus avonensis* and *S. eminens* will have a direct effect on their population, which are of SAC importance. Of the other rare plants, only *Hypericum montanum* and *Cardamine impatiens* may be directly affected by the DCO Scheme.
- 6.1.3 As work is proposed within the Avon Gorge Woodlands SAC/SSSI, a Habitats Regulations Assessment will be required and SSSI assent from Natural England.

SECTION 7

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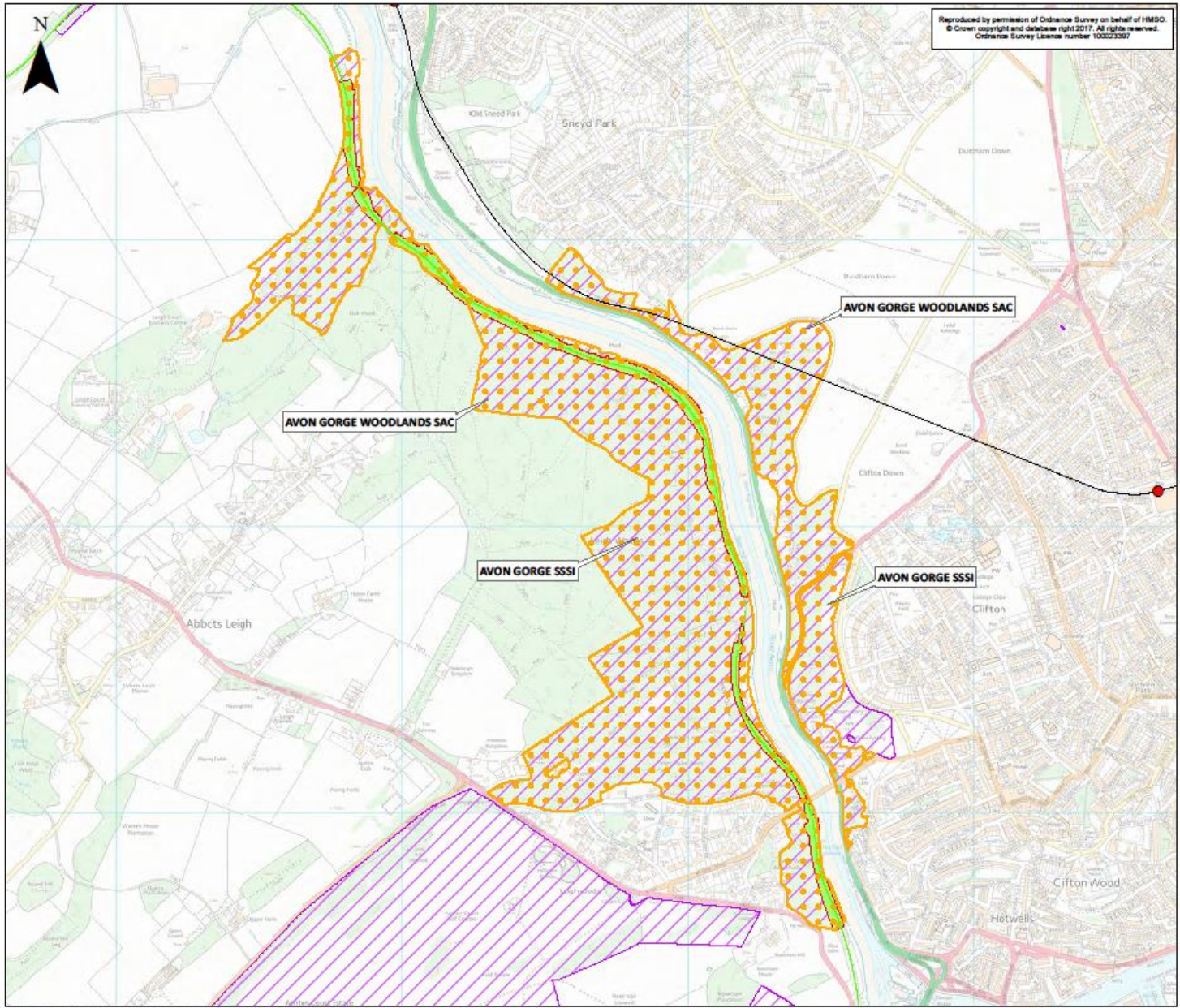
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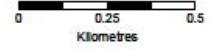


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KEY

- Existing Railway Line
- Existing Railway Station
- Portishead Branch Line**
- The Nationally Significant Infrastructure Project (NSIP) Works
- The Associated Development Works
- Section in Tunnel
- Other Works**
- Network Rail Permitted Development Rights
- Ecology**
- Extent of Flora Survey
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)



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Project

Portishead Branch Line
 (MetroWest Phase 1)

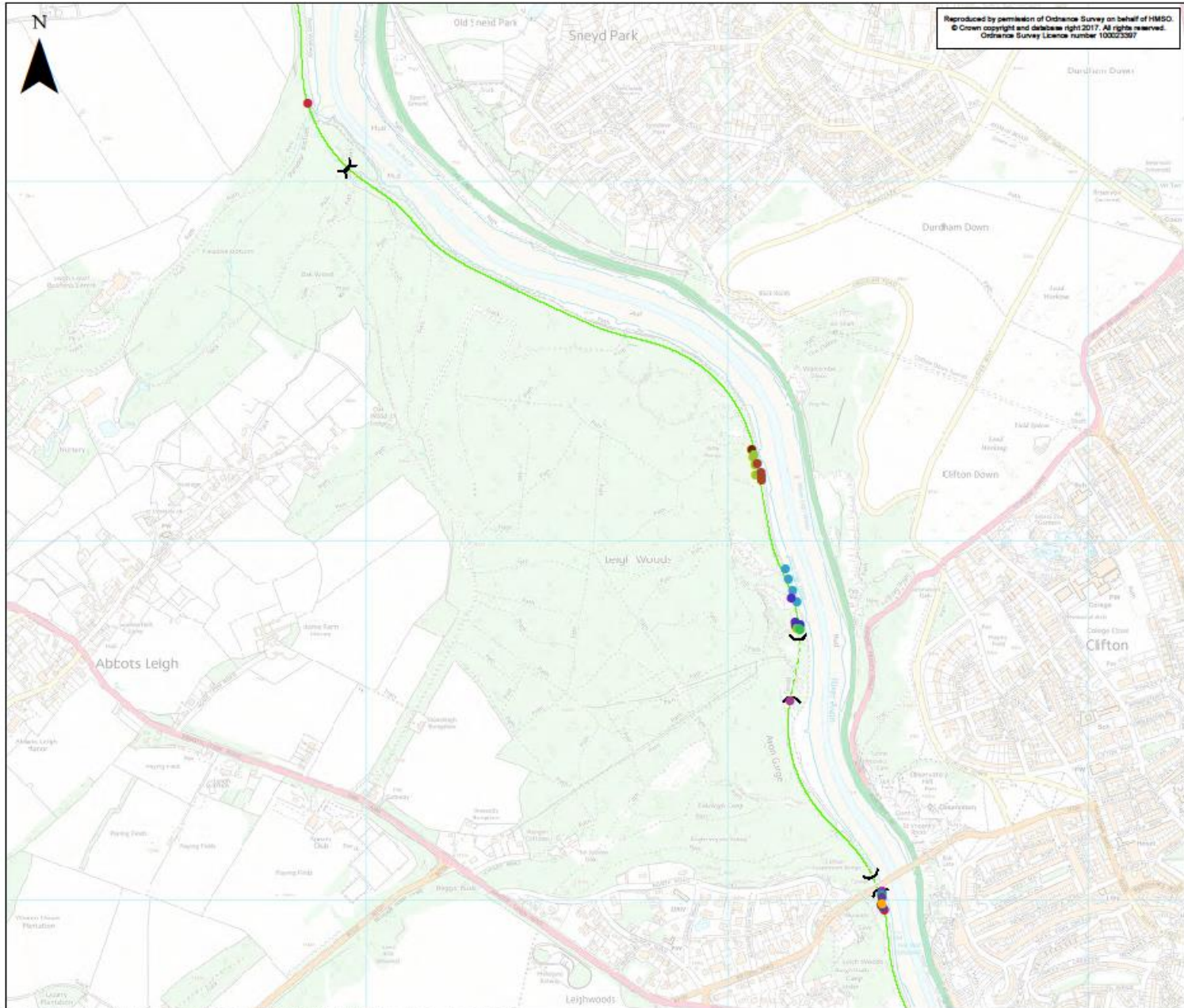
Drawing

Figure 1:
 The extent of the Flora Surveys

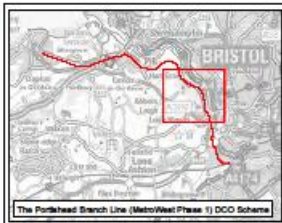
Drawn By: Martin Costello **Date:** 25/09/2017
Checked By: Emily Earing **Date:** 25/09/2017
Approved By: Carolyn Francis **Date:** 25/09/2017

Drawing No.: 674046-009-002-A **Revision:** 2

Drawing Scale: 1:12,500 @ A3



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The Portishead Branch Line (MetroWest Phase 1) DCO Schema

- KEY**
- Portishead Branch Line**
- The Associated Development Works
 - Section in Tunnel
- Flora Survey**
- *Allium oleraceum*
 - *Anisantha madriensis*
 - *Arabis stricta*
 - *Carex digitata*
 - *Carex humilis*
 - *Cerastium pumilum*
 - *Clinopodium acinos*
 - *Geranium purpureum*
 - *Hieracium glevense*
 - *Homungia petas*
 - *Hypericum montanum*
 - *Polygonatum odoratum*
 - *Veronica spicata*



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Project: **Portishead Branch Line (MetroWest Phase 1)**

Drawing: **Figure 3: Location of Rare Plants**

Drawn By: Martin Costello	Date: 15/09/2017
Checked By: Hazel Webb	Date: 15/09/2017
Approved By: Tim Rice	Date: 15/09/2017
Drawing No.: 674946-001-003-A	Revision: 1
Drawing Scale: 1:10,000 @ A3	

Annex A
Avon Gorge Notable and Invasive
Plant Species

Avon Gorge Nationally Rare, Scarce & Uncommon, Red-Listed (Threatened), Locally Notable, important & special spp/taxa *L.Houston, 2012, rev. 2015*

Taxonomic Name	Common Name	SSSI/SAC citation	Nat Rarity status	Red Threat List status	England Red List Status 2014	10 km sq GB distribution	Local distribution & notes
AG rare & important plants							
<i>Allium oleraceum</i>	Field Garlic	n/c	U	VU	('cc')	145 sq	Both sides of Gorge (incl River Avon Tow Path); in general UK decline; omitted from past surveys
<i>Allium sphaerocephalon</i>	Round-headed Leek/Bristol Onion	SSSI	R Prot'd	VU	VU	2 sq;	Clifton side only. Sole UK natural mainland site: else small site in Jersey. NB: WCA Sch 8 Protected
<i>Anisantha madritensis</i>	Compact Brome	SSSI	R	(LC)	(LC)	7 or 9 sq (3rd edn 1962 Atlas)	Both sides , tho native status queried by some authorities. (<i>Bromus madritensis</i> in citation)
<i>Arabis scabra</i>	Bristol Rock-cress	SSSI/SAC	R Prot'd	VU	VU	1 sq	Both sides (incl River Avon Tow Path & Qs 5, 4 & 2). Only native site GB. NB: WCA Sch 8 Protected. (<i>A. stricta</i> in citation)
<i>Atriplex longipes</i>	Long-stalked Orache	n/c	S	LC	LC	27 sq	Clifton side only? Salt-marsh
<i>Cardamine impatiens</i>	Narrow-leaved Bitter-cress	n/c	S	NT	('cc')	75 sq	Leigh Wds side only ; omitted in past surveys
<i>Carex digitata</i>	Fingered Sedge	SSSI	S	LC	('cc')	24 sq	Both sides , more LWds (incl rly land); v Glos plant
<i>Carex humilis</i>	Dwarf Sedge	SSSI	S	LC	LC	23 sq	Both sides , though almost all on Clifton side
<i>Cerastium pumilum</i>	Dwarf Mouse-ear	SSSI	S	NT	('cc')	44 sq	Both sides. Numbers here recently v low.
<i>Clinopodium acinos</i>	Basil thyme	n/c	U	VU	VU	240 sq	Both sides. General recent GB decline
<i>Convallaria majalis</i>	Lily of the Valley	SSSI note	U	LC	LC	237sq	Leigh Woods side ; classic rarity (qv 'Lily Point')
<i>Epipactis phyllanthes</i>	Green-flowered Helleborine	n/c	S	LC	LC	86 sq	Leigh Woods side tho v rarely: 1st rec'd 1985
<i>Gastridium ventricosum</i>	Nit-grass	SSSI	S	LC	('cc')	31 sq	Clifton side only

Avon Gorge Nationally Rare, Scarce & Uncommon, Red-Listed (Threatened), Locally Notable, important & special spp/taxa *L.Houston, 2012, rev. 2015*

Taxonomic Name	Common Name	SSSI/SAC citation	Nat Rarity status	Red Threat List status	England Red List Status 2014	10 km sq GB distribution	Local distribution & notes
<i>Geranium purpureum</i>	Little Robin	SSSI	S	LC	LC	45 sq	Both sides; River Avon Tow Path classic site now v overgrown
<i>Geranium sanguineum</i>	Bloody Crane's-bill	n/c	U	LC	NT.	206 sq	Clifton side only
<i>Helleborus foetidus</i>	Stinking Hellebore	n/c	S	LC	LC	91 sq - but native?	Both sides: rare; thought garden escape here
<i>Hornungia petraea</i>	Hutchinsia	SSSI	S	LC	('cc')	40 sq:	Both sides, tho more sites Clifton side
<i>Hypericum montanum</i>	Pale St John's-wort	n/c	U	NT	('cc')	125 sq	Both sides. General GB decline: omitted in past surveys
<i>Hypopitys monotropa</i>	Yellow Bird's-nest*	n/c	U	EN	LC	103 sq	Leigh Woods side: past record (River Avon Tow Path)
<i>Neottia nidus-avis</i>	Bird's-nest Orchid*	n/c	n/r	NT	VU	340 sq	Leigh Woods side only. General GB decline
<i>Ophrys apifera</i> var. <i>trollii</i>	Wasp Orchid	n/c	na	LC	LC	n/k	Both, or was. BRERC notable, Cotswold speciality
<i>Ophrys insectifera</i>	Fly Orchid	n/c	U	VU	VU	110 sq	Leigh Wds side only? Both '03. Gen'l GB decline
<i>Orchis purpurea</i>	Lady Orchid	n/c	S	EN	VU	16 sq	Leigh Wds side only; 1 plant, '90s only, now lost
<i>Orobanche hederæ</i>	Ivy Broomrape	SSSI note	U	LC	LC	120sq	Both sides: local speciality, on <i>Hedera hibernica</i>
<i>Platanthera chlorantha</i>	Greater Butterfly-orchid	n/c	n/r	NT	('cc')	626 sq	Leigh Wds side only (plateau, Stokeleigh Camp)
<i>Polygonatum odoratum</i>	Angular Solomon's-seal	SSSI	S	LC	('cc')	26 sq	Leigh Woods side only (Q2, Lily Point)
<i>Polypodium cambricum</i>	Southern Polypody	SSSI note	U	LC	LC	116 sq	Both sides: BRERC notable, increasing; (ID diff)
<i>Potentilla tabernaemontani</i>	Spring Cinquefoil	SSSI	S	LC	('cc')	74 sq	Both sides (esp by River Avon Tow Path)
<i>Scilla autumnalis</i>	Autumn Squill	SSSI	S	LC	('cc')	42 sq	Clifton side only (St Vincent's Rocks only)
<i>Sedum forsterianum</i>	Rock Stonecrop	SSSI	S	LC	LC	78 sq	Clifton side only (St Vincent's Rocks only)
<i>Sorbus anglica</i>	English Whitebeam	SSSI/(SAC)	R	NT	VU	13 sq	Both sides, but only 1 on Clifton side!

Avon Gorge Nationally Rare, Scarce & Uncommon, Red-Listed (Threatened), Locally Notable, important & special spp/taxa *L.Houston, 2012, rev. 2015*

Taxonomic Name	Common Name	SSSI/SAC citation	Nat Rarity status	Red Threat List status	England Red List Status 2014	10 km sq GB distribution	Local distribution & notes
<i>Sorbus bristoliensis</i>	Bristol Whitebeam	SSSI/SAC	R	VU	VU	1 sq	Both sides: Avon Gorge endemic!
<i>Sorbus eminens</i>	Round-leaved Whitebeam	SSSI/(SAC)	R	VU	VU	8 sq	Both sides (mostly Leigh Wds, esp River Avon Tow Path side)
<i>Sorbus leighensis</i>	Leigh Woods Whitebeam	(SSSI/SAC)	R	EN	EN	1 sq	Both sides (mostly LW) AG endemic! (2009)
<i>Sorbus porrigentiformis</i>	Grey-leaved Whitebeam	SSSI	S	LC	LC	26 sq	Both sides: key tree in evolution of new spp
<i>Sorbus whiteana</i>	White's Whitebeam	(SSSI/SAC)	R	EN	EN	3 sq	Both sides; in Avon & Wye Gorges; 1st publ'd '06
<i>Sorbus wilmottiana</i>	Wilmott's Whitebeam	SSSI/SAC	R	EN	EN	1 sq	Both sides: Avon Gorge endemic!
<i>Sorbus spectans</i>	Observatory Whitebeam	(SSSI/SAC)	[R]	[EN}	EN	1 sq	Clifton side only?: AG endemic! 1st publ'd 2014
<i>Sorbus avonensis</i>	Avon Whitebeam	(SSSI/SAC)	"R"	CR	(CE)	?1 sq	Both sides (esp by rly): maybe sp? 1st publ'd '09
<i>Sorbus x houstoniae</i>	Houston's Whitebeam	(SSSI/SAC)	"R"	CR	W(H)	1 sq	Leigh Wds side only: 1 tree! 1st published 2009
<i>Sorbus x proctoriana</i>	Proctor's Rowan	(SSSI/SAC)	"R"	LC	W(H)	1 sq	Leigh Wds side only: 1 tree! (2009) (pt-alien)
<i>Sorbus x robertsonii</i>	Robertson's Whitebeam	(SSSI/SAC)	"R"	CR	W(H)	1 sq	Clifton side, AG, 1 tree only? (+ Ched?) 1st publ'd '09
<i>Sorbus x thuringiaca</i>	Bastard Mountain-ash	(SSSI/SAC)	S	VU	W(H)	17 sq	Leigh Woods side only now (1 natural tree)
<i>Spiranthes spiralis</i>	Autumn Lady's-tresses	n/c	n/r	NT	NT.	302 sq	Both sides (v rare on both): in general decline
<i>Thalictrum minus</i>	Lesser Meadow-rue	SSSI note	n/r	LC	LC	353 sq	Clifton side: 1 plant kn, 100+ yrs old! (Local notable)
<i>Tilia cordata</i>	Small-leaved Lime	SSSI/SAC	n/r	LC	LC	728 sq	Both sides: <i>Tilia-Acerion</i> habitat LW side only
<i>Tilia platyphyllos</i>	Large-leaved Lime	n/c	S	LC	LC	74 sq	Leigh Wds side only (unsure how many natural)
<i>Trinia glauca</i>	Honewort	SSSI/SAC	R	LC	LC	5 sq	Clifton side only (AG plant an ecotype, as such EN)
<i>Veronica spicata</i> (ssp <i>hybrida</i>)	(Western) Spiked Speedwell	SSSI	S Prot'd	LC	('cc')	20 sq	Both sides (LW by rly). Division into ssp (Western) dropped in Stace (1997) NB: WCA Sch 8 Prot'd

Avon Gorge Nationally Rare, Scarce & Uncommon, Red-Listed (Threatened), Locally Notable, important & special spp/taxa *L.Houston, 2012, rev. 2015*

Taxonomic Name	Common Name	SSSI/SAC citation	Nat Rarity status	Red Threat List status	England Red List Status 2014	10 km sq GB distribution	Local distribution & notes
England Red List only (2014)							
<i>Arabis hirsuta</i>	Hairy Rock-cress	n/c	n/r	LC	NT	(GB data)	Both sides. Past decline in England
<i>Briza media</i>	Quaking-grass	n/c	n/r	LC	NT	(GB data)	Both sides. Past decline in England
<i>Calluna vulgaris</i>	Ling (Heather)	n/c	n/r	LC	NT	(GB data)	Both sides (v rare). Past decline in England
<i>Campanula rotundifolia</i>	Harebell	n/c	n/r	LC	NT	(GB data)	Both sides Past decline in England
<i>Carlina vulgaris</i>	Carline Thistle	n/c	n/r	LC	NT	(GB data)	Both sides, Past decline in England
<i>Erica cinerea</i>	Bell Heather	n/c	n/r	LC	NT	(GB data)	Clifton side only? Past decline in England
<i>Fragaria vesca</i>	Wild Strawberry	n/c	n/r	LC	NT	(GB data)	Both sides. Past decline in England
<i>Helianthemum nummularium</i>	Common Rock-rose	n/c	n/r	LC	NT	(GB data)	Both sides. Past decline in England
<i>Lathyrus sylvestris</i>	Narrow-leaved Everlasting-pea	n/c	n/r	LC	('cc')	(GB data)	Clifton side only. Hidden past decline in England
<i>Lithospermum officinale</i>	Common Gromwell	n/c	n/r	LC	('cc')	(GB data)	Leigh Wds side only? Hidden past decline in Eng.
<i>Oxalis acetosella</i>	Wood-sorrel	n/c	n/r	LC	NT	(GB data)	Leigh Wds side only? Past decline in England
<i>Petroselinum crispum</i>	Garden Parsley	n/c	n/r	LC	('cc')	(GB data)	Clifton side. [Archaeophyte] hidden past dec, Eng
<i>Plantago media</i>	Hoary Plantain	n/c	n/r	LC	NT	(GB data)	Clifton side only? Past decline in England
<i>Potentilla erecta</i>	Tormentil	n/c	n/r	LC	NT	(GB data)	Both sides? Past decline in England
<i>Sanicula europaea</i>	Sanicle	n/c	n/r	LC	NT	(GB data)	Leigh Wds side only? Past decline in England
<i>Solidago virgaurea</i>	Golden-rod	n/c	n/r	LC	NT	(GB data)	Both sides. Past decline in England
<i>Succisa pratensis</i>	Devil's-bit Scabious	n/c	n/r	LC	NT	(GB data)	Both sides. Past decline in England

Avon Gorge Nationally Rare, Scarce & Uncommon, Red-Listed (Threatened), Locally Notable, important & special spp/taxa *L.Houston, 2012, rev. 2015*

Taxonomic Name	Common Name	SSSI/SAC citation	Nat Rarity status	Red Threat List status	England Red List Status 2014	10 km sq GB distribution	Local distribution & notes
<i>Thymus pulegioides</i>	Large Thyme	n/c	n/r	LC	('cc')	279 sq	Both sides Hidden past decline in England
<i>Valeriana officinalis</i>	Common Valerian	n/c	n/r	LC	NT	(GB data)	Leigh Wds side only? Past decline in England
<i>Vicia sylvatica</i>	Wood Vetch	n/c	n/r	LC	('cc')	(GB data)	Leigh Wds side only. Hidden past decline Eng.
Non-native problem species							
<i>Acer platanoides</i>	Norway Maple	n/a	n/a	n/a	n/a	n/a	Both sides
<i>Acer pseudoplatanus</i>	Sycamore	n/a	n/a	n/a	n/a	n/a	Both sides
<i>Allium carinatum</i>	Keeled garlic	n/a	n/a	n/a	n/a	n/a	Both sides
<i>Allium roseum</i>	Rosy garlic	n/a	n/a	n/a	n/a	n/a	Clifton side only?
<i>Buddleia davidii</i>	Butterfly bush	n/a	n/a	n/a	n/a	n/a	Both sides
<i>Cotoneaster spp.</i>	Cotoneasters	n/a	n/a	n/a	n/a	n/a	Both sides: incl <i>C. horizontalis</i> , <i>C. simonsii</i> et al
<i>Fallopia japonica</i>	Japanese Knotweed	n/a	n/a	n/a	n/a	n/a	Both sides, incl by rly
<i>Impatiens glandulifera</i>	Himalayan balsam	n/a	n/a	n/a	n/a	n/a	Both sides
<i>Petasites fragrans</i>	Winter Heliotrope	n/a	n/a	n/a	n/a	n/a	Both sides?
<i>Prunus laurocerasus</i>	Cherry Laurel	n/a	n/a	n/a	n/a	n/a	Both sides (esp LW side, S end)
<i>Rhododendron ponticum</i>	Rhododendron	n/a	n/a	n/a	n/a	n/a	Leigh Wds side (N. end, on acid)
<i>Quercus ilex</i>	Holm Oak	n/a	n/a	n/a	n/a	n/a	Both sides; throughout: highly invasive
<i>Smyrniololus atratum</i>	Alexanders	n/a	n/a	n/a	n/a	n/a	Both sides, problem in certain sites
<i>Viburnum tinus</i>	Laurustinus	n/a	n/a	n/a	n/a	n/a	Both sides?

Avon Gorge Nationally Rare, Scarce & Uncommon, Red-Listed (Threatened), Locally Notable, important & special spp/taxa *L.Houston, 2012, rev. 2015*

Taxonomic Name	Common Name	SSSI/SAC citation	Nat Rarity status	Red Threat List status	England Red List Status 2014	10 km sq GB distribution	Local distribution & notes
Abbreviations							
<p>SSSI / SAC citation: (SSSI/SAC) in brackets, of Sorbus species = implied in citation (esp of species discovered since citation). National Rarity Status: R = Nationally Rare (found in 1-15 10x10 km squares of National Grid); S = Nationally Scarce (16-100 10x10 km squares) ; U = Nationally Uncommon (101-250 10x10 km squares). Prot'd = Protected under Wildlife & Countryside Act 1981 (WCA), under Schedule (Sched) 8. Red Threat list: CE = Critically Endangered; EN = Endangered; V = Vulnerable; NT = Near Threatened; LC = of Least Concern. England Threat List: my additional abbreviations: ('cc') = of conservation concern (ie, plants which are 'of least concern' but did decline in past and are potentially vulnerable to mismanagement, and are flagged up as such in the England List); W(H) = 'Waiting (Hybrid)' (ie awaiting hybrid atlas before calculating their threat status. n/a = not applicable; n/c = 'not in citation' for SSSI /SAC ; n/r = 'not rare' , ie no rarity status</p>							
<p>AG = Avon Gorge; BRERC = Bristol Regional Environmental Records Centre; Ched = Cheddar (Gorge); esp = especially; LW, LWds = Leigh Woods, ie west or south side of Avon Gorge; Q = quarry ; rly = railway; v = very NSEW = compass points</p>							
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Annex B

Laser/GPS survey of whitebeams in Avon Gorge Woodlands SSSI/SAC on Portishead Branch Line

Tim Rich & Libby Houston

4 July 2017

Laser/GPS survey of whitebeams in Avon Gorge Woodlands SAC/ Avon Woods on the Portishead Branch Line

Introduction

A survey of whitebeam (*Sorbus*) trees was carried out along the Portishead Branch Line through the Avon Gorge Woodlands SAC/SSSI in 2015 and 2016 by Libby Houston, which showed many rare whitebeams were present along the railway. A second survey was carried out in 2016 using laser/GPS to plot accurately the location of the rare whitebeams.

Methods

The survey was carried out over four days in June and August 2016 from the railway line. Libby Houston identified the trees in the field and related the trees to those previously included in her main 2015-2016 survey spreadsheet. The locations plotted with a laser system linked to GPS by James Barker; this system records the position of the tree, within 5 m of each track, from the trunk or the base. In a few cases the rooting positions may be slightly further from the track. Trees adjacent to and overhanging the track which might need to be cleared for rail safety were also recorded.

The locations of the whitebeams were plotted on the following maps linked to the spreadsheet:

- W1097B-ARP-DRG-ECV-000206 (none)
- W1097B-ARP-DRG-ECV-000207 (none)
- W1097B-ARP-DRG-ECV-000208
- W1097B-ARP-DRG-ECV-000209
- W1097B-ARP-DRG-ECV-000210
- W1097B-ARP-DRG-ECV-000211
- W1097B-ARP-DRG-ECV-000212
- W1097B-ARP-DRG-ECV-000213
- W1097B-ARP-DRG-ECV-000214

Some interpretation of the maps is required from knowledge of the survey coupled with some updated identifications in 2017. Occasionally a group of trees shown on the map may represent a single coppice stump with multiple stems rather than multiple trees. A few identifications were also corrected based on subsequent re-examination of leaf samples which need to be incorporated into the database to update the maps. One section of cliff (W1097B-ARP-DRG-ECV-000211 Ch 8270 to 8350) had a group of about 180 trees recorded as 'various' trees due to their inaccessibility without climbing and impracticality of surveying them all individually within the time available.

Few rare whitebeams currently grow within the 3 m track corridor.

Results

Table 7.1 lists the individual trees which may be affected by the DCO Scheme based on the survey information. This list will be reviewed once the revised scheme design has been completed. Table 7-1 represents a worst case of the number of *Sorbus* trees that may be affected by the scheme.

Table 7-1: Assessment of whitebeams which may be affected by the DCO Scheme in Avon Gorge Woodlands SAC/ Avon Woods SSSI ².

Map	Chainage	Sorbus species	Total	Notes (including tree no.)
208	6920	avonensis	1	Avo3; portal,
	6920	avonensis	1	Avo4; above portal
	6920	avonensis	1	Avo5; portal
	6930	avonensis	1	Avo7
	6940	avonensis	1	Avo22 (correction - not aria)
	6950	avonensis	1	Avo23 (correction - not ari15)
	6960	avonensis	1	Avo8, top of rock
	6970	avonensis	1	As aria on map, identification now updated.
	6980	avonensis	1	Avo9
	6980	avonensis	1	Avo10
	7000	avonensis		Avo11; previously cut down and dead in 2017
	7020	avonensis	1	Avo12;
	7020	avonensis	1	As Aria on map, identification now updated
	7040	avonensis	1	Not mapped - down embankment;
	7150	avonensis		Lots of trees on River Avon Tow Path side (not mapped)
	7170	avonensis	1	Avo13, top of slope
	7170	avonensis	1	Avo14, top of slope
	7170	avonensis	1	Avo15; previously cut
	7170	avonensis	1	New tree not mapped, under AVo15; small and cut previously
	7170	avonensis	1	New tree not mapped, under AVo1Emi8; small and cut previously
	7170	eminens	1	Emi7; small
	7170	eminens	1	Emi8; small
	7170	avonensis	1	Redetermined from Aria (aria25)
	7170	avonensis	1	Redetermined from Aria (aria4)
209	7450	eminens	1	Emi3; tunnel approach
	7450	eminens	1	Emi9; upside, (one tree 3 stems)
	7460	eminens	1	Emi10; over tunnel, cut before
210	7670	bristoliensis	1	Bri8; above tunnel,
	7760	wilmottiana		Large important group (13+) behind safety fence,

² The maps and chainages are taken from the scheme maps. Species and number of individuals lost are indicated with notes including the tree survey number. Trees possibly lost in brackets are those which are probably unaffected but are included at this stage to ensure that they are checked.

Table 7-1: Assessment of whitebeams which may be affected by the DCO Scheme in Avon Gorge Woodlands SAC/ Avon Woods SSSI ².

Map	Chainage	Sorbus species	Total	Notes (including tree no.)
	7760	spectans		Behind safety fence,
	7920	leighensis	1	Lei2; multiple stems (1 tree?) on top of wall previously coppiced
	7920	eminens	1	Emi11; multiple stems on top of wall (1 tree?) previously coppiced
211	8270	eminens	1	Emi14 (as various)
	8270	leighensis	1	Lei24 (as various)
	8270	leighensis	1	Lei25 (as various)
	8280	leighensis	1	Lei27 (as various); previously cut
	8280	leighensis	1	Lei29 (as various); previously cut
	8270-8350	various whitebeams	180?	Various on cliff outside fence line but many previously cut. Not plotted exactly. Includes many small leighensis (Lei30-Lei80), 6 bristoliensis, 6 porrigentiformis, 2 eminens and many aria.
	8340	bristoliensis	1	Bri20; cut stump 5 m above track
	8340	porrigentiformis	1	Por3
	8340	porrigentiformis	1	Por4
	8350	wilmottiana		Dead in 2017
	8390	bristoliensis	1	Bri22; cut in past
212	8410	bristoliensis	1	Bri23; small wisp on 3 m cliff
	8430	bristoliensis	1	Bri24, small wisp on 3 m cliff
	9060	leighensis	1	Lei87 (plotted as aria)
	9080	leighensis	1	(plotted as aria)
	9110	leighensis	1	Not mapped, hanging over River Avon Tow Path
213	9090-9280	eminens	26	26 trees (approx. nos. Emi48-EMI67+extras) along top of wall, upside, many previously cut
	9150	leighensis	5	Lei81-Lei85; above fence line on downside but cut in past
	9220	eminens	1	Emi47 (unnumbered) cut in past
	9220	leighensis	1	Not mapped, cut in past
	[9330	eminens	1	Emi182; marked on wrong side of bridge, should be 9340]
214	9340	eminens	1	Emi182
	9430	eminens	1	Emi184; arched
	9430	eminens	1	Emi185; crown previously cut
?	c. 9820	eminens	1	Emi208; additional tree, not surveyed yet

Discussion

Currently, up to; 20 Critically Endangered individuals, 19 Endangered individuals, and 39 Vulnerable individuals are within 5 m of the DCO Scheme pathway.