

Appendix A12.2: Baseline Data and Detailed Survey Methods

1 Purpose of Appendix

1.1.1 This appendix provides detailed information on the survey baseline for the ecological features outlined in Chapter 12. Detailed methods for bats, breeding birds and aquatic surveys are also presented in this appendix. Baseline information for badger, otter, freshwater pearl mussel (FWPM) and Schedule 1 bird species can be found in the Confidential Appendix A12.3.

2 Online Data

2.1.1 National Biodiversity Network (NBN) data has been used, where appropriate, to assess the occurrence of ecological features within the study area as indicated within Section 12.2 (Chapter 12). The data search of NBN omitted records pre-1986 as thirty years was considered a sufficient time period for records to inform the baseline.

2.1.2 The use of NBN data is governed by the terms and conditions of the network. The data providers, original recorders (where identified), and the NBN Trust bear no responsibility for the further analysis or interpretation of that material, data and/or information. NBN data providers are presented in Table 1.

Table 1: NBN data providers, recorders and dataset licence

Ecological Feature	Data Provider	Recorder(s)	Licence
Water vole	NBN: Highland Biological Recording Group (HBRG)	Ally Macaskill	CC-BY ¹

3 Bats

Roost Surveys – Ground-Based Roost Assessments

3.1.1 Ground-based roost assessment data collected at DMRB Stage 2 was carried forward to inform the DMRB Stage 3 survey requirements and assessment. This dataset was updated following design changes at DMRB Stage 3 and is presented in Tables 2 to 5.

3.1.2 Detailed ground-based roost assessments were undertaken on those buildings, structures and trees under the footprint of the proposed scheme. These were carried out using binoculars with a close focus, a high powered torch and endoscope (Maplin Video Borescope) for directly inspecting cavities for signs of bats. Bat dropping samples collected during surveys were sent to The University of Warwick, Ecowarwicker Ecological Forensics service, where DNA analysis determined the bat species present.

3.1.3 Features that were not within the footprint of the proposed scheme, but had potential to be used by bats, were subject to a similar level of effort where possible. However, access constraints meant that these features were predominantly carried out at a preliminary ecological appraisal level (Collins, 2016) whereby their roosting potential was assessed from a distance in combination with its proximity to high, moderate and low quality habitat.

3.1.4 Results of the ground-based roost assessments are presented in Tables 2 to 5. Where activity surveys subsequently identified roosts, this is reflected in the data provided. Of the 74 structures surveyed, 50 had negligible potential for both summer and winter roosts. None of the 37 buildings surveyed had negligible summer or winter roosting potential. The locations of these features are shown on Figure 12.5.

¹ Creative Commons Attribution 4.0 International

Buildings and Structures

Table 2: Results of the buildings surveys for summer and winter bat roost potential

Distance from Proposed Scheme	Building Summer Roost Potential					Building Winter Roost Potential				
	Roost	High	Moderate	Low	Total	Roost	High	Moderate	Low	Total
0m	0	0	0	0	0	0	0	0	0	0
0m+ to 10m	2	3	0	1	6	0	1	3	2	6
11m+ to 30m	3	10	3	0	16	0	0	12	4	16
31m+ to 50m	2	2	3	0	7	0	0	4	3	7
51m+	1	4	3	0	8	0	0	4	4	8
Total	8	19	9	1	37	0	1	23	13	37

Table 3: Results of the structures surveys for summer and winter bat roost potential

Distance from Proposed Scheme	Structure Summer Roost Potential					Structure Winter Roost Potential				
	Roost	High	Moderate	Low	Total	Roost	High	Moderate	Low	Total
0m	0	3	4	6	13	0	3	2	8	13
0m+ to 10m	2	0	5	2	9	0	0	4	5	9
11m+ to 30m	0	1	0	0	1	0	0	0	1	1
31m+ to 50m	0	0	0	0	0	0	0	0	0	0
51m +	0	0	0	1	1	0	0	0	1	1
Total	2	4	9	9	24	0	3	6	15	24

Trees

Table 4: Results of the tree surveys for significant summer bat roosts (roosts and high potential/1* category trees)

Distance from Proposed Scheme	Number of Roost Trees	Number of High Potential (1*) Trees	Grand Total
0m	1 ²	34	35
0m+ to 10m	0	17	17
11m+ to 30m	0	34	34
31m+ to 50m	0	34	34
51m +	0	36	36
Total	1	155	156

Roost Surveys – Summer Emergence and Re-entry Surveys

- 3.1.5 Surveys at DMRB Stage 3 were carried out using hand-held frequency division bat detectors (BatBox Duet) with Creative Zen, Transcend Mp330 or Tascam DR-05 linear PCM recorders, and complemented by AnaBat Express zero-crossing detectors and Anabat Walkabout full spectrum detectors. Acoustic files were analysed using BatSound 4.2 or AnaLook Insight version 21926. Results of summer emergence and re-entry surveys are presented in Table 5 and the location of these features are shown on Figure 12.5.

Roost Surveys – Winter Hibernation Surveys

- 3.1.6 Where buildings or structures were assessed as having potential to be used by hibernating bats, inspection surveys were conducted and static bat detectors (AnaBat Express and AnaBat SD1 bat detectors) were deployed for a minimum of ten days over winter (January-February) (adapted from

² BT 5.44 was identified as a roost by Heritage Environmental Ltd, (HEL) as part of surveys prior to ground investigation works.

Hundt, 2012) to give an indication of bat presence over winter. The data have been analysed using AnaLook W v4.1 software.

3.1.7 No hibernation roosts were identified during these DMRB Stage 3 surveys.

Confirmed Roost Summary

Table 5: DMRB Stage 3 survey results of bat roosts found during all surveys

Reference	Distance From Proposed Scheme	Confirmed Roosting Species	Roost Type	Details	Figure Reference
Tree 5.44	0m	Pipistrelle species	Summer roost for small numbers of a common species.	Three pipistrelle species bats observed under bark plate during a woodland assessment survey.	12.5d
Structure 5.12	0m+ to 10m	Common and soprano pipistrelles	Summer roost for small numbers of a common species. Not a maternity roost.	Suspected emergence of six bats from two roost locations at the first survey - four soprano and common pipistrelle bats and two common pipistrelle bats.	12.5a
Structure 5.6	0m+ to 10m	Common pipistrelle and <i>Myotis</i> species	Summer roost for a common species (pipistrelle species) and a night roost for a rarer species (<i>Myotis</i> species). Not a maternity roost.	Suspected emergence of a single <i>Myotis</i> species bat from the south abutment on the first survey. Suspected emergence of a single common pipistrelle from the southern part of the bridge on the third survey.	12.5c
Building 5.66	51m+	Pipistrelle species	Summer roost for small numbers of a common species. Not a maternity roost.	Modern house of unusual design. Loose tiles present. Woodland and river nearby present high potential for commuting and foraging. Pipistrelle droppings on external wall of garage.	12.5a
Building 5.8	11m+ to 30m	Pipistrelle species (likely soprano pipistrelle)	Potential maternity roost of a common species.	Coach house loose tiles and gaps into roof space under soffit. Woodland and river nearby present high potential for commuting and foraging. Anecdotal evidence of large roost. Potential for many species. Many Pipistrelle droppings on external wall.	12.5a
Building 5.7	31m+ to 50m	Pipistrelle species	Summer roost for small numbers of a common species. Not a maternity roost.	Druimuan house residential property with prominent features of loose roofing tiles. Well-sealed at roof arches. Good feature in gable-end barge boards. Pipistrelle droppings on external wall.	12.5a
Building 5.63	11m+ to 30m	Pipistrelle and brown long eared species	Summer roost for small numbers of a common species. Not a maternity roost.	Farm outbuilding with corrugated metal roof. Interior access partially unavailable. Prominent gaps in roof into roof space. Pipistrelle droppings on internal wall.	12.5e
Building 5.64	0m+ to 10m	Pipistrelle species	Summer roost for small numbers of a common species. Not a maternity roost.	Tomban Farmhouse with primary features of loose slates in roofing. Interior access unavailable. Pipistrelle droppings on external wall.	12.5e
Building 6.9	0m to 10m	Soprano pipistrelle	Summer roost for small numbers of a common species.	Single soprano pipistrelle observed emerging from the front porch of the house.	12.5g
Building 6.4	31m+ to 50m	Pipistrelle species	Potential maternity roost of a common species.	Transect survey observed three pipistrelle species touching at a point on the building.	12.5g

Reference	Distance From Proposed Scheme	Confirmed Roosting Species	Roost Type	Details	Figure Reference
Building 6.21	11m+ to 30m	Pipistrelle species	Summer roost for small numbers of a common species. Not a maternity roost.	Calvine School outbuilding. Interior access partially unavailable. Pipistrelle droppings on internal wall with potential for brown long-eared and natterer's.	12.5g

Activity Surveys

- 3.1.8 The impact of the proposed scheme on bat flight lines (particularly road crossing points) and bats ability to use multiple aspects of the landscape was assessed. Culverts and bridges which were assessed (at DMRB Stage 2) as having moderate or high roosting/commuting potential were surveyed using static detectors. Roosting/commuting potential was based on physical characteristics, quality of habitat and the presence of existing linear features leading to the structure.

Passive Monitoring at Bridges and Culverts

- 3.1.9 Surveys at DMRB Stage 3 were carried out using static detectors (AnaBat Express and AnaBat SD1 bat detectors). Detectors were deployed for a minimum of five nights over spring, summer and autumn (adapted from Hundt, 2012). Where possible, surveys were spread across the season, to cover the periods when bats would be expected to be most active during the pre-maternity, maternity and post-maternity seasons respectively.
- 3.1.10 The acoustic sound files were analysed using AnaLook W v4.1 software.
- 3.1.11 In the absence of guidance on criteria for transforming the number of echolocation calls detected into relative activity levels, a method was developed to enable a comparison between the sites surveyed and enabled mitigation to be designed to target the most important areas.
- 3.1.12 This valuation was based on:
- overall activity levels (recorded as bat passes per night for all species) as those areas supporting larger numbers of foraging or commuting bats would be deemed most valuable;
 - species richness as those areas supporting a higher number of species of bats would be deemed most valuable; and
 - presence of rare species (as defined in Wray et al., 2010).
- 3.1.13 To create the activity index for structures, the bat passes per night (BPpN) for all species across the four proposed schemes, which make up the Southern Section Projects of the A9 Dualling Programme, were combined and the interquartile ranges of the data set calculated. Combining the data created a bigger data set which made the interquartile thresholds more reliable. These ranges were used to assign High, Moderate or Low activity to each structure according to the following:
- High activity: BPpN above the third quartile;
 - Moderate activity: BPpN between the first and third quartiles; and
 - Low activity: BPpN below the first quartile.
- 3.1.14 Species richness was determined by the number of each species recorded at each location. Where species were unknown, or pipistrelle species could not be discerned, these records were excluded from the species richness. Categories of species richness were assigned according to the following:
- High species richness: four species or more;
 - Moderate species richness: between two and three species; and
 - Low species richness: less than two species.

- 3.1.15 An index value for rarity was calculated using the same approach calculating interquartile ranges for BPpN across the Southern Section Projects but only including Myotis species and brown long-eared bats (taken as being rarer species (Wray et al., 2010)). As above (see paragraph 3.1.13), a value of High, Moderate and Low were assigned to the quartile ranges.
- 3.1.16 An overall value of each passive monitoring location was calculated by assigning three points to each result of High, two points for Moderate and one point for Low. The total points for each feature then equated to an overall value as follows:
- High value for total scores of eight and nine;
 - Moderate value for total scores of five, six and seven; and
 - Low value for total scores of three and four.
- 3.1.17 The overall values of the passive monitoring locations are presented in Table 6 and the locations of these features are shown on Figure 12.6.

Table 6: Percentage call abundance and overall value of the passive monitoring location

Structure	Percentage Species Call Abundance						Score	Overall Value
	Myotis Species	Brown Long-eared	Pipistrelle Species	Common Pipistrelle	Soprano Pipistrelle	Unknown		
BS 5.11	0.2	0.0	0.1	19.5	80.2	0.0	5	Moderate
BS 5.12	0.3	0.0	0.6	59.2	31.5	8.3	7	Moderate
BS 5.13	0.3	0.2	0.1	20.6	78.8	0.0	8	High
BS 5.14	10.7	0.0	0.0	0.0	89.3	0.0	4	Low
BS 5.15	1.2	7.0	1.2	46.8	42.1	1.8	7	Moderate
BS 5.19	5.2	0.0	0.0	12.1	82.8	0.0	6	Moderate
BS 5.33 E	14.2	0.0	2.6	13.5	69.4	0.4	8	High
BS 5.33 W	0.6	0.2	17.2	14.0	67.3	0.7	9	High
BS 5.34	0.0	0.0	2.9	73.5	11.8	11.8	3	Low
BS 5.36	0.0	0.8	0.0	74.6	24.6	0.0	5	Moderate
BS 5.4	0.1	0.3	3.8	5.4	90.0	0.4	9	High
BS 5.42	64.0	0.6	0.7	16.7	10.1	8.0	8	High
BS 5.6	1.4	0.1	4.4	23.2	69.5	1.4	9	High
BS 5.8	0.0	0.0	0.9	46.0	50.5	2.6	4	Low
BS 6.23	7.7	1.5	0.0	56.2	31.5	3.1	7	Moderate
BS 6.29	0.8	0.0	1.0	95.1	3.1	0.0	7	Moderate
BS 6.5	6.3	2.1	0.0	56.3	35.4	0.0	6	Moderate

Manual Bat Activity Transects

- 3.1.18 Five walked transect routes were undertaken to obtain a measure of bat activity and species richness in habitats along the proposed scheme and to help identify those areas of higher value to bats to allow mitigation to be designed if needed. The transect routes were designed to encompass a range of habitats at varying proximity to the existing A9 (Collins, 2016).
- 3.1.19 Surveys at DMRB Stage 3 were carried out using hand-held frequency division bat detectors (BatBox Duet) with Creative Zen, Transcend Mp330 or Tascam DR-05 linear PCM recorders. Trimble Juno T41/5 and the Apple iPad mini 4 (Apple A8, iOS, Wi-Fi and cellular) mobile mapping devices with GPS were used to record the exact position of each registration and observation.
- 3.1.20 The acoustic sound files were analysed using AnaLook W v4.1 software.
- 3.1.21 See Figure 12.6 for the results from these transects.

3.1.22 Activity was measured in bat passes per hour (BPpH). Interquartile ranges were created in line with the method used for passive monitoring analysis (overall activity, diversity and rare species activity) and an overall index value was then created for each transect using the same points system detailed in paragraph 3.1.16 (Table 7). Where species were unknown, or pipistrelle species could not be discerned, these records were excluded from the species richness.

Table 7: Percentage call abundance and overall value of the walked transect route

Transect	Percentage Species Abundance					Score	Overall Value
	Myotis Species	Pipistrelle Species	Common Pipistrelle	Soprano Pipistrelle	Unknown		
T5.1*	1.1	1.1	22.8	67.9	7.1	8	High
T5.2	3.0	12.9	6.8	72.0	5.3	7	Moderate
T5.3	9.4	12.5	3.1	71.9	3.1	6	Moderate
T6.1	0.6	13.9	13.3	70.5	1.7	7	Moderate
T6.2	0.0	10.1	18.6	60.5	10.9	5	Moderate

* One bat (common pipistrelle) was observed crossing the existing A9 during T5.1

Rare and Cryptic Species Monitoring

3.1.23 Where data search, survey or habitat assessment had shown the presence or potential presence of rare or rarer, and/or cryptic species within 350m of the proposed scheme (Wray et al. 2010), additional passive monitoring was conducted. The results were used to help identify those areas of higher value to rare or rarer, and/or cryptic species of bats to allow mitigation to be designed if needed. Cryptic species are defined here as those with similarities in echolocation to other bat species, or those with echolocation calls which are more difficult to detect.

3.1.24 Surveys at DMRB Stage 3 were carried out using static detectors (AnaBat Express and AnaBat SD1 bat detectors) deployed for a minimum of six nights over mid-summer. See Figure 12.6 for the monitoring locations.

3.1.25 The acoustic sound files were analysed using AnaLook W v4.1 software. The data was used to determine the likely presence of a roost for species that had not been picked up during previous surveys and to determine the importance of this area for these species.

3.1.26 Cryptic species data was measured in rare species BPpN. Interquartile ranges were calculated for rare species (Myotis species and brown long-eared bats) across the Southern Section Projects. These ranges were used to assign High, Moderate or Low value to the monitoring location according to the following (Table 8):

- High activity: BPpN above the third quartile;
- Moderate activity: BPpN between the first and third quartiles; and
- Low activity: BPpN below the first quartile.

Table 8: Number of rare bat passes and the overall activity value

Woodland	Myotis Species Calls	Brown Long-eared Calls	Nights of Recording	Bat passes per Night	Overall Activity Value
Killiecrankie	11	4	10	1.5	Moderate

4 Breeding Birds

4.1.1 An adapted Breeding Bird Survey (BBS), designed by the BTO, JNCC and RSPB (Bibby et al., 2000) was utilised. The standard BBS methodology (Bibby et al., 2000) recommends multiple survey visits spread across the breeding bird season (March-August inclusive). Due to the large survey area the methodology was adapted to survey the total area once between April and July (inclusive). It is considered that by surveying the total area, the data provide a suitable indication of the species assemblage present across all habitat types within 150m from the mainline of the proposed scheme.

- 4.1.2 The survey area was divided into survey sectors that were 1km to 1.5km in length. Each survey team comprised two ecologists (including at least one specialist ornithologist). Survey work was undertaken each morning between dawn and 12:00 British Summer Time (BST) in optimum weather conditions for survey (light winds, good visibility and lack of persistent or heavy rain).
- 4.1.3 A complete list of bird species recorded as breeding within the study area is shown below in Table 9 where species are highlighted (red, amber or green) according to their classification as birds of conservation concern (Eaton et al., 2015). The locations of recordings are shown on Figure 12.7.

Table 9: Breeding bird records within the study area, their protection and conservation status.

Species	Breeding Records	Species listed on SBL	Species listed on Tayside LBAP
Black grouse	1	Yes	Yes
Cuckoo	10	Yes	No
Curlew	8	Yes	Yes
Grey wagtail	9	No	No
House sparrow	8	Yes	Yes
Lapwing	9	Yes	Yes
Lesser redpoll	12	Yes	No
Mistle thrush	35	No	No
Pied flycatcher	2	No	No
Skylark	6	Yes	Yes
Song thrush	62	Yes	Yes
Spotted flycatcher	5	Yes	Yes
Starling	16	Yes	No
Tree pipit	22	Yes	No
Whinchat	16	No	Yes
Wood warbler	11	Yes	Yes
Yellowhammer	3	Yes	Yes
Black-headed gull	5	Yes	No
Bullfinch	1	Yes	Yes
Common gull	24	No	No
Common sandpiper	34	No	No
Dipper	2	No	No
Duncock	17	No	No
Greylag goose	5	No	Yes
House martin	8	No	Yes
Kestrel	1	Yes	Yes
Mallard	4	No	No
Meadow pipit	110	No	No
Oystercatcher	33	No	Yes
Reed bunting	1	Yes	Yes
Snipe	1	No	Yes
Stock dove	1	No	No
Willow warbler	281	No	No
Blackbird	78	No	No
Blackcap	17	No	No
Blue tit	283	No	No
Buzzard	5	No	Yes
Carrion crow	4	No	No
Chaffinch	529	No	No
Chiffchaff	6	No	No

Species	Breeding Records	Species listed on SBL	Species listed on Tayside LBAP
Coal tit	170	No	No
Collared dove	3	No	No
Common crossbill*	2	No	No
Garden warbler	21	No	No
Goldcrest	144	No	No
Goldfinch	13	No	Yes
Goosander	2	No	Yes
Great spotted woodpecker	14	No	Yes
Great tit	118	No	No
Greenfinch	9	No	No
Jackdaw	15	No	No
Jay	5	No	No
Long-tailed tit	26	No	No
Magpie	1	No	No
Pied wagtail	26	No	No
Raven	1	No	No
Robin	228	No	No
Rook	1	No	No
Siskin	42	Yes	No
Sparrowhawk	1	No	Yes
Stonechat	2	No	Yes
Swallow	18	No	Yes
Treecreeper	15	No	No
Wheatear	4	No	Yes
Whitethroat	3	No	No
Woodpigeon	12	No	No
Wren	179	No	No

* Presence on the Schedule 1 list of the Wildlife and Countryside Act 1981 (as amended)

5 Water Vole

5.1.1 No field signs of water vole were recorded during field surveys. Some of the watercourses surveyed had limited suitable habitat for water vole and are detailed below in Table 10.

Table 10: Watercourses recorded with suitable habitat for water vole

Watercourse	Description
WF96	Ditch along edge of heavily grazed field, collapsed in places. Some parts sectioned off from grazing, some potential for water vole.
WF106	Grassy banks within woodland. Some potential for water vole.
WF107	Grassy banks outside and within woodland. Some potential.
WF109	Some potential at top of burn with grassy vegetation. Woodland considered not suitable.
WF114	Rocky burn with grassy banks. Some potential for water vole.
WF115	Burn running through field, some potential for water vole.
WF117	Grassy banks with sand/ rock substrate. Some potential for water vole.
WF169	Dry grassy ditch adjacent to field. Some potential for water vole if water levels increase.

6 Pine Marten, Red Squirrel and Wildcat

6.1.1 Incidental records of evidence of pine marten and red squirrel are detailed below in Table 11 and are shown on Figure 12.9. No incidental recordings of wildcat were made.

Table 11: Incidental records of red squirrel and pine marten from south to north

Species	Evidence	Grid Reference	Description of Incidental	Figure Reference
Pine Marten	Sighting	NN 89951 63944	Individual in woodland north of Aldclune.	12.9a
Pine Marten	Sighting	NN 79200 66603	Individual in Clunes Wood.	12.9d
Red squirrel	Sighting	NN 91180 62931	Individual on fence of property next to road.	12.9a
Red squirrel	Sighting	NN 91601 63097	Individual in woodland west of Old Faskally House.	12.9a
Red squirrel	Sighting	NN 91568 63133	Individual in woodland west of Old Faskally House.	12.9a
Red squirrel	Sighting	NN 91098 63000	Individual in woodland northwest of Killiecrankie.	12.9a
Red squirrel	Feeding signs	NN 90929 63442	Chewed cones along watercourse.	12.9a
Red squirrel	Sighting	NN 90847 63548	Individual in woodland north of House of Urrard.	12.9a
Red squirrel	Sighting	NN 89990 64136	Two squirrels on a felled tree bridging Allt Chluain.	12.9a
Red squirrel	Drey	NN 89479 64121	Intact drey in Scot's pine in AWI pine plantation north-west of Aldclune.	12.9b
Red squirrel	Drey	NN 89495 64195	Intact drey in Scot's pine in AWI pine plantation north-west of Aldclune.	12.9b
Red squirrel	Potential drey	NN 89405 64189	Conifer woodland south of existing A9, circa 50m from carriageway at western extent of woodland and 20m from fence to south.	12.9b
Red squirrel	Sighting	NN 87985 64447	Individual in woodland south of River Garry.	12.9b
Red squirrel	Feeding signs	NN 86273 65321	Chewed cones in coniferous woodland south of River Garry.	12.9c
Red squirrel	Sighting	NN 80563 65947	Individual in woodland between Pitagowan and Calvine.	12.9d

7 Reptiles

7.1.1 Results of the reptile surveys conducted are presented in Table 12 and are shown on Figure 12.10.

Table 12: Results of reptile habitat assessment and surveys from south to north

Site	Habitat Description	Central Grid Reference	Area (ha)	ACOs* Deployed	Species Recorded and Peak Adult Count			Current Reptile Habitat Status	Figure Reference
					Adder	Common lizard	Slow worm		
1	Small section of clearfell.	NN 91803 62676	0.2	6	-	2	-	Presence	12.10a
2	South-facing slope with a mosaic of rough grassland and dry heath with low height heather cover. Rock piles present.	NN 79680 66129	3.0	47	1	2	8	Local Key Reptile Site	12.10g
3	South-facing slope of rough grassland and moderate immature birch cover.	NN 79592 66108	1.4	20	-	-	4	Presence	12.10g
4	Majority dry heath with interspersed wet heath and	NN 78357 67102	3.9	40	-	3	3	Presence	12.10h

Site	Habitat Description	Central Grid Reference	Area (ha)	ACOs* Deployed	Species Recorded and Peak Adult Count			Current Reptile Habitat Status	Figure Reference
					Adder	Common lizard	Slow worm		
	bracken. Area of exposed scree slope at top of A9 cutting at the centre of the site. Rock piles present.								
5	Sparse birch woodland with glades and rocky scree.	NN 78527 66877	1.7	21	-	3	3	Presence	12.10h
6	A variety of habitats with dry heath with low height heather cover to the north, sparse birch woodland central and rough grassland to the south.	NN 77248 68103	9.3	95	5	5	47	Key Reptile Site	12.10h, i
7	Majority dry heath with low height heather cover interspersed with bracken. Rock piles present.	NN 77301 68166	4.7	49	6	4	2	Local Key Reptile Site	12.10i
8	A mosaic of rough grassland, pine plantation and dry heath. Rock piles present.	NN 76392 69263	4.4	50	3	5	-	Local Key Reptile Site	12.10j
9	Sparse birch woodland with majority low shrub dry heath on the southbound verge of the A9 carriageway. Rock face and rock piles present.	NN 73904 70021	2.0	24	9	4	-	Local Key Reptile Site	12.10k

*Artificial Cover Objects

7.1.2 Incidental sightings along the proposed scheme are detailed below in Table 13 and are shown on Figure 12.10.

Table 13: Incidental sightings outwith ACO survey areas from south to north

Species	No. Individuals	Age/Sex	Location	Grid Reference	Figure Reference
Adder	1	-	South-bound verge of B847, west of House of Bruar.	NN 80997 65669	12.10f
Adder	1	-	North-bound verge of B847, west of House of Bruar.	NN 80911 65701	12.10f
Adder	1	-	In area of broom and heather between military road and north-bound A9 carriageway.	NN 77073 68601	12.10i
Adder	1	-	South of A9, west of Allt Crom Bhruthaich.	NN 76914 68824	12.10i
Adder	1	-	South of A9, west of Allt Crom Bhruthaich.	NN 76895 68817	12.10i

Species	No. Individuals	Age/Sex	Location	Grid Reference	Figure Reference
Adder	1	-	In between military road and north-bound A9 carriageway.	NN 76656 68983	12.10i
Adder	1	Adult female	South-east of Dalreoch in marshy grassland.	NN 76326 69133	12.10i
Slow worm	1	-	Rough grassland bank of south-bound A9 verge	NN 85679 65248	12.10d
Slow worm	1	Adult male	North-bound verge of B847, west of House of Bruar.	NN 81200 65663	12.10f
Slow worm	2	-	North-bound verge of B847, west of House of Bruar.	NN 81198 65678	12.10f
Slow worm	1	Adult gravid female	Dry heathland north of A9 at Calvine.	NN 80103 66070	12.10g
Slow worm	1	Adult female	Dry heathland north of A9 near General Wade's Military Road.	NN 79624 66533	12.10g
Common lizard	5	-	Rough grassland bank of north-bound A9 verge, west of Shierglas Quarry.	NN 86812 64957	12.10d
Common lizard	3	-	Rough grassland bank of north-bound A9 verge, west of Shierglas Quarry.	NN 86725 65019	12.10d
Common lizard	1	-	Woodland edge in rough grassland on southern bank of River Garry, west of Shierglas Quarry.	NN 86527 65268	12.10d
Common lizard	3	-	Rough grassland bank of north-bound A9 verge, west of Shierglas Quarry.	NN 86453 65154	12.10d
Common lizard	1	-	Rough grassland bank of north-bound A9 verge, east of Balnansteuartach Farm.	NN 83434 65477	12.10e
Common lizard	1	-	Under River Garry A9 crossing at House of Bruar, on west bank.	NN 82511 65791	12.10f
Common lizard	1	-	Under River Garry A9 crossing at House of Bruar, on west bank.	NN 82507 65798	12.10f
Common lizard	1	-	Dry heathland north of A9 at Calvine.	NN 81020 65923	12.10f
Common lizard	1	-	North of existing A9, west of Tomchitchen House.	NN 80539 65955	12.10g
Common lizard	1	-	North of existing A9, west of Tomchitchen House.	NN 80271 66192	12.10g
Common lizard	1	-	South of existing A9 at Clunes Lodge.	NN 78303 67057	12.10h
Common lizard	1	-	East bank of Allt Geallaidh, south of A9 carriageway.	NN 73481 70220	12.10k

8 Phase 1 Habitat Survey

8.1.1 Target notes, detailing habitats and plant species, from the A9 dualling programme route-wide Phase 1 habitat surveys (Transport Scotland, 2015) (Figure 12.2) are provided in Table 14.

Table 14: A9 dualling programme route-wide Phase 1 habitat survey target notes

Target Note Reference	Grid Reference	Description	Figure Reference
TN55	NN 91734 62621	Invasive Non-native Species Unidentified knotweed with moderately rounded leaf base (potentially hybrid knotweed). Only one young plant present.	12.2a
TN56	NN 91702 62604	Common ragwort at edge of woodland clearing/glade by bird feeders. Mixed semi-natural woodland on steep slope above River Garry gorge.	12.2a
TN57	NN 91727 62677	Uncommon plant wood vetch locally frequent in roadside grassland verge beside stonewall at Killiecrankie Visitor Centre.	12.2a
TN58	NN 91720 62757	Dense bryophyte field layer dominated by big shaggy-moss in damp birch woodland.	12.2a

Target Note Reference	Grid Reference	Description	Figure Reference
TN59	NN 91744 62790	Localised lily-of-the-valley (approximately 3m x 5m). Located near top of dry ditch on east facing slope opposite stone wall.	12.2a
TN63	NN 91799 62329	Invasive Non-native Species Japanese knotweed by roadside opposite cottage.	12.2a
TN66	NN 91970 62596	Flush habitat Small acidic flush in otherwise neutral grassland field near boundary with unenclosed grassland. Very low sphagnum cover (lustrous bog-moss) amongst brown <i>Pleurocarpus</i> sp. mosses. Localised sedge (including carnation sedge) present and purple moor-grass. Deer droppings also recorded.	12.2a
TN67	NN 91782 62531	Canopy dominated by downy birch and sessile oak, with abundant ash. Understorey dominated by coppiced hazel, cherry and ash seedlings. Field layer dominated by dog's mercury and big shaggy-moss, bent grass, male-fern, violet sp., and false brome.	12.2a
TN69	NN 91801 62358	Soft downy-rose.	12.2a
TN70	NN 91762 62894	Pyramidal orchid (one flowering plant) and melancholy thistle in species rich neutral grassland verge by bridge. Grassland grades into minute patch of acid heath (less than 5m x 5m). Invasive snowberry (probably self-seeded) established in nearby scrub.	12.2a
TN71	NN 91616 62747	Invasive rhododendron spreading from managed garden on embankment by bend in B8079 road.	12.2a
TN75	NN 91575 63069	Damp ancient woodland dominated by downy birch to south, then dominated by mature beech further north towards Alt Girmaig river. Other locally dominant canopy species include pine and cherry. Open understorey of scattered hazel. Very lush bryophyte layer dominated by big shaggy-moss. Field layer dominated moss and sheep's-fescue with frequent bilberry.	12.2a
TN80	NN 91725 63143 NN 91799 63043	Small number of spreading bellflower plants on south-west facing slope near woodland edge. Clump of around eight plants. Rare but presumed non-native (outside of native UK range).	12.2a
TN82	NN 91730 62857	Invasive snowberry on scrubby woodland edge by culvert. Likely to have spread from field below where probably planted.	12.2a
TN85	NN 91506 63290	Eutrophic species poor wet grasslands.	12.2a
TN86	NN 90841 63491	Rhododendron spreading from gardens to pond and woodland.	12.2b
TN87	NN 90754 63529	Shallow muddy pond within managed grounds of House of Urrard.	12.2b
TN88	NN 90734 63609	Deer enclosure with mixed semi-mature trees. Ash, alder and crack-willow present.	12.2b
TN89	NN 90982 63638	Small eutrophic flood plain mire. Generally species poor but sedge locally dominant and other species may be overlooked due to the time of survey (August to September).	12.2b
TN90	NN 90462 63678	Species-poor neutral basin mire habitat. Habitat clearly distinguishable in aerial photographs. Fed from groundwater source from north.	12.2b
TN91	NN 90413 63789	Marshy grassland corner of improved field fed by A9 surface water run-off.	12.2b
TN92	NN 89992 64110	Road bridge over the River Garry where land slippage has taken place. It was not possible to access the watercourse here as the sides are steep and in many areas loose. The woodland comprises species such as ash, bird cherry, silver birch, wych elm and hazel.	12.2b
TN95	NN 89090 64250	Shingle Islands SAC Qualifying Interest Annex 1 floodplain alder woodland on sandy substrates. Ash dominates the canopy, with goat willow, alder and downy birch also present. Understorey consists of cherry and ash saplings. Field layer includes typical flood plain species such as meadowsweet and wild angelica. Tall fescue and a bent sp. are also present.	12.2c
TN97	NN 89037 64292	Orchids on local road verge, 20m north of A9 bridge over River Garry. Minimum of three broad-leaved helleborine and several pyramidal orchids.	12.2c
TN98	NN 88393 64309	Invasive Non-native Species Snowberry in former garden (abandoned), snowberry stretches for approximately 25m and is 3 - 5m in depth.	12.2c

Target Note Reference	Grid Reference	Description	Figure Reference
TN109	NN 85353 65236	Minimum of four specimens of pyramidal orchid recorded at base of bank where it meets roadside verge on bend of A9 near Bruar.	12.2e
TN110	NN 85225 65235	Pyramidal orchids and several helleborine orchids. Roadside verge of A9.	12.2e
TN112	NN 84923 65287	Invasive Non-native Species - monkeyflower. Also poorly developed 2m-wide flood-plain mire habitat up to 2m wide on both banks of stream.	12.2e
TN113	NN 85016 65243	Invasive Non-native Species - monkeyflower.	12.2e
TN122	NN 84594 65681	Acid grassland with scattered heather. Shingle substrate towards river with wild thyme. Species-rich due to varying pH. Dominated by red fescue with frequent lady's bedstraw, devil's-bit scabious and cat's-ear. Local area has some potential for marsh fritillary due to the size of grassland concerned, grazing regime, and presence of both scabious and purple moor-grass.	12.2e
TN131	NN 83584 65396	Invasive Non-native Species - monkeyflower.	12.2e
TN132	NN 82780 65687	Semi-improved neutral grassland. Grassland with a high herb to grass ratio along the track of an improved field. Yarrow, common mouse-ear, ribwort plantain, common sorrel, white clover, harebell, devil's-bit scabious, red fescue, Yorkshire-fog, red clover, lady's bedstraw, crested dog's-tail, lesser stitchwort, creeping thistle, germander speedwell, common bird's-foot-trefoil, an eyebright sp., sheep's sorrel, nipplewort, sweet vernal-grass, meadow buttercup, common cat's-ear, and autumn hawkbit.	12.2f
TN133	NN 83075 65605	Very species-rich semi-improved grassland, containing some sand and/or calcareous indicators. Parts are mildly acid (acid indicators). Crested dog's-tail, Yorkshire-fog, red fescue, sheep's-fescue, an eyebright, mouse-ear-hawkweed, cat's-ear, autumn hawkbit, harebell, creeping buttercup, meadow buttercup, ribwort plantain, common bird's-foot-trefoil, common knapweed, slender St John's-wort, field wood-rush, red clover, lady's bedstraw, violet species, common mouse-ear, salad burnet, field gentian, tormentil, common rock-rose, fairy flax, heather, pignut, yellow-rattle. Bladder campion by the river.	12.2f
TN136	NN 81673 65787	Damp neutral grassland – false oat-grass, raspberry, sphagnum, birch, meadowsweet. Trees with bat potential.	12.2f
TN137	NN 81563 65713	Marshy grassland provides potential reptile habitat. Species include rush, lesser stitchwort, sedge species, ribwort plantain, compact rush, crested dogs-tail, sweet vernal-grass, cat's-ear, autumn hawkbit, selfheal, common sorrel, creeping buttercup, meadow buttercup, Yorkshire-fog, soft-rush, common bent, tufted vetch, silverweed, carnation sedge, sneezewort, heath wood-rush, marsh violet, meadow vetchling, tormentil, mat-grass, creeping bent, wavy hair-grass, sphagnum.	12.2f
TN138	NN 81451 65698	Rocky outcrop unimproved acid grassland; harebell, eyebright, bilberry, heath milkwort, field gentian. Unimproved neutral grassland with acid and calcareous influences. Timothy, crested dogs-tail, harebell, red clover, sweet vernal-grass, creeping buttercup, mouse-ear-hawkweed, lady's bedstraw, common cat's-ear and bird's-foot-trefoil.	12.2f
TN139	NN 81141 65838	Acid flush – cottongrass, sundew, dominated by sphagnum, with rush, bird's-foot-trefoil, cross-leaved heath, marsh thistle, sneezewort and purple moor-grass.	12.2f
TN140	NN 81207 65714	Stream through poor semi-improved neutral grassland. Rosebay willowherb, sorrel, ragwort, nettle, creeping thistle along stream. Within field – sweet vernal-grass, yarrow, ribwort, bent sp., fescues, oat-grass, yellow-rattle, germander speedwell, harebell, buttercup and creeping thistle.	12.2f
TN141	NN 80236 65960	Dry stone wall partially collapsed, edge of field is dense conifer and birch – most likely plantation. Verge section is heather and cross-leaved heath patches (ditch within verge also) intermittent ruderal (thistle, bracken, young birch). Woodland understory contains harebell, ragwort, wood-sorrel, mosses, tormentil, lady's bedstraw, bents, wavy hair-grass and rocks.	12.2g
TN142	NN 80235 66064	Habitat has section of wet mire in dips with bog-myrtle, heath rush, bog asphodel, wet sphagnum. Drier areas show an increase in purple moor-grass, devil's-bit scabious heather, silver birch, harebell, eyebright, quaking-grass, carnation sedge, sweet vernal-grass, tormentil and lady's bedstraw.	12.2g
TN143	NN 80048	Vegetation changes becoming bracken dominated (likely to be peat under	12.2g

Target Note Reference	Grid Reference	Description	Figure Reference
	66101	bracken). A wet channel with bog-myrtle and bog asphodel heath rush dominate this section which has areas of standing water a possible flush. Habitat forms tussocks and hummocks with a mixture of heather, grassland and bracken with flushes in lower areas.	
TN144	NN 80248 65824	Broadleaved woodland with open glades of semi-improved neutral grassland containing false oat-grass, ferns, birch, Yorkshire-fog, raspberry, rosebay willowherb and hogweed.	12.2g
TN145	NN 80443 65991	Grassland contains both acid and neutral species – fescues, Yorkshire-fog, heather, bell heather, sweet vernal-grass, tormentil, sphagnum, mat-grass, creeping thistle, ragwort.	12.2g
TN146	NN 79865 65982	Coniferous woodland with broadleaved edge and bracken at side of road.	12.2g
TN147	NN 79903 66051	Verge continues to be dominated by silver birch in dense stands at the top with areas of bracken and bog-myrtle. Ditch within verge. General habitat is bracken/heath with hummocks supporting bog-myrtle in deergrass and sphagnum.	12.2g
TN148	NN 79741 66142	Acid flush area before deep channel.	12.2g
TN149	NN 79470 66265	Flushes with dense sphagnum, sundew, and butterwort. Watercourse/stream with bracken banks stone banks near edge. Unlikely to be otter holts or water vole burrows although parts of the habitat may be suitable.	12.2g
TN150	NN 79270 66457	Habitat changing becoming heather dominant with stone on grassland and large stands of bracken surrounding. Soil becomes thin and sandy with heather and sweet vernal-grass towards an area of disturbed ground with self-set conifer and birch with mouse-ear-hawkweed which could contain artificial material. Older conifer plantation nice grassland/moss/lichen understory.	12.2g
TN151	NN 79514 66145	Narrow grass verge next to conifer plantation containing stands of silver birch.	12.2g
TN153	NN 78934 66605	Verge is wooded (coniferous) with areas of bare rock face further along the verge.	12.2h
TN154	NN 78599 67005	Areas of dense bracken with semi improved neutral grassland. Areas of bog-myrtle around stream and purple moor-grass in sections of marshy grassland with fescues, bent, sphagnum, scabious, eyebright and common knapweed.	12.2h
TN155	NN 78692 66888	Good semi-improved grassland with scattered tall ferns, bog-myrtle and birch trees with low bat potential. Stream surrounded by heath rush, bog-myrtle, bog asphodel, rush, purple moor-grass, scabious. Areas of marshy grassland include wavy hair-grass, rushes, purple moor-grass and bog asphodel.	12.2h
TN156	NN 78118 67104	Mature trees with bat potential. Poor semi-improved neutral grassland with patches of rush and scabious.	12.2h
TN157	NN 78330 67141	Up stone track rock face either side with birch and willow, occasional bell heather and heather.	12.2h
TN160	NN 78156 67367	Flush with stream through. Surrounded by heath rush, bog-myrtle, scabious, marsh thistle, occasional sphagnum, purple moor-grass, bog asphodel and buttercup.	12.2h
TN162	NN 78110 67363	Bracken with peaty marshy ground underneath.	12.2h
TN163	NN 77933 67437	Wood ant nest.	12.2h
TN165	NN 77837 67381	Grassland includes cross-leaved heath, bent, cock's-foot, harebell, bird's-foot-trefoil, sweet vernal-grass, patches of bracken, lady's bedstraw, moss, tormentil, scabious, thistle, yarrow, knapweed, selfheal. Scrub is dominated by silver birch. Woodland edge and top of embankment contains silver birch and alder at bottom. Limited bat potential under bridge but good habitat for otters. Other side of stream includes Yorkshire-fog, quaking-grass, knapweed, broom and eyebright.	12.2h
TN166	NN 77552 67559	Wet vegetation includes sphagnum, bog asphodel, heath rush, purple moor-grass. Bat potential in dead trees. Hazel, willow and birch hedge. Dense woodland first 3.5m from lower road then open grassland/bracken with scattered trees – then dense line of trees and scrub at bottom of slope up to A9.	12.2h
TN167	NN 77738 67626	Becoming more acidic with small patches of bog asphodel, purple moor-grass which are acid influences. Neutral grassland and dry stone wall nearby with neutral grassland dominated by purple moor-grass.	12.2h

Target Note Reference	Grid Reference	Description	Figure Reference
TN168	NN 77461 67959	Acid grassland/heath mosaic composed of petty whin, bell heather, heather, mat-grass, deergress, purple moor-grass, tormentil and scabious.	12.2i
TN169	NN 77219 68404	Steep rock face/cliff with dwarf birch, rowan, ferns and heathers. Verge comprises plantain, cat's-ear, heathers, tormentil, bent grass, scabious, fescues, sweet vernal-grass, Yorkshire-fog, yarrow, ragwort, knapweed, rosebay willowherb and sphagnum sp.	12.2i
TN170	NN 76885 68901	Some wetter vegetation on verge which includes heath rush and purple moor-grass.	12.2i
TN172	NN 77066 68672	Habitat is mixed and includes broom and silver birch with scattered and abundant heather patches, bird's-foot-trefoil, mouse-ear-hawkweed, wood sage, thistle, cock's-foot, sweet vernal-grass and fescues.	12.2i
TN173	NN 77062 68879	Mire and bracken then dries into heather/purple moor-grass then flush of mire and back to heather forming a mosaic too complex to map consisting of: Mire 35%, bracken 60%, heath 10%, flush 5%.	12.2i
TN174	NN 76773 69082	Acid grassland/heath mosaic includes heather, wavy hair-grass, tormentil, bilberry, harebell, areas of bracken and marshy grassland (deergress, bog-myrtle, sphagnum, heath rush, bog asphodel) /flush and valley mire.	12.2i
TN175	NN 76193 69288	Grassland previously disturbed and has a dense carpet of mouse-ear-hawkweed in some parts with patchy heather, bell heather and cross-leaved heath. With the southern section containing sweet vernal-grass, fescues, cock's-foot, selfheal and heath wood-rush. Patches of artificial stone indicate previous disturbance.	12.2j
TN176	NN 76185 69210	Habitat becomes more mire-like with purple moor-grass, deergress, bog-myrtle, heath rush, sphagnum and butterwort towards the edge of the stream.	12.2j
TN177	NN 76503 69022	Habitat changes to neutral grassland with some purple moor-grass still present but sweet vernal-grass, Yorkshire-fog, buttercup, and daisy starting to dominate.	12.2i
TN178	NN 76569 69138	Bank on south bound carriageway exposed rock with patches of grass and heather with conifer, young willow and broom growing on top of the embankment.	12.2i
TN179	NN 75915 69373	Sheep grazed field of semi-improved grassland contains sweet vernal-grass, harebell, wild thyme, eyebright, autumn hawkbit, quaking-grass, lady's bedstraw, cocksfoot. Road verge contains bird's-foot-trefoil, ragwort, eyebright and heath rush.	12.2j
TN180	NN 75676 69543	Heath/ acid grassland mosaic in succession to scrub with alder and rush in wetter areas. Alder seen. Species include germander speedwell, silver birch, tormentil, cross-leaved heath, Yorkshire-fog, harebell, yarrow, thistle, sphagnum, quaking-grass, wild thyme, fescues and purple moor-grass.	12.2j
TN181	NN 76080 69349	Old cottage (abandoned) bat potential in house and out building. Surrounding garden and field is overgrown and includes false oat-grass, wavy hair-grass, nettles, cock's-foot, meadow buttercup, Yorkshire-fog. Dry stone walls surround property.	12.2j
TN182	NN 75943 69558	Channel containing round-leaved sundew. Habitat is predominantly mire with sections where purple moor-grass dominates becoming drier heading south where heather is dominant on the sphagnum changing to neutral grassland towards the woodland.	12.2j
TN183	NN 76145 69385	Steep embankment dominated by heather with conifers. Mosses frequent under heather especially near to concrete lined ditch at top of embankment before plantation. Plantation not accessible due to deer fencing.	12.2j
TN184	NN 75135 69739	Semi neutral with acid patches. Grassland reveals slightly more acidic features and patches of heather and creeping willow, mat-grass, deergress, purple moor-grass, bird's-foot-trefoil, plantain, selfheal, frequent sweet vernal-grass and eyebright.	12.2j
TN185	NN 75344 69688	Acid mosaic provides good reptile habitat and consists of heather, cross-leaved heath, purple moor-grass, tormentil, thistle, ragwort, sweet vernal and mat-grass. Habitat then changes with frequent self-seeded conifers, bird's-foot-trefoil and mouse-ear-hawkweed. Partially disturbed ground is likely to be recolonised bare ground with patches of cross-leaved heath and conifer. Bog asphodel, purple moor-grass, heather and cross-leaved heath, sphagnum and cottongrass are present with exposed peat in areas where vehicles have tracked over (wet to stand on). Habitat continues into mire but becomes increasingly dry and modified in places moving into a dry acid heath/grassland mosaic with some signs of improvement. Species here include heather, harebell, tormentil, sweet vernal-grass, bird's-foot-trefoil, ribwort plantain and	12.2j


Target Note Reference	Grid Reference	Description	Figure Reference
		carnation sedge.	
TN186	NN 75489 69682	River with otter potential and bat potential in bridge structure. Grassland before bridge includes species such as sweet vernal-grass, thyme, heather and creeping thistle. Mature plantation woodland has a neutral grassland understorey comprising Yorkshire-fog, field germander, nettle and buttercup.	12.2j
TN187	NN 75640 69622	Mire containing purple moor-grass, bog-myrtle, deergrass, bog asphodel, cross-leaved heath, tormentil and heather changing into dry heath on the slope. Lower down towards river a heath/acid grassland mosaic forms and contains species such as cross-leaved heath, wavy hair-grass and thyme.	12.2j
TN188	NN 75516 69597	River banks are vegetated with grass, conifers and rowan and exposed rocks with moss.	12.2j
TN189	NN 74684 69842	Dry channel running from woodland into field. Marshy indicators near to channel include purple moor-grass, sphagnum, carnation sedge, soft-rush, mat-grass, marsh violet and deergrass. Ditch habitat (dry ditch) largely semi-improved neutral grassland with acidic features including patches of heather and northern bedstraw, cock's-foot, bird's-foot-trefoil, tormentil, ragwort and a linear stand of pine.	12.2k
TN190	NN 74675 69724	Acid grassland with purple moor-grass grassland, wavy hair-grass, tormentil, bog asphodel, bog-myrtle, cross-leaved heath, common sorrel, fescues, meadowsweet, soft-rush and perennial rye-grass.	12.2k
TN191	NN 74693 69685	Stream with shallow banks within a neutral grassland field containing creeping thistle, common nettle, bent sp., Yorkshire-fog, creeping buttercup, pineappleweed, cock's-foot, perennial rye-grass, broad-leaved dock, common mouse-ear, yarrow, fescues and lesser stitchwort.	12.2k
TN192	NN 74773 69719	Grassland contains yarrow, creeping thistle, lesser stitchwort, false oat-grass, common nettle, Yorkshire-fog, fescues, germander speedwell, soft-rush, bent sp. Monkeyflower is abundant along the flush.	12.2k
TN193	NN 74805 69719	Flush (acid/neutral), lots of moss, bog asphodel, cottongrass and adder's-tongue fern, surrounded by soft and compact rush, marsh orchids and heath bedstraw. Flush is within acid grassland.	12.2k
TN194	NN 74491 69830	Valley mire area by underpass and along bottom of slope includes cross-leaved heath (wetter areas), star sedge, carnation sedge, purple moor-grass, bog asphodel, round-leaved sundew, sphagnum sp., bog pondweed, cottongrass, heath rush, marsh violet, soft-rush and scabious sp. Small watercourse within field is quite shallow with pebbles and small fish and has potential for use by otters.	12.2k
TN195	NN 74268 69968	Narrow channel running through acid grassland with a marshy grassland strip either side. Marshy grassland includes sneezewort, quaking-grass, purple moor-grass, bog-myrtle, harebell, thyme, cross-leaved heath, deergrass, sundew, sphagnum and bog asphodel.	12.2k
TN197	NN 73907 70138	Dead deer stag. Dragonfly and butterflies see - good invertebrate habitat. Mire with wet channels running through containing species such as bog-myrtle, purple moor-grass, bog asphodel and bog pondweed.	12.2k
TN198	NN 7360870113	Acid grassland dominated by purple moor-grass. Fungi are present within the sward and a dry stone wall is present.	12.2k
TN199	NN 73697 69984	Alder and birch are present with fallen wood and woody debris.	12.2k
TN200	NN 73714 70080	Acid grassland beneath scattered birch. Dominated by sphagnum with abundant fescues and frequent tormentil and heath bedstraw, occasional heath speedwell and rare occurrences of marsh violet.	12.2k
TN201	NN 73879 69926	Acid grassland and heather. Fescues dominate this habitat with abundant sphagnum, false oat-grass, ribwort and locally abundant lady's bedstraw. Tormentil, heather, cock's-foot, yarrow and purple moor-grass are frequent with occasional common bird's-foot-trefoil, sheep's sorrel and heath wood-rush and rare occurrences of field gentian, cross-leaved heath, marsh thistle and harebell.	12.2k
TN203	NN 73242 70251	Wet acid heath grassland mosaic. Dominated by heather and cross-leaved heath with abundant sphagnum. False oat-grass dominates the grassland with frequent fescues and occasional cock's-foot and Yorkshire-fog.	12.2k
TN205	NN 73477 70201	Hay meadow grasses present include sweet vernal-grass, crested dog's-tail, yellow-rattle, false oat-grass, bird's-foot-trefoil, eyebright, white clover, creeping thistle. Water course flows over rocky substrate relatively fast flowing 4m-1m wide. Golden-ringed dragonfly seen flying up and down. Lots of chub-like fish. Little or no vegetation in water course.	12.2k


Target Note Reference	Grid Reference	Description	Figure Reference
TN207	NN 73453 70282	Small river running over rocky bed with very small water falls. Banks are quite steep but rocky in places. Too small to map. Some gabion basket defences put in. Banks on north side of feature contain neutral grassland species. Sweet vernal-grass is dominant with abundant Yorkshire-fog, frequent oat-grass, ragwort and creeping thistle with occasional bent sp. and selfheal and rare occurrences of sheep's sorrel and spear thistle.	12.2k
TN208	NN 73488 70215	Grassland dominated by fescues with abundant reflexed stonecrop and false oat-grass. Ribwort plantain and birch seedlings are frequent with occasional heath bedstraw, heather, bell heather and tormentil. Marsh thistle, meadowsweet, common knapweed and wild thyme are rare here. Wet dwarf shrub heath is present at the top of the bank dominated by heather with abundant fescues, sphagnum, ribwort plantain and frequent tormentil. This moves into acid grassland of similar species with abundant lady's bedstraw, frequent yarrow and bent sp. Wavy hair-grass, cock's-foot, Yorkshire-fog and creeping buttercup are occasional and there are rare occurrences of ragwort and germander speedwell.	12.2k

9 Phase 2 Habitat Survey


9.1.1 Target notes from Phase 2 habitat surveys are provided in Table 15 and shown on Figure 12.11.

Table 15: Jacobs Phase 2 habitat survey target notes


Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
J-TN01	South of existing A9 at Aldclune	NN 89472 64158	AWI Category 1a	<p>Fairly open coniferous plantation woodland with canopy dominated by Scots pine (A) and larch (A). Sitka spruce was locally dominant and wych elm and sycamore were also present. The understory generally consisted of willow, elder and rowan (all F), with some occasional silver and downy birch. Shrubs of broom, holly and bramble were present. The field layer was rich with wavy hair-grass (A), creeping soft-grass (A), bracken, male fern, wood sorrel, common dog-violet, lady's bedstraw and mosses (all F). Scattered species (O-R) included foxglove, common nettle, Herb-Robert, germander speedwell, glittering wood-moss, <i>Polytrichum</i> sp. and fungi. Areas of dominant Scots pine is considered an impoverished/species poor example of W18.</p> 	12.11b
J-TN02	Aldclune and Invervack Meadows SSSI at Essangal Bridge	NN 89181 64232	Broad-leaved semi-natural woodland	<p>Area surveyed as the extension to the existing Essangal Underbridge could result in permanent loss of SSSI habitat under the pier of the new structure. Furthermore, there may be a loss of SSSI habitat, mainly through shading and additional temporary loss of woodland at this site during the construction phase.</p> <p>Semi-natural broad-leaved woodland along the river banks, dominated by alder (A) with ash, bird cherry, elm, hawthorn and willow. Broom was also present. The ground flora was mainly grassy and species poor, but scattered species (O-R) included bloody crane's-bill, common knapweed, cow parsley, creeping buttercup, crosswort, false oat-grass, hedge woundwort, great wood-rush and quaking-grass.</p>	12.11c


Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
				 <p data-bbox="875 1010 2029 1106">Adjacent to the existing Essangal bridge and the Highland Main Line railway was an area of tall ruderal vegetation extending for approximately 50m (NN 89198 64243), comprising common nettle (F), creeping thistle (F), raspberry (F) with cock's-foot, common knapweed, crosswort, dog's mercury, false oat-grass, ground-elder, hedge woundwort, hogweed and Yorkshire-fog.</p>	


Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
				 <p data-bbox="875 1018 1989 1062">Shingle areas adjacent to the River Garry were largely free of vegetation, but bladder campion (R), columbine (R) and restharrow (R) were recorded.</p>	


Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
				 <p>The habitat recorded above is not what the SSSI is designated for; <i>Lowland calcareous grassland</i>. A National Vegetation Classification (NVC) survey was therefore not undertaken.</p>	
J-TN03	Tulach Hill and Glen Fender Meadows SAC and Tulach Hill SSSI	NN 86994 64706	Basic flush	<p>Area surveyed due to potential for drawdown effects of a potential Groundwater Dependent Terrestrial Ecosystem (GWDTE) site.</p> <p>Series of small springs and associated flushes creating tufa-forming habitat of approximately 5m x 30m. Surrounding this and extending up and down slope, and along the watercourses, is purple moor-grass/quaking-grass grassland. The flush area is connected by a small watercourse to small springs higher up the slope. Cock's-foot, common butterwort, common cottongrass, common sedge, devil's-bit scabious, glaucous sedge, grass-of-Parnassus, harebell, heather, jointed rush, ribwort plantain and yellow saxifrage were also recorded. The moss <i>Palustriella commutata</i> was present around the spring heads.</p> <p>See GWDTE site CF01 in Table 16 for more details.</p>	12.11d
J-TN04	Tulach Hill and Glen Fender Meadows SAC and Tulach Hill SSSI Tulach Hill	NN 87003 64787	Semi-improved neutral grassland (transition to calcareous grassland)	<p>Area surveyed due to potential for drawdown effects of a potential GWDTE site.</p> <p>The corner of Tulach Hill is more semi-improved, to less improved and bare in places due to the influence of beech trees. The grassland becomes less improved upslope. Common nettle, creeping thistle, and false oat-grass were all locally abundant. The grass was very dense in places with a lack of herb species, but a few tree seedlings (birch). Cock's-foot, fescue, wavy hair-grass and Yorkshire-fog were also present. The following species were rare, becoming less so upslope: bitter-vetch, common bird's-foot-trefoil, common mouse-ear, common ragwort, common rock-rose, common sorrel,</p>	12.11d

Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
				germander speedwell, harebell, hawthorn, heath bedstraw, lady's bedstraw, lady's-mantle, meadow buttercup, meadowsweet, sweet vernal-grass, thyme, tormentil, violet sp., white clover and yarrow. Dog's mercury was very local under the trees (boundary wall). Higher up the slope, the grass is less dense, herb species increase and purple moor-grass and quaking-grass become common. It was concluded that this site would not be affected by the proposed scheme and therefore a NVC survey was not undertaken.	
J-TN05	River Tay SAC	NN 83222 65560	Broadleaved woodland	Area surveyed due to permanent SAC habitat loss as part of the proposed scheme. Mix of tree species along the water's edge; bird cherry, ash, alder, rowan, hazel, common knapweed, great woodrush, common dog-violet, harebell, goldenrod, lady's bedstraw, devil's-bit scabious, wood sorrel, false oat-grass, Yorkshire-fog, germander speedwell, heather, goat willow, wood avens, common ragwort, sycamore, harebell, meadowsweet and meadow crane's-bill. A NVC survey was not undertaken as the area was too small.	12.11e/f
J-TN06	South of existing A9 at Tomban	NN 83262 65438	AWI Category 2a	Area surveyed due to permanent loss of verified AWI habitat as part of the proposed scheme. Very grassy ground-flora with evidence of grazing. Yorkshire-fog abundant, but also <i>Poa</i> species (<i>pratensis</i> , <i>trivialis</i>) Herb count low; includes creeping buttercup, marsh thistle, lesser spearwort, common dog-violet, meadow buttercup, heath bedstraw, harebell, germander speedwell, common ragwort, tormentil, <i>Polytrichum commune</i> (moss). Tree species present include silver birch (D), rowan (O) and alder (R). Hard fern (O) is also present. Coniferous trees are present along roadside edge with some invasion into woodland area. Bracken was not a feature. Outwith the woodland area are pockets of damp grassland with species such as devil's bit scabious, quaking grass, sneezewort, marsh thistle and very occasionally <i>Sphagnum</i> . Ground flora within the woodland was much less diverse. The woodland would be W11 (<i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland)/W17 (<i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Dicranum majus</i> woodland). The habitat was considered to be of a reasonable quality, especially as the grasslands outside the woodland areas are more species rich.	12.11e/f

Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
					
J-TN07	Aldclune and Invervack Meadows SSSI	NN 83125 65563	Broadleaved woodland	<p>Area surveyed due to permanent SAC habitat loss as part of the proposed scheme.</p> <p>Ash and alder with poor ground flora. Cock's-foot, Yorkshire-fog, creeping buttercup, common nipplewort, selfheal, hawthorn, common sorrel, blackthorn, germander speedwell, silver birch, wood sorrel, woundwort, rowan, dog's-mercury, common nettle, hazel, wood avens, marsh marigold (VL), meadow buttercup, common chickweed, common dog-violet.</p> <p>The habitat recorded above is not what the SSSI is designated for; <i>Lowland calcareous grassland</i>. A National Vegetation Classification (NVC) survey was therefore not undertaken.</p>	12.11e/f
J-TN08	Either side of access track to Pitaldonich Farm, south of existing A9.	NN 83053 65499	AWI Category 1a	<p>Area surveyed due to permanent loss of verified AWI habitat as part of the proposed scheme.</p> <p>Very grassy ground-flora with evidence of grazing. Tree species present include silver birch, rowan, and alder. The ground flora is not species rich.</p> <p>The woodland would be W11 (<i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland).</p>	12.11e/f
J-TN09	Calvine	NN 81608 65698	Unimproved acid grassland	<p>This area was visited as it was observed to be of botanical importance during a survey of an adjacent potential GWDTE site and would be lost as a result of the proposed scheme.</p> <p>Scattered patches of unimproved acid grassland on rocky outcrops in agriculturally improved grazed grassland. Eyebright, germander speedwell, devil's-bit scabious, petty whin, goat's-beard, tormentil, violet sp., heath speedwell, heath bedstraw, wild thyme, heather and common centaury present. Field gentian also recorded (R).</p> <p>A NVC survey was not undertaken as the area was too small.</p>	12.11f
J-TN10	West of Clunes Wood, north of	NN 78669 66876	AWI Category 2a	<p>Area surveyed due to permanent loss of verified AWI habitat as part of the proposed scheme.</p> <p>Quite open scattered woodland with mainly silver birch and some alder, especially in damper areas. Bracken dominates the ground flora later in the season, but the area is mainly grassy before that with little obvious heath vegetation except at</p>	12.11h

Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
	existing A9			<p>the edges, particularly the uphill edge where there is more vegetation nearby. Occasional ash and rowan also present. The woodland would be W11 (<i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland)/W17 (<i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Dicranum majus</i> woodland); more W11, but some heath habitat hints at W17. Some small areas of <i>Myrica gale</i> higher up in wetter areas, but very scattered.</p> <p>Soil unlikely to be re-used from this location due to large amounts of bracken.</p> <p>The area within the existing highway boundary was not surveyed.</p> 	
J-TN11	South-east of Clunes Lodge, south of existing A9	NN 78583 66841	AWI Category 2a	<p>Area surveyed due to permanent loss of verified AWI habitat as part of the proposed scheme.</p> <p>Woodland on west-facing slope with open canopy dominated by silver birch, and scarce downy birch, rowan and goat willow. Bracken dominates the ground flora, interspersed with grassland comprised primarily of common bent, wavy hair-grass, sweet vernal-grass, Yorkshire-fog and cock's-foot; but a variety of flowering plants were present including lady's bedstraw, tormentil, daisy, germander speedwell, and yarrow. Local wetter areas floral communities included bog-myrtle and cross-leaved heath.</p> <p>The woodland would be W16 (<i>Quercus</i> spp. – <i>Betula</i> spp. – <i>Deschampsia flexuosa</i> woodland).</p> <p>Soil unlikely to be re-used from this location due to large amounts of bracken.</p>	12.11h

Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
					
J-TN12	North-west/west of Clunes Lodge, south of existing A9	NN 78090 67184	AWI Category 2a	<p>Area surveyed due to permanent loss of verified AWI habitat as part of the proposed scheme.</p> <p>The area was predominantly sloping neutral grassland with localised pockets of scattered broadleaved trees and shrubs, consisting of downy birch (A), goat willow (A), broom and bog-myrtle. Grasses included Yorkshire-fog, purple moor-grass and sweet vernal-grass (all F), with scattered (O) meadow oat-grass and rough meadow-grass. Lady's bedstraw, devil's-bit-scabious, tormentil, viola sp., yarrow, sheep's sorrel, black knapweed, ribwort plantain, daisy and common ragwort were frequent. Other species present (O-R) included marsh thistle, creeping thistle, greater stitchwort, selfheal, sneezewort, eyebright, common bird's-foot-trefoil, lady's-mantle and harebell. Woodland exhibited some of the characteristics of W4.</p> <p>Wetter patches of heath at the bottom of the slope to the south east included cross-leaved heath, heather, purple moor-grass, butterwort, bog asphodel, bog-myrtle, quaking-grass, sphagnum, round-leaved sundew and rush sp. This area transitioned to dry heath higher up the slope, where bell heather and heather were dominant.</p> <p>A strip of deciduous plantation woodland, consisting of birch and willow species, lined the north eastern edge of the survey area.</p>	12.11h
J-TN13	North-west of Clunes Lodge, north of existing A9	NN 77956 67425	AWI Category 2a	<p>Area surveyed due to permanent loss of verified AWI habitat as part of the proposed scheme.</p> <p>Open scattered woodland consisting mainly of silver birch and some alder. Large areas of bracken understorey, with some localised wetter areas and some agriculturally improved grasslands. Some areas have been grazed.</p> <p>The habitat is very grassy and generally herb poor (common species not withstanding). Little or no heath species (dwarf shrubs).</p>	12.11h

Jacobs Target Note Reference	Location	Grid Reference	Habitat	Description	Figure Reference
J-TN14	Glen Garry, south of existing A9	NN 77595 67560	AWI Category 2a	<p>Area surveyed due to permanent loss of verified AWI habitat as part of the proposed scheme.</p> <p>The area was predominantly sloping neutral grassland with localised pockets of scattered broadleaved trees, consisting of downy birch (A) and goat willow (A). A strip of deciduous plantation woodland, consisting of birch and willow species, also lined the north eastern edge of the survey area. Broom and bog-myrtle were locally frequent, as were patches of tall ruderals including rosebay willow herb and nettle. Grasses were predominantly (A-F) cock's-foot, common bent, false oat-grass and Yorkshire-fog and purple moor-grass was also locally frequent. Knapweed and bracken were locally abundant and frequent species included creeping thistle, yarrow, tormentil, lady's bedstraw, bird's-foot-trefoil, speedwell, eyebright, ribwort plantain, ragwort, red clover, vetch sp.(LF) and harebell (LF).</p> 	12.11h

10 Groundwater Dependent Terrestrial Ecosystem Survey

10.1.1 Four GWDTE sites within the study area were assessed in Chapter 10 (Geology, Soils, Contaminated Land and Groundwater) as being impacted by the proposed scheme (Table 16).

Table 16: Details of GWDTE sites that could be impacted by the proposed scheme

GWDTE (reference from Chapter 10)	Grid Reference	Description
CF01	NN 86992 64712	Calcareous spring/flush. The vegetation was assessed as being M37 <i>Cratoneuron commutatum-Festuca rubra</i> spring and M10 <i>Carex dioica-Pinguicula vulgaris</i> mire transitioning into a purple moor-grass (<i>Molinia caerulea</i>)/quaking grass (<i>Briza media</i>) grassland with affinities to M26 <i>Molinia caerulea-Crepis paludosa</i> mire (Rodwell, 1991; Averis et al., 2014). The site falls within the Tulach Hill and Glen Fender Meadows SAC and Tulach Hill SSSI. Base-rich fens are one of the qualifying interests of the SAC. The habitat occurs in a complex topography, with drier and wetter habitats and well-developed zonation comprising mainly M10, with some M9 <i>Carex rostrata-Calliergon cuspidatum/giganteum</i> mire and M11 <i>Carex demissa-Saxifraga aizoides</i> mire (SNH, 2016). The M10 mire type identified at the spring/flush generally occurs as elongated or oval patches often in vertical strips running downslope from lines of springs, and the feature is therefore typical of the mire type and a feature of the SAC.
TN160-162	NN 78161 67341	The area is mainly bracken and semi-improved acid grassland with localised acid flushes (M6 <i>Carex echinata-Sphagnum fallax/denticulatum</i> mire) associated with small watercourses and seepage lines. M6 mires are common in upland areas and are the most widespread soligenous mires in the British uplands (Rodwell, 1991; Averis et al., 2014).
ANF02	NN 75210 69703	A small area of M25 <i>Molinia caerulea-Potentilla erecta</i> mire within a shallow linear depression. The habitat occurs throughout the western uplands and can be extensive in parts, and is often the result of woodland clearance, or the agricultural improvement of wet heath and blanket bog (Rodwell, 1991; Averis et al., 2014).
TN190-193	NN 74729 69730	The area was mainly M23 <i>Juncus effusus-acutiflorus-Galium palustre</i> rush pasture occurring as a narrow stand alongside two modified watercourses. M23 is widespread and extremely common across parts of western Britain. Almost all M23 is understood to be derived from woodland or scrub (Rodwell, 1991; Averis et al., 2014).

11 Invasive Non-native Species

11.1.1 Five invasive non-native species (INNS) were recorded in the study area (Table 17).

Table 17: INNS recorded within the study area

Species	Grid Reference	Description
Japanese knotweed	NN 91799 62329	Japanese knotweed by roadside opposite cottage.
Japanese knotweed	NN 91736 62972	Large stand of Japanese knotweed upstream of the existing A9.
Rhododendron	NN 91616 62747	Rhododendron spreading from managed garden on embankment by bend in B8079 road.
Rhododendron	NN 90841 63491	Rhododendron spreading from gardens to pond and woodland.
Monkeyflower	NN 84923 65287	Invasive species monkeyflower present.
Monkeyflower	NN 85016 65243	Invasive species monkeyflower present.
Monkeyflower	NN 83584 65396	Invasive species monkeyflower present.
Monkeyflower	NN 74773 69719	Monkeyflower is abundant along the flush.
Snowberry	NN 91762 62894	Snowberry (probably self-seeded) established in nearby scrub.
Snowberry	NN 91730 62857	Snowberry on scrubby woodland edge by culvert. Likely to have spread from field below where probably planted.
Snowberry	NN 88393 64309	Snowberry in former garden (abandoned), snowberry stretches for approximately 25m and is 3 - 5m in depth.
American mink	NN 89057 64274	Mink prints recorded along the River Garry under the existing A9.

12 Aquatic Analysis Methods

Watercourse Condition

- 12.1.1 The Water Framework Directive (WFD) classification does not place a value (or importance) on watercourses as such; rather it qualifies a deviation from reference or pristine condition due to environmental stress. That means a minor watercourse that is exceeding its predicted quality (based upon a suite of physically and biologically similar reference sites) can be classified as High status, without supporting habitat or species of importance. Whilst a minor watercourse may be an excellent example of that watercourse type, the classification/status does not infer any environmental value other than the absence of environmental stress.

Macroinvertebrates

- 12.1.2 The following macroinvertebrate metrics were calculated for each site: WFD classification; Whalley, Hawkes, Paisley and Trigg (WHPT) metric; Biological Monitoring Working Party (BMWP); Number of Scoring Taxa (NTAXA); Average Score Per Taxon (ASPT); Lotic Invertebrate Index for Flow Evaluation (LIFE); Proportion of Sediment-Sensitive Invertebrates (PSI); and Community Conservation Index (CCI). Descriptions of these metrics are given below.

WFD Classification

- 12.1.3 An ecological status class of High, Good, Moderate, Poor or Bad is calculated for the macroinvertebrate biological quality element in surface waters using the WFD-compliant River Invertebrate Classification Tool (RICT) (WFD-UKTAG, 2014a). Environmental characteristics recorded during the field survey, macroinvertebrate metric data and other site data including water chemistry, distance to source and altitude are used to assign each site to a class (WFD-UKTAG, 2014a). The observed macroinvertebrate community is compared to that expected from a watercourse in reference condition and the variance between the observed and expected determines the ecological status. Macroinvertebrate metrics were calculated using the WHPT method which replaces the formerly used BMWP method (WFD-UKTAG, 2014a). Two metrics, the ASPT and number of taxa contributing to the assessment (NTAXA), were calculated using the WHPT method in RICT and were used to classify the site. The metrics calculated by RICT are not appropriate for artificial water bodies, non-flowing or ephemeral water bodies (such as ditches) or sites located within 2.5km of their source.

BMWP and Derived Metrics

- 12.1.4 BMWP score and its derived metrics are no longer used for WFD classification, but are still valid measures of the impact of organic pollution and general degradation on macroinvertebrate communities (Hawkes, 1997). To calculate the score, each macroinvertebrate family present in a sample is assigned a score from one to ten, depending on their tolerance to pollution (low scores are given to pollution-tolerant taxa). The BMWP score is the sum of all the scoring families present in a given sample. The BMWP score is divided by the number of macroinvertebrate families present in the sample (NTAXA) to give the ASPT. Higher BMWP and ASPT scores indicate increased sensitivity to pollution. ASPT is considered a more stable and reliable measure of pollution than BMWP because it describes the tolerance of the families collected in each individual sample whereas BMWP scores can be low at sites with low NTAXA, even if the taxa collected all belonged to pollution-intolerant families. No formal interpretations exist for these metrics, but BMWP scores greater than 100 and ASPT scores greater than 6.0 are considered to represent good quality macroinvertebrate communities.

LIFE

- 12.1.5 Freshwater macroinvertebrates have specific requirements for flow conditions and can be used to determine not only predominant flow types (Extence et al., 1999) but also changes in flow character. The LIFE metric uses abundance data to assign a flow preference score to macroinvertebrate families present in a sample and an overall score for the site can be interpreted as an abundance-weighted average-score-per-taxon metric. The family-level LIFE score is also calculated in RICT as a ratio of the observed/expected at reference sites (O/E) for the sample. The metrics calculated by RICT are not appropriate for artificial water bodies, non-flowing or ephemeral water bodies (such as ditches), so

O/E scores were not calculated for these sites (WFD-UKTAG, 2014a). A LIFE O/E score of 0.93 or greater suggests that a site is not subject to flow-related stress (Clark et al., 2003).

PSI

12.1.6 The PSI metric aims to act as a proxy for the quantity of fine sediment at a site (Extence et al., 2011). Macroinvertebrate species are assigned a fine sediment sensitivity rating that ranges from highly insensitive to highly sensitive to fine sediment. The PSI score is calculated as the percentage of sensitive taxa in the sample (Table 18).

Table 18: Interpretation of PSI scores

PSI Score	Description
81-100	Minimally sedimented/Unsedimented
61-80	Slightly sedimented
41-60	Moderately sedimented
21-40	Sedimented
0-20	Heavily sedimented

CCI

12.1.7 The CCI metric represents the national rarity and diversity of species identified within a site and designates a conservation value to the sampled community (Chadd & Extence, 2004). A conservation score (CS) is applied to each species based upon its national rarity. The CCI is calculated from the sum of conservation scores divided by the number of contributing species to obtain the mean value. This is then multiplied by the community score (CoS), derived either from the rarest taxon present or the BMWP score. CCI scores are assigned into conservation classes; the class boundaries and descriptions are given in Table 19. CCI scores and classes can be adjusted to take into account local conditions. For example, a species may be nationally scarce but relatively common in a particular location, and vice versa.

Table 19: CCI score classifications (Chadd & Extence, 2004)

Conservation Class	Score	Description
Low	< 5.0	Sites supporting only common species and/or low taxon richness.
Moderate	>5.0 – 10.0	Sites supporting at least one species with limited distribution and/or moderate taxon richness.
Fairly High	>10.0 – 15.0	Site supporting at least one uncommon species or several of limited distribution and/or high taxon richness.
High	>15.0 – 20.0	Site supporting several uncommon species, one of which may be nationally rare and/or high taxon richness.
Very High	>20.0	Site supporting several rare species and/or very high taxon richness.

Macrophytes

12.1.8 Macrophytes are the larger photosynthetic organisms that can be seen with the naked eye. This definition includes vascular plants, bryophytes, stoneworts and macro-algae (WFD-UKTAG, 2014b). Macrophyte assessment involved compiling macrophyte species lists and taxon cover values (TCVs, Table 20) from a 100m reach of the watercourse. During these surveys, field data detailing the physical characteristics of each sample site were collected including location, width, depth, substrate, habitats (for example pools and riffles), shading, water clarity and bed stability. The overall coverage of macrophytes and algae was also recorded. The hydrophyte (i.e. truly aquatic) macrophyte species collected are assigned a value according to its tolerance to nutrients and is assigned to one of 23 function groups. These data are used to calculate the following metrics:

- River Macrophyte Nutrient Index (RMNI): measure of nutrient enrichment at the site. Values range from 1 to 10, with high scores assigned to nutrient-tolerant taxa (Wilby et al., 2012).
- Number of macrophyte taxa (NTAXA): number of truly aquatic taxa observed in the survey.
- Number of functional groups (NFG): measures the functional diversity at the site.

- Cover of green filamentous algae (ALG): percentage cover of green filamentous algae observed over the whole of the survey reach.

Table 20: Taxon Cover Values

TCV	Percentage Cover
1	<0.1%
2	0.1 to 1%
3	1 to 2.5%
4	2.5% to 5%
5	5 to 10%
6	10 to 25%
7	25 to 50%
8	50 to 75%
9	>75%

12.1.9 The standard WFD assessment tool, LEAFPACS2, uses macrophyte and environmental data to assess the condition of flowing watercourses according to WFD requirements (WFD-UKTAG, 2014b). LEAFPACS2 can also be used to indicate eutrophication of a watercourse as the analysis method targets the extent and impact of elevated levels of nutrients. An ecological quality ratio (EQR) was calculated for each of the above metrics as well as for the site as a whole. The EQR is the ratio of the observed conditions at the site to those expected in reference (i.e. high quality or pristine) conditions. The EQR ranges from zero to one, with one indicating that the observed conditions are equal to reference conditions. A WFD classification of High, Good, Moderate, Poor or Bad is also assigned to the site, as well as a measure of the confidence of the classification.

Predictive System for Multimetrics (PSYM)

- 12.1.10 The PSYM method compares the results for a pond against expected values based on the physical characteristics. Metrics used to compare with expected values in order to obtain final score are, for macrophytes: number of submerged and marginal plant species; number of uncommon plant species; and Trophic Ranking Score (TRS). Metrics for macroinvertebrates are: ASPT as described in paragraph 12.1.4; number of Odonata and Megaloptera Families (OM); and number of Coleoptera families (CO). Ecological Quality Indices (EQI), the ratio between the observed and expected values, are calculated for each metric as a measure of how close they are to the minimally impacted baseline condition.
- 12.1.11 The pond scores an Index of Biotic Integrity (IBI) based on the macrophyte and macroinvertebrate data which was used to determine the PSYM quality category. The following IBI ranges were used: IBI >75%=Good, 51-75%= Moderate, 25-50%=Poor and <25%=Very Poor.

13 Aquatic Survey Results

Aquatic Habitats

- 13.1.1 Relevant notes from the aquatic walkover surveys undertaken in 2015 by Jacobs are provided in Table 21 below.

Table 21: Watercourse characterisations based on aquatic walkover surveys

Water Feature	Grid Reference	Description	Similar Water Features
Allt Eachainn	NN 91903 62501	Medium sized watercourse on steep hillside. Consists of fast flowing waterfalls and cascades over bedrock. Not accessible to migratory species.	n/a
WF188	NN 91901 62568	Small watercourses formed by wet field/bog drainage. No distinct channel in places and not directly connected to any larger watercourses.	WF85 - NN 91871 62678 WF90 - NN 91450 63241 WF91 - NN 91248 63469 WF95 - NN 90736 63692

Water Feature	Grid Reference	Description	Similar Water Features
WF87	NN 91736 62972	Watercourse up to 3m wide, with variable depth. Steep bedrock cascade and waterfall downstream of Killiecrankie into the River Garry. Upstream of Killiecrankie the watercourse is gently sloping with a waterfall approximately 100m upstream of A9. Upstream of Killiecrankie is mainly cobble and gravel substrate although A9 culvert is approximately 40m long with concrete substrate. Large stand of Japanese knotweed upstream of A9.	n/a
Allt Girnaig	NN 91577 63114	Large watercourse in steep gorge. Fast flowing torrents and run over bedrock substrate. Gradient levels out downstream and substrate becomes cobble dominated.	n/a
WF94 WF94A	NN 90738 63552	Artificial pond fenced off in a pheasant pen and flowing into an ornamental pond (94A) supporting wildfowl.	n/a
WF96A	NN 90506 63711	Pond within broadleaved woodland. Silt and organic matter substrate, heavily shaded.	n/a
WF96	NN 90532 63897	Very small channel, 20cm wide with 10cm water. Draining down the wooded hillside into pond 96A.	n/a
Allt Chluain	NN 89981 63938	Medium size watercourse in small gorge. Cascade dominated high velocity flows over mixed substrate. Not suitable for most fish species.	n/a
Essangal Burn	NN 89078 64222	Small watercourse, 0.5m wide and 10cm deep, flowing along the edge of a rough pasture field. Flows directly into the Garry. Not suitable for protected species.	n/a
River Garry (100A)	NN 89075 64261	Large watercourse. The wetted channel is around 40m wide at this point with the actual channel bed extending to 80m. Cobble and gravel deposition downstream of the crossing has resulted in a faster flowing section of turbulent water on the right. The substrate is predominantly cobble but is obscured in the deeper section. Suitable habitat for protected species.	River Garry (100B) - NN 87255 64879 River Garry (100C) - NN 85135 65329 River Garry (100D) - NN 83703 65624
WF101	NN 88380 64370	Small watercourse flowing out of Sheirglass Quarry directly into River Garry. Not suitable for fish.	n/a
WF103	NN 87056 64811	Small watercourse generally 1.5-2m wide and 10-20cm deep. Flowing through a mixture of woodland and rough pasture. Mostly gravel/pebble dominated substrate. Good macroinvertebrate habitat but limited fish habitat. Mostly inaccessible to migratory species. Several similar watercourses in the area.	WF92 - NN 90965 63509 WF102 - NN 87302 64808 WF104 - NN 87006 64932 WF105 - NN 86928 64969 WF106 - NN 86710 65190 WF107 - NN 86542 65181 WF108 - NN 86116 65218 WF109 - NN 85964 65212 WF110 - NN 85581 65212 WF111 - NN 85435 65190 WF112 - NN 85186 65209 WF113 - NN 85019 65259 WF114 - NN 84925 65295 WF116 - NN 84219 65686 WF117 - NN 83809 65637 WF118 - NN 83595 65525 WF189 - NN 83310 65449 WF121 - NN 83088 65523
Allt Bhaic	NN 84555 65618	Medium size watercourse, 4m wide and 30cm deep, flowing through improved pasture with very little gradient. Run and riffle flow types over cobble/gravel substrate. Flows directly into River Garry. Accessible and suitable for protected species.	n/a
River Bruar	NN 82277 66043	Large size watercourse, 15m wide and around 0.5m deep. Fast-flowing over bedrock and boulder substrate. Not crossed by the A9 but flows directly	n/a

Water Feature	Grid Reference	Description	Similar Water Features
		into River Garry.	
River Garry (100E)	NN 82573 65783	At this point the River Garry is approximately 30m wide and around 0.5m deep. The substrate is predominantly cobble and areas of deposition are present on the right side of the channel indicating a dynamic channel. The habitat here is suitable for salmonid fry and parr.	n/a
WF127 WF125	NN 81682 65730 NN 81980 65816	Small watercourses, less than 1m wide and 20cm deep flowing through moorland/heath upstream of the A9 and rough pasture downstream, flowing directly into the River Garry. Provide macroinvertebrate habitat but not suitable for most fish species. Characteristic of several watercourses in the area.	n/a
WF136	NN 80280 65883	Small watercourse, approximately 0.5m wide and 20cm deep, flowing through moorland/heath upstream of the A9 and woodland downstream. The steep gradient where the watercourse flows into the River Garry makes this watercourse inaccessible to fish species. This watercourse is characteristic of several watercourses in the area.	WF132 - NN 80533 65869 WF134 - NN 80420 65892 WF137 - NN 80136 65895 WF138 - NN 80019 65904 WF139 - NN 79695 66037 WF140 - NN 79406 66190 WF141 - NN 79163 66323 WF143 - NN 78835 66668 WF144 - NN 78553 66827 WF145 - NN 78289 67013 WF147 - NN 78080 67243 WF153 - NN 77024 68738
Allt a'Chrombaidh	NN 78934 66556	Medium size watercourse, 2m wide and 1m deep. Series of cascades, pools and torrents over bedrock substrate. Not suitable for fish species.	n/a
River Garry (100F)	NN 78892 66521	Large watercourse, up to 30m wide with variable depth and flow type. Fast-flowing over a predominantly bedrock substrate and steep bedrock banks. Small areas of habitat suitable for fish.	n/a
WF148	NN 77893 67366	Small ephemeral watercourse in concrete or silt/organic channel overgrown by terrestrial grasses. Flows into a larger watercourse.	WF124 - NN 82085 65817 WF152 - NN 77094 68632 WF163 - NN 73710 70047
Allt nan Cuinneag	NN 77853 67482	Medium size watercourse, 2m wide with an average depth of 30cm. Predominantly cascade over a bedrock substrate. Flows directly into River Garry. Only very bottom of reach is suitable and accessible for fish species.	n/a
WF151	NN 77133 68298	Small concrete channel upstream of A9, downstream of A9 is a small (0.4m wide and 15cm deep), natural channel with cobble and pebble substrate. Flowing through woodland on both sides of the A9, with a steep drop into the River Garry.	n/a
Allt Crom Bhruthaich	NN 76967 68929	Medium size watercourse, 3m wide and 25cm average depth. Flows through a gorge in a series of steep cascades and run over a bedrock and boulder substrate. Not suitable or accessible for fish species.	n/a
WF154	NN 76640 68956	Small watercourse, averaging less than 1m wide and 10cm deep. Running through moorland upstream of the A9 and rough pasture downstream, with a section of steep bedrock/scree between the A9 and B-road. Flowing into the River Garry but inaccessible for fish.	WF155 - NN 76357 69159 WF156 - NN 76075 69386 WF157 - NN 75841 69479 WF129 - NN 81069 65684 WF129A - NN 81242 65743
Allt Anndeir	NN 75512 69607	Relatively large watercourse, 6m wide with variable depth averaging 20cm. Upstream of the A9 is steep torrents and cascade over bedrock whereas downstream is slow flowing riffle over cobble substrate with little gradient. Flows directly into the River Garry and the downstream section is suitable and accessible to fish species.	n/a
WF159	NN 74612 69739	Small watercourse, 1.5m-2m wide and 20cm deep. Concrete drainage channel running parallel to A9 on	WF162 - NN 74666 69765

Water Feature	Grid Reference	Description	Similar Water Features
		upstream side. Downstream of the A9 the channel runs through rough pasture along the edge of conifer woodland. The substrate here is a mixture of cobble and gravel with some macrophytes, good habitat for juvenile fish.	
Allt Geallaidh	NN 73487 70189	Medium size watercourse, 4.5m wide and 15cm deep. Run/riffle flows over cobble substrate with little gradient. Flows directly into River Garry and is suitable/accessible for fish species.	n/a

Aquatic Habitat Evaluation

- 13.1.2 Each water feature, with the exception of the ponds, was given an ecological value determined by the presence and accessibility of habitat and resources for the qualifying species of the River Tay SAC (see Tables 12.4 and 12.5 in Chapter 12 for criteria). These classifications are displayed on Figure 12.13. Six sites, five on the River Garry and one on Allt Bhaic, were classified as excellent due to the presence of accessible habitat suitable for a variety of life stages of the qualifying species. Unnamed watercourse 121 was classified as good due to the presence of accessible lamprey habitat while the River Bruar, Allt Anndeir, unnamed watercourse 159, Allt Geallaidh and one site on the River Garry were classified as good due to the presence of salmonid habitat, although accessibility may be limited. Thirty-eight sites were classified as moderate as they generally contain limited habitat for the qualifying species but are likely to provide a macroinvertebrate food source. The remaining 22 sites, including Allt Eachainn, were classified as poor as they are mostly inaccessible and contain little habitat for fish or macroinvertebrates.

Fish

- 13.1.3 No fish surveys were conducted therefore all assessments are based on desk based information, consultation responses and habitat surveys. Atlantic salmon are known to be present throughout the main stem of the River Tay and accessible tributaries including the River Tummel, River Tilt and River Garry (TDSFB, 2009). Until January 2017 the Struan Weir, on the River Garry at the confluence with the Errochty, was impassable for migratory species. In January 2017 this weir was breached as part of a plan to re-water the upper River Garry making it accessible to Atlantic salmon for the first time in 60 years. It is now considered that the Struan Weir is passable; however it may take several years for the population to fully re-colonise this section of river.
- 13.1.4 TDSFB have been stocking various watercourses within the Tay catchment since the 1980's. The information available from TDSFB annual reports is presented in Table 22 for watercourses within, or directly connected to, the study area.

Table 22: Number of eyed ova/un-fed fry reported in TDSFB annual reports (- indicates no data). Prior to 2015/2016 no differentiation was made between the River Garry above and below Struan Weir

Watercourse	Report 2008/2009	Report 2009/2010	Report 2010/2011	Report 2011/2012	Report 2012/2013	Report 2013/2014	Report 2014/2015	Report 2015/2016
River Tilt	280,000	300,000	95,000	50,000	72,000	89,000	-	85,550
Banvie Burn	80,000	50,000	15,000	55,000	-	-	-	-
Errochty Water	195,000	170,000	70,000	50,000	43,000	15,000	104,765	50,745
River Garry	-	-	150,000	245,000	212,000	391,000	308,593	-
River Garry (above Struan Weir)	-	-	-	-	-	-	-	214,863
River Garry (below Struan Weir)	-	-	-	-	-	-	-	74,093

Aquatic Macroinvertebrates

- 13.1.5 Aquatic macroinvertebrate surveys were conducted on 15 April 2015 and 19 November 2015. Field sampling, laboratory analysis and metric calculations were all in accordance with standard methodologies and published reports (see Section 8).
- 13.1.6 WFD classifications were calculated for ten of the 19 sites, seven on tributaries and three on the River Garry (Table 23). The remaining nine watercourses could not be classified because the macroinvertebrate survey site was within 2.5 km of the source. Most of the tributary classifications were High or Good, but Allt Anndeir received a Bad classification for the November sample and Allt Crom Bhruthaich received Moderate classifications for both samples. The classifications for the three River Garry sites varied from Bad to High, and the classification for only one of the four total River Garry samples collected agreed with the High classification that the river received from SEPA in 2015 for macroinvertebrates. The SEPA classification is based on samples collected in a different location from those sampled in April and November 2015, and these differences in habitats may explain the discrepancy between classifications.
- 13.1.7 BMWP scores exceeded 100 for many of the watercourses, indicating high quality and little impact from organic pollution (Table 23). The high ASPT scores at Allt Eachainn and River Garry (site 100B), which had low BMWP and NTAXA scores, indicated that although diversity was low in these watercourses, the taxa that were present were intolerant of organic pollution. Low BMWP and ASPT scores at the River Garry (site 100A) suggest that this reach of the River Garry may be impacted by organic pollution or general degradation.
- 13.1.8 The LIFE metrics were calculated for ten for the 19 sites, seven on tributaries and three on the River Garry (Table 23). The remaining nine watercourses could not be classified because the macroinvertebrate survey site was within 2.5 km of the source. LIFE O/E values were close to 1 for most of the watercourses, indicating that these sites are not flow-stressed and are characteristic of reference conditions. The LIFE O/E value for Allt Crom Bhruthaich (November) was just below the threshold of 0.93, indicating that flow may be a stressor on the macroinvertebrate community in this watercourse. However, the April O/E value in Allt Crom Bhruthaich was above the threshold, and survey notes indicate that this watercourse was flowing at the time of sampling; therefore Allt Crom Bhruthaich is likely not experiencing substantial flow stress.
- 13.1.9 PSI scores indicated that most sites were slightly or minimally impacted by fine sediments, although the April sample from WF136 and November samples from WF116 and Allt Crom Bhruthaich showed moderate sedimentation (Table 23).
- 13.1.10 CCI scores exceeded 10.0 at most sites in at least one season, indicating Fairly High or High conservation value (Table 23). The CCI scores at WF103, WF116 and WF121 all indicated Low conservation value in November, but Moderate or better conservation value in April. Macroinvertebrates emerge from watercourses in different seasons, so the lower scores received in November could indicate that species with high conservation value emerged between the April and November sampling. Species of conservation interest, including the Notable stonefly, *Nemoura dubitans*, and other Regionally Notable species of stonefly, caddisfly and beetle were widely distributed in watercourses sampled in the study area (Table 23).

Table 23: Summary of macroinvertebrate environmental data and metrics calculated based on the April and November surveys (n/c = none collected)

Site Name	Month	Temperature (°C)	Dissolved Oxygen (%)	Conductivity (µS)	WFD Class	BMWP	NTAXA	ASPT	LIFE (O/E)	PSI Score	CCI Score	CCI Class	CCI Species of Conservation Interest (CS ≥ 6)
Allt Eachainn	Apr	6.5	104	74	High	84	12	7.0	1.07	100.0	11.0	Fairly High	n/c
Unnamed (WF87)	Apr	7.2	104	94	n/a	125	n/a	n/a	n/a	86.0	10.4	Fairly High	<i>Potamophylax rotundipennis</i>
	Nov	6.1	101	99	n/a	111	n/a	n/a	n/a	89.3	11.4	Fairly High	<i>Protonemura meyeri</i>
Allt Girnaig	Apr	6.6	106	82	High	122	17	7.2	1.02	90.5	13.1	Fairly High	<i>Protonemura meyeri</i>
	Nov	5.5	101	83	Good	81	13	6.23	0.95	91.7	12.0	Fairly High	<i>Protonemura meyeri</i>
River Garry (100A)	Apr	5.6	110	24	Moderate	48	9	5.3	0.95	91.7	15.0	Fairly High	<i>Oreodytes davisii</i>
Unnamed (WF103)	Apr	7.4	104	155	n/a	177	n/a	n/a	n/a	85.2	17.1	High	<i>Potamophylax rotundipennis, Protonemura meyeri</i>
	Nov	7.2	99	270	n/a	70	n/a	n/a	n/a	81.3	5.0	Low	n/c
River Garry (100B)	Apr	7.7*	106	33	Bad	38	6	6.3	0.93	100.0	8.8	Moderate	n/c
	Nov	5.8	99	54	High	81	12	6.75	1.00	100.0	12.2	Fairly High	<i>Potamophylax rotundipennis</i>
Unnamed (WF111)	Apr	7.5	104	168	n/a	154	n/a	n/a	n/a	91.5	13.7	Fairly High	n/c
	Nov	7.0	99	208	n/a	139	n/a	n/a	n/a	79.6	11.3	Fairly High	n/c
Allt Bhaic	Apr	9.8*	105	93	High	157	23	6.8	1.00	90.2	17.9	High	<i>Nemoura dubitans, Protonemura meyeri</i>
	Nov	6.0	101	94	High	90	14	6.43	1.03	96.6	5.5	Moderate	n/c
Unnamed (WF116)	Apr	11.5*	100	83	n/a	70	n/a	n/a	n/a	71.4	7.8	Moderate	n/c
	Nov	6.8	89	77	n/a	40	n/a	n/a	n/a	45.5	1.5	Low	n/c
Unnamed (WF121)	Apr	8.6*	102	45	n/a	82	n/a	n/a	n/a	63.0	13.6	Fairly High	<i>Potamophylax rotundipennis, Protonemura meyeri</i>
	Nov	6.6	99	47	n/a	72	n/a	n/a	n/a	84.2	5.0	Low	n/c
River Garry (100E)	Apr	8.1*	107	35	Good	80	12	6.7	0.96	86.4	10.0	Moderate	n/c
River Bruar	Apr	7.5*	106	18	High	77	11	7.0	1.02	94.1	10.7	Fairly High	n/c
	Nov	5.1	101	40	Good	121	19	6.37	0.98	91.1	11.8	Fairly High	<i>Potamophylax rotundipennis, Protonemura meyeri</i>
Unnamed (WF127)	Apr	10*	97	101	n/a	98	n/a	n/a	n/a	68.4	9.2	Moderate	n/c
	Nov	7.0	95	83	n/a	114	n/a	n/a	n/a	89.7	11.3	Fairly High	<i>Potamophylax rotundipennis, Protonemura meyeri</i>
Unnamed	Apr	7.0	101	163	n/a	78	n/a	n/a	n/a	60.0	10.0	Moderate	n/c

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Appendix A12.2: Baseline Data and Detailed Survey Methods



Site Name	Month	Temperature (°C)	Dissolved Oxygen (%)	Conductivity (µs)	WFD Class	BMWP	NTAXA	ASPT	LIFE (O/E)	PSI Score	CCI Score	CCI Class	CCI Species of Conservation Interest (CS ≥ 6)
(WF136)	Nov	7.1	93	81	n/a	120	n/a	n/a	n/a	80.7	12.9	Fairly High	<i>Leuctra moselyi</i> , <i>Potamophylax rotundipennis</i>
Allt nan Cuinneag	Apr	9.9*	101	56	n/a	147	n/a	n/a	n/a	88.7	12.5	Fairly High	<i>Potamophylax rotundipennis</i> , <i>Protonemura meyeri</i>
	Nov	6.5	98	57	n/a	120	n/a	n/a	n/a	92.2	10.8	Fairly High	<i>Protonemura meyeri</i>
Allt Crom Bhruthaich	Apr	9.3*	99	48	Moderate	72	12	6.0	0.97	93.8	10.0	Moderate	<i>Protonemura meyeri</i>
	Nov	6.3	97	45	Moderate	75	13	5.77	0.90	60.0	5.5	Moderate	n/c
Allt Anndeir	Apr	7.2	106	17	Good	73	10	7.3	1.00	94.7	10.0	Moderate	n/c
	Nov	5.2	100	39	Bad	44	5	8.80	1.11	100.0	5.3	Moderate	n/c
Unnamed (WF159)	Apr	11.2*	100	93	n/a	122	n/a	n/a	n/a	78.4	9.3	Moderate	n/c
	Nov	6.5	94	68	n/a	143	n/a	n/a	n/a	82.4	9.7	Moderate	<i>Protonemura meyeri</i>
Allt Geallaidh	Apr	10.8*	102	39	High	152	23	6.6	1.00	90.6	15.3	High	n/c
	Nov	5.8	94	53	Good	181	27	6.70	0.95	87.9	16.0	High	<i>Protonemura meyeri</i>

*possible erroneous reading.

Macrophytes

- 13.1.11 The metrics calculated from the macrophyte surveys at Allt Bhaic and unnamed watercourse WF159 are given in Table 24.

Table 24 Summary of macrophyte data. Taxon cover values are reported for all species collected

Metric	Allt Bhaic	WF159
River Macrophyte Nutrient Index	8.66	6.12
River Macrophyte Nutrient Index EQR	0.08	0.48
Number of hydrophyte taxa (NTAXA)	1	3
NTAXA EQR	0.04	0.55
Number of Functional Groups	1	3
Filamentous Green Algae Cover (%)	0.5	0.5
Filamentous Green Algae Cover EQR	0.96	0.96
Overall EQR	0.07	0.48
Classification (confidence of class)	Bad (87.5)	Moderate (76.1)
Overall Macrophyte Cover (%)	0	8
Overall Filamentous Algae Cover (%)	1	1
Cladophora glomerata/ Rhizoclonium hieroglyphicum*	2	2
Common water moss *	0	4
Water mint	0	1
Mimulus sp./hybrid	0	2
Broad-leaved Pondweed *	0	3

*hydrophyte (i.e. truly aquatic) species.

Ponds

- 13.1.12 The PSYM classification along with observed indices and EQIs are given in Table 25.

Table 25: PSYM results and classification

Indices	WF96A
No. of submerged + marginal plant species (SM)	7
EQI (SM)	0.38
Number of uncommon plant species (U)	0
EQI (U)	0.00
Trophic Ranking Score (TRS)	9.33
EQI (TRS)	1.67
Average Score Per Taxon (ASPT)	3.86
EQI (ASPT)	0.68
Odonata + Megaloptera (OM) families	0
EQI (OM)	0.00
Coleoptera families (CO)	2
EQI (CO)	0.59
Index of Biotic Integrity (%)	22%
PSYM quality category	Very Poor
Priority species	0

Indices	WF96A
Meet Priority Pond criteria?	No

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