

Appendix A12.2

Vegetation and Habitats



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1. Introduction

- 1.1.1 Atkins Mouchel Joint Venture (AMJV) is the Lead Design Consultant for the A9 Dualling Northern Section (Dalraddy to Inverness), which includes the Tomatin to Moy section of the A9. MacArthur Green has been commissioned to assist AMJV with vegetation and habitat classification elements relating to the Design Manual for Roads and Bridges (DMRB) Stage 3 Environmental Assessment.
- 1.1.2 Surveys took the form of National Vegetation Classification (NVC) surveys. The NVC scheme provides a standardised system for classifying and mapping semi-natural habitats in Great Britain. The aim of the NVC survey was to classify, map and describe the vegetation communities present within the relevant Study Area in order to identify those areas of greatest ecological interest/sensitivity: Habitats Directive Annex I habitats, Scottish Biodiversity List (SBL) priority habitats and potential Groundwater Dependent Terrestrial Ecosystems (GWDTE).
- 1.1.3 This document details the results of the NVC field surveys and an evaluation of the communities recorded. Surveys were carried out during May 2016.

2. The Study Area

- 2.1.1 The Tomatin to Moy Study Area extends from around NH 805 293 by Tomatin (just north of the A9 River Findhorn crossing) northwards to around NH 728 349, south-west of Meall Mòr. The stretch of the A9 to be dualled is approximately 9.9km long.
- 2.1.2 The Study Area, within which NVC surveys were undertaken, was determined by buffering the maximum extent of the Proposed Scheme footprint by 250m. The 250m buffer was applied to ensure surveys covered the necessary area to determine the presence of potential GWDTEs, in line with Scottish Environmental Protection Agency (SEPA) guidance on GWDTE (SEPA, 2014aⁱ, 2014bⁱⁱ).
- 2.1.3 In one area, in the vicinity of two short stretches of the River Findhorn south of Invereen and west of Lower Inverbrough, it was possible to reduce the extent of the 250m Study Area due to the presence of a natural hydrological barrier, which would mean any potential GWDTE on the other side of the hydrological barrier would not be affected by any dualling works on the A9. The NVC Study Area is illustrated in Figure 12.2a-k.
- 2.1.4 No other definite hydrological barriers were identified prior to surveys. Minor watercourses and features such as the existing A9, associated trunk and minor roads, and adjacent railway were not considered definite hydrological barriers, because of the potential for deeper groundwater flows to exist beneath them.
- 2.1.5 The NVC Study Area contains a wide range of upland mires, heaths, grasslands and woodlands; lowland woodland and grassland types are much scarcer and cover smaller extents. Swamp and flush vegetation makes up a small percentage of the Study Area.
- 2.1.6 Most of the vegetation in the Study Area has been affected anthropogenically over time in a number of ways. In upland areas these impacts have been mainly through moorland management techniques such as muirburn (for grouse), grazing and drainage, but also forestry in some areas: these management activities have clearly influenced the plant communities here. In more lowland areas, livestock farming and associated agricultural practices are clear drivers and maintainers of many habitats and vegetation types

present, and the species composition of much of the vegetation shows the influences of grazing, drainage, re-seeding and fertiliser application.

- 2.1.7 There are no designated ecological or geological sites within the NVC Study Area.

3. Methodology

3.1 Field Survey

- 3.1.1 The vegetation was surveyed by a team of four suitably qualified and experienced botanical surveyors (Ben Averis, Brian Henry, Jason Mackay and Carolyn Cowan) using the NVC scheme (Rodwell, 1991-2000; 5 volumesⁱⁱⁱ) and in accordance with NVC survey guidelines (Rodwell, 2006^{iv}). The NVC scheme provides a standardised system for classifying and mapping semi-natural habitats, and ensures that surveys are carried out to a consistent level of detail and accuracy.
- 3.1.2 Homogenous stands and mosaics of vegetation were identified and mapped by eye, and drawn as polygons on high resolution field maps; i.e. 1:5,000 @A3 using 10cm orthoimagery. These polygons were surveyed qualitatively to record dominant and constant species, sub-dominant species and other notable species present. The surveyors worked progressively across the Study Area to ensure that no areas were missed and that mapping was accurate. 10cm resolution aerial photography of the Study Area was used to aid accurate mapping of vegetation boundaries. NVC communities were attributed to the mapped polygons using surveyor experience and matching field data against published floristic tables (Rodwell, 1991-2000ⁱⁱⁱ). Stands were classified to sub-community level where possible, although in many cases the vegetation was mapped to community level only because the vegetation was too species poor or patches were too small to allow meaningful sub-community determination; or because some areas exhibited features or fine-scale patterns of two or more sub-communities.
- 3.1.3 Quadrat sampling was not used in this survey because experienced NVC surveyors do not need to record quadrats in order to reliably identify NVC communities and sub-communities (Rodwell, 2006^{iv}). Notes were made about the structure and flora of larger areas of vegetation in many places (such as the abundance and frequency of species, and in some cases condition and evident anthropogenic impacts). It can be more accurate to record several larger scale qualitative samples than one or two smaller quantitative samples; furthermore, qualitative information from several sample locations can be vital for understanding the dynamics and trends in local (Study Area) vegetation patterns (Rodwell, 2006^{iv}).
- 3.1.4 Due to small scale vegetation and habitat variability, and numerous zones of habitat transition between similar NVC communities, many polygons represent complex mosaics of two or more NVC communities. Where polygons have been mapped as mosaics an approximate percentage cover of each NVC community within the polygon is given so that the dominant community and character of the vegetation could be ascertained.
- 3.1.5 Botanical nomenclature in this report follows that of Stace (2010^v) for vascular plants and Atherton *et al* (2010^{vi}) for bryophytes.

3.2 Nature Conservation Evaluation

- 3.2.1 The general approach to defining the importance of habitats follows CIEEM (2016)^{vii} guidance. The approach is also in line with advice given in DMRB Interim Advice Note 130/10 'Ecology and Nature Conservation: Criteria for Impact Assessment'^{viii}.
- 3.2.2 Ecosystems, habitats and species are assigned levels of importance for nature conservation based on the criteria set out in Table 3.1.
- 3.2.3 The rarity, ability to resist or recover from environmental change, and uniqueness of an ecological feature, function/role within an ecosystem, and level of legal protection or designation afforded to a given ecological feature are all factors taken into account in determining its importance.

Table A3.1: Importance Criteria

Importance	Criteria
International	Ecosystems or habitats essential for the maintenance of: <ul style="list-style-type: none"> internationally designated areas or undesignated areas that meet the criteria for designation; and/or viable populations of species of international conservation concern.
National	Ecosystems or habitats essential for the maintenance of: <ul style="list-style-type: none"> qualifying communities and assemblages that occur within nationally designated sites or within undesignated areas that meet the criteria for such designation; and/or viable populations of species of national conservation concern.
Regional	Ecosystems or habitats essential for the maintenance of: <ul style="list-style-type: none"> communities and assemblages that occur within regionally important sites or localities listed as being of conservation importance in the Highland Biodiversity Action Plan (BAP) or Cairngorms Nature Action Plan (CNAP) (including Local Nature Reserves) or within undesignated areas that meet the criteria for such designation; and/or viable populations of species of regional conservation concern.
Authority Area	Ecosystems or habitats essential for the maintenance of: <ul style="list-style-type: none"> populations of species of conservation concern within the authority area.
Local	Ecosystems or habitats essential for the maintenance of: <ul style="list-style-type: none"> populations of species of conservation concern within the local area (for example a Local Nature Reserve (LNR)).
Less than Local	Ecosystems or habitats that do not meet the above criteria, i.e., supporting at least populations of species of conservation concern within the local area

4. Survey Constraints and Limitations

- 4.1.1 The majority of the Study Area was surveyed from 2nd May to 6th May 2016 inclusive and on 16th and 17th May 2016. Surveys during this period were carried out by four surveyors, over 22 surveyor days, from approximately 08:30 – 18:30. The weather conditions were amenable to survey: bright, with broken cloud and relatively light to moderate winds. All parts of the Study Area were accessible.
- 4.1.2 Additional NVC survey was undertaken in November 2016 and February 2017 in relation to access tracks and signage locations following a revision to the Proposed Scheme

design. Surveys in November were undertaken by two surveyors over two days, and in February by 2 surveyors over four days. The weather conditions for these surveys were amenable to survey: bright and crisp with no cloud and light wind.

- 4.1.3 The surveys conducted in early to mid-May were undertaken relatively early in the flowering season for a northerly site such as Tomatin to Moy, and therefore not the optimal time for carrying out vegetation surveys. However, due to many of the easily recognisable types of habitat present (e.g. heaths, woodlands etc.), the presence of new young vegetation, early flowering species, buds, recognisable dead vegetation from the previous season, and vegetation that persists through the winter (e.g. trees, scrub, mosses), it was still possible to classify the vegetation accurately. Therefore, the time of year was not seen as a constraint to the survey.
- 4.1.4 The November and February surveys were conducted outside of the optimal period for habitat and vegetation surveys. However, the Study Area was an extension of an area covered by the same surveyor earlier in the season in the May 2016 surveys, and many parts of the Study Area were an extension of previously mapped habitats. Furthermore, the presence of still readily recognisable habitats (e.g. heaths, woodlands etc.), and the continued presence of still living perennial vegetation and some dead plant material, made it possible to classify the vegetation accurately. Therefore, the time of year was not seen as a constraint to these surveys.
- 4.1.5 The NVC system does not cover all possible semi-natural vegetation or habitat types that may be found. Since the NVC was adopted for use in Britain in the 1980s, further survey work and an increased knowledge of vegetation communities has led to additional communities being described that do not fall within the NVC system. Where such communities are found and recorded they are given a non-NVC community code and are described.
- 4.1.6 It should be noted that the results from this survey, and the matches made in describing communities, represent a current community evaluation at the time of survey, as opposed to one seeking to describe what the community was before any human interference, or what it might become in the future. In light of this, a clear constraint of the vegetation survey and evaluation process as used in this and other surveys is that it offers only a snapshot of the vegetation communities present and should not be interpreted as a static long term reference.

5. NVC Survey Results and Vegetation Descriptions

5.1 Summary of NVC Communities

- 5.1.1 The categories of vegetation within the Study Area include the following 43 NVC communities recorded during the survey:
- woodland and scrub: W4, W6, W7, W9, W10, W11, W17, W18, W19, W23, W24
 - mires and flushes: M2, M3, M4, M6, M10, M17, M19, M20, M23, M25
 - wet heaths: M15, M16
 - dry heaths: H9, H10, H12, H9-12 Intermediate, H16, H18, H21
 - grasslands and bracken: U2, U4, U5, U6, U20, MG1, MG6, MG9, MG10
 - swamp: S9
 - vegetation of open habitats: OV24, OV25, OV27

- 5.1.2 The following sections describe the flora, structure and habitats of these communities and any associated observed sub-communities, found within this Study Area. For each NVC community description, the first paragraph refers to the community in Britain or Scotland as a whole, before moving on to the other paragraphs which describe the vegetation as it was found to occur within this Study Area. The NVC communities within each broad habitat type (e.g. woodland) are described in order of community number within the Study Area.
- 5.1.3 The survey results are shown on Figure 12.2a-k. Occasional target notes were also made during surveys, mainly to pinpoint areas or species of special interest. These target notes are also shown on Figure 12.2a-k and detailed within Annex A. Target note photographs are provided in Annex B. Further photographs of a number of the typical community and habitat types found within the Study Area are provided within Annex C.
- 5.1.4 For each community description, reference is also made to any association with Annex I habitats, Scottish Biodiversity List (SBL) priority habitats and potential GWDTE status (as per SEPA guidance). These associations are Study Area specific; full details and discussion are provided in Section 6.

5.2 Woodland and Scrub

- 5.2.1 Woodland is widespread and quite extensive throughout the Study Area, and a relatively diverse range of types are present in varying habitat patch sizes. Some woodland types are rare here, and some of the stands recorded are small and atypical for the assigned NVC communities or sub-communities, as further described below. A small number of woodland communities account for the majority of the woodland stands present.

W4 *Betula pubescens* – *Molinia caerulea* woodland

Communities/sub-communities recorded: W4, W4b, W4c

GWDTE status – High; SBL – Upland birchwoods (W4 at the community level) or Wet woodland (W4b and W4c)

- 5.2.2 W4 is a community of moist, moderately acidic, though not necessarily highly oligotrophic, peaty soils. It is characteristic of thin or drying ombrogenous peats which are isolated from the influence of base-rich or eutrophic groundwaters, but is also found on peaty gleys flushed by rather base- and nutrient-poor water (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). *Betula pubescens* is the most common woody species, and is usually dominant. The great abundance of *Molinia caerulea* is the most distinctive feature of the field layer, and other species may be limited to areas between *Molinia* tussocks. A number of bryophytes can be found within W4; *Sphagnum* spp. are usually present (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}).
- 5.2.3 Within the Study Area W4 is scarce and occurs only as small, scattered and fragmented stands, it does not form any large expanses of woodland. For the most part it is found in mosaics with the drier *Betula* woodlands W11 and W17 (described below).
- 5.2.4 A few stands of W4 were recorded to community level only, due to the nature of the small stands; usually species-poor with many associated species, where present, shared with adjoining W11 and/or W17 woodland. Community level W4 within the Study Area has a canopy dominated by *Betula* spp., with occasional *Pinus sylvestris* and rarely some *Salix* spp. The field layer is typically dominated by a species-poor sward of *Molinia caerulea*. Where the *M. caerulea* becomes less tussocky and thins out, there are other species such as *Agrostis capillaris*, *Anthoxanthum odoratum* and *Galium saxatile*. The basal layer sometimes contains scattered patches of *Sphagnum* sp.

- 5.2.5 A few small areas of the wetter **W4b *Juncus effusus* sub-community** are present within the Study Area. These stands have a canopy dominated by *Betula pubescens*, sometimes with frequent *Salix cinerea*. *Pinus sylvestris* and *Picea sitchensis* occasionally encroach into some areas. The ground flora is dominated by *Juncus effusus*, *Polytrichum commune* and *Sphagnum fallax*. In places there is also scattered *Eriophorum vaginatum*, *Deschampsia cespitosa*, *Sphagnum palustre*, *Hylocomium splendens*, *Thuidium tamariscinum* and *Rhytidiadelphus triquetrus*.
- 5.2.6 A number of small stands of the **W4c *Sphagnum* sub-community** are present within the Study Area. The canopy is again characterised by *Betula pubescens*, rarely with some *P. sylvestris*. The ground vegetation here preserves elements of the wet heath or mire from which the woodland has developed; in some cases the stands resemble *B. pubescens* over-topping M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire. The field layer in these stands contains abundant *Eriophorum vaginatum* mixed with *Calluna vulgaris*, *Erica tetralix*, *Juncus effusus*, *Sphagnum fallax*, *S. palustre*, *S. capillifolium*, *Hylocomium splendens* and *Polytrichum commune*. By contrast, the usual community constant, *Molinia caerulea*, was found to be rare in these stands of W4c, and in W4b.

W6 *Alnus glutinosa* – *Urtica dioica* woodland

Communities/sub-communities recorded: W6

GWDTE status – Moderate; Annex I - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*; SBL – Wet woodland

- 5.2.7 W6 is a poorly-defined community of eutrophic moist soils, especially where there has been substantial deposition of mineral matter, or on floodplain mires where enriched waters flood fen peat (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). *Alnus glutinosa* is usually the most common tree, particularly on wetter soils, but is replaced by *Salix* spp. or *Betula pubescens* on some sites. Unlike the other *A. glutinosa* woodland types (i.e. W5 and W7) the field layer generally lacks the richer and tall swamp and fen species, and is instead replaced by a species-poor, albeit quite distinctive, field layer. The most typical species is *Urtica dioica*. The few other typical species are mainly characteristic of damp to moderately wet habitats (Rodwell *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}).
- 5.2.8 Within the Study Area a single stand of woodland in the south was classed as W6. The canopy here is dominated by *A. glutinosa* with some *B. pubescens*, *Acer pseudoplatanus* and *Sorbus aucuparia*. The field layer was seen to contain abundant to dominant *Urtica dioica*.
- 5.2.9 This stand of W6 is not considered to be a candidate for Annex I alluvial forest habitat status owing to its artificial-looking character having been affected by adjacent plantation and improved pasture.

W7 *Alnus glutinosa* – *Fraxinus excelsior* – *Lysimachia nemoreum* woodland

Communities/sub-communities recorded: W7, W7a, W7c

GWDTE status – High; Annex I - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*; SBL – Wet woodland

- 5.2.10 W7 is typical of moist to very wet mineral soils which are only moderately base-rich and not very eutrophic (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). It is most extensive in the wetter parts of Britain, but usually occurs on soils where there is no great tendency for

peat accumulation. *Alnus glutinosa* is usually the main tree species, and is commonly accompanied by other species such as *Fraxinus excelsior*, *Betula* spp., *Salix* spp. and *Acer pseudoplatanus*. The field layer can be very varied; the wetness and nutrient status of the soil determines what other species may occur, these being mainly grasses and herbaceous dicotyledons (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). There are three sub-communities; differences between them are related to the extent of waterlogging, the nature of the water supply and its movement.

- 5.2.11 Just five small stands of W7 woodland were recorded within the Study Area, most being classified as either the **W7a *Urtica dioica* sub-community** or **W7c *Deschampsia cespitosa* sub-community**.
- 5.2.12 The canopy in these areas is largely atypical with an absence of *Alnus glutinosa*; instead the canopy consists mainly of *Betula* spp. along with some occasional *Salix cinerea*, *Sorbus aucuparia* and *Acer pseudoplatanus*. One stand consists of non-native *Populus* spp. with abundant *Sambucus nigra* and *Symphoricarpos albus* in the shrub layer.
- 5.2.13 Species commonly found in the ground vegetation below these canopies include *Deschampsia cespitosa*, *Ranunculus acris*, *Agrostis capillaris*, *Conopodium majus*, *Valeriana officinalis*, *Anemone nemorosa*, *Rhizomnium punctatum*, *Rhytidadelphus squarrosus* and *Mnium hornum*.
- 5.2.14 Each stand of W7 was assessed on a case by case basis to determine if it could be considered Annex I alluvial forest habitat. Many stands were not deemed to be of Annex I status because of their canopy species (either non-native or not containing the characteristic *Alnus glutinosa* or *Fraxinus excelsior*) or because the stands were of very young secondary regeneration.

W9 *Fraxinus excelsior* – *Sorbus aucuparia* – *Mercurialis perennis* woodland

Communities/sub-communities recorded: W9a

SBL – Upland mixed ashwoods

- 5.2.15 W9 is a community of permanently moist calcareous soils in the sub-montane climate of north-west Britain. It is commonly found by streams and flush lines in the uplands, where the climate is cool, wet and windy (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). In typical stands *Fraxinus excelsior* and *Corylus avellana* are the most abundant woody species, and *Betula pubescens* and *Sorbus aucuparia* may be co-dominant. The field layer is usually a complex mosaic, with no single species dominating, although *Mercurialis perennis* and *Hyacinthoides non-scripta* both tend to be frequent. Other features distinctive of W9 include an abundance of *Oxalis acetosella*, various fern species, and a well-developed bryophyte layer (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}).
- 5.2.16 Only a couple of small pockets of W9 woodland occur within the Study Area, these being within a thin strip of sloping ground between the B9154 road and the railway by Moy. Each stand is floristically closest to the **W9a Typical sub-community**. The stands form patches within a much larger expanse of W11, W17 and W18 woodlands.
- 5.2.17 Within the areas of W9 the canopy has abundant *Fraxinus excelsior* with frequent to occasional *Betula* sp., *Tilia x europaea*, *Acer pseudoplatanus*, *Pinus sylvestris* and rarely some *Quercus* spp., *Fagus sylvatica* and *Larix* spp.
- 5.2.18 The ground flora in these stands is very mossy with much leaf litter; the relative scarcity of herbs observed is probably a result of the survey being conducted in early May.

Throughout the moss carpets there is scattered *Pteridium aquilinum*, *Dryopteris* spp., *Urtica dioica*, *Conopodium majus*, *Oxalis acetosella* and graminoids such as *Holcus lanatus*. The thick carpet of mosses shows much overlap with the abutting W11, W17 and W18 woodland and contains abundant to frequent *Rhytidiadelphus triquetrus*, *Hylocomium splendens*, *Hypnum* spp., *Mnium hornum*, *Thuidium tamariscinum*, *Pseudoscleropodium purum*, *Plagiothecium undulatum* and the liverwort *Lophocolea bidentata*.

W10 *Quercus robur* – *Pteridium aquilinum* - *Rubus fruticosus* woodland

Communities/sub-communities recorded: W10

SBL – Lowland mixed deciduous woodland

- 5.2.19 This is a variable community of base-poor brown earths, found mainly in the lowlands of southern Britain (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). However, it can be found scattered in the north as well. Typically, *Quercus* spp. are the most common trees, and *Betula pendula* is abundant. *Fraxinus excelsior* can be frequent, with *Acer pseudoplatanus* and sometimes *Ulmus glabra*, in the north-west. Some stands are dominated by planted conifers, but with enough of a field layer to classify the vegetation type (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). The field layer is varied but usually lacks base-rich indicators such as *Mercurialis perennis*. The bryophyte cover is generally low.
- 5.2.20 A single patch of W10 woodland was recorded in the south of the Study Area. Here, the canopy is characterised by *Betula pubescens*, *Acer pseudoplatanus* and *Quercus robur*. The field layer contains *Urtica dioica* and grasses such as *Holcus lanatus* and *Dactylis glomerata*.

W11 *Quercus petraea* – *Betula pubescens* – *Oxalis acetosella* woodland

Communities/sub-communities recorded: W11, W11c, W11d

SBL – Upland birchwoods

- 5.2.21 W11 is a community of moist, free-draining base-poor brown earth soils in the cooler, wetter north-west of Britain. It is characteristic of substrates that are neither markedly calcareous nor strongly acidic. The character of the community is heavily influenced by grazing (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). These woodlands have a canopy of *Betula* spp. and/or *Quercus* spp. and a field layer dominated mainly by grasses. The canopy composition reflects its affinities with the W17 *Quercus petraea* – *Betula pubescens* – *Dicranum majus* community described below, and from which it is distinguished mainly by the swards of grasses including *Agrostis* spp., *Holcus mollis* and *Anthoxanthum odoratum*, rather than one dominated by *pleurocarpous* mosses, sub-shrubs and *Deschampsia flexuosa*.
- 5.2.22 W11 is widespread throughout the Study Area. Many stands were not recorded to sub-community level; these typically consist of a canopy of *Betula* spp. over a species-poor and semi-improved grassy field layer similar to U4 grassland. The W11 woodlands in much of the Study Area have evidently been grazed for many years and have a relatively open canopy. In some locations they may represent the establishment of a *Betula* canopy within an area that was formerly open, acid grassland. These stands of 'acid grassland with a *Betula* canopy' do not fit into any of the recognised W11 sub-communities. However, in other areas, a number of stands of the **W11c *Anemone***

nemorosa sub-community and **W11d *Stellaria holostea* – *Hypericum pulchrum* sub-community** were recorded.

- 5.2.23 Many stands of W11 are present in mosaics with W17 woodland (see below), and in these areas there is typically some species overlap in the transitional zone, often seen through the grassy W11 flora becoming more mossy where tending toward W17.
- 5.2.24 Throughout all areas of W11 woodland within the Study Area the canopy is dominated by *Betula* spp. In a few stands there is sometimes abundant, but more usually frequent to occasional, *Populus tremula*. More occasional are *Pinus sylvestris*, *Salix* spp., *Sorbus aucuparia*, *Picea sitchensis*, *Larix* spp. and, in the underscrub, *Juniperus communis*. Rare associates in the canopy and underscrub include *Sambucus nigra*, *Alnus glutinosa*, *Fagus sylvatica*, *Tilia x europaea*, *Rhododendron ponticum* and *Cytisus scoparius*.
- 5.2.25 The field flora tends to be grassy, but mosses can be frequent and often dominate small patches. The most commonly occurring and abundant species in the ground flora include *Agrostis capillaris*, *Anthoxanthum odoratum*, *Holcus mollis*, *H. lanatus*, *Oxalis acetosella* and *Conopodium majus*. More occasional are *Anemone nemorosa* (especially in W11c), *Festuca* spp., *Pteridium aquilinum*, *Rubus fruticosus*, *Deschampsia flexuosa*, *Dryopteris* spp., *Blechnum spicant*, *Luzula sylvatica*, *Galium saxatile* and *Primula vulgaris*. Rarely there are tufts of *Juncus effusus* and *Deschampsia cespitosa* in areas of damper soil.
- 5.2.26 Mosses are usually present, although variable in their cover, being more abundant in areas where the W11 is juxtaposed with W17 woodland. The most common moss species found in W11 in this survey are *Rhytidiadelphus squarrosus*, *R. triquetrus*, *Hylocomium splendens* and *Pleurozium schreberi*.

W17 *Quercus petraea* – *Betula pubescens* – *Dicranum majus* woodland

Communities/sub-communities recorded: W17, W17b, W17c

SBL – Upland birchwoods

- 5.2.27 W17 *Quercus petraea* – *Betula pubescens* – *Dicranum majus* woodland is a community of very acid, often thin and fragmentary soils in the cool, wet north-west of Britain where there is a strong tendency for mor accumulation and where high rainfall leads to strong leaching (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^x). Local differences in climate and topography have a strong influence on the vegetation and frequently interact with grazing to determine the distinctive floristics of the sub-communities (Rodwell *et al* 1991). In this community *Quercus petraea* and/or *Betula pubescens* usually dominate, although *B. pubescens* is particularly frequent to the north-west where *Quercus* spp. are scarce. The field layer is usually characterised by ericoid shrubs, *Pteridium aquilinum* and grasses; bryophytes are also particularly abundant within this community (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^x).
- 5.2.28 W17 is widespread throughout the Study Area, often as single stands of the community, but also frequently in mosaics with W11 woodland (the ubiquitous cover of bryophytes in W17 often serves as point of distinction between the two communities) and W18 woodland.
- 5.2.29 Though sometimes recorded at the community level, the stands within the Study Area generally fall into two sub-communities: the heathy **W17b Typical sub-community** and

the grassier **W17c *Anthoxanthum odoratum* – *Agrostis capillaris* sub-community**, which is also often dominated by bryophytes.

- 5.2.30 The canopies throughout all stands of W17 within the Study Area are dominated by *Betula* spp. Some are pure stands of *Betula*, whereas others contain a mix of associates in very variable quantities, these species including *Populus tremula*, *Pinus sylvestris* and *Larix* spp. Rarely, in some stands, there is the odd *Acer pseudoplatanus*, *Salix* sp., or *Picea sitchensis* tree. The underscrub rarely contains some *Cytisus scoparius* or *Juniperus communis*.
- 5.2.31 The basal layer usually contains extensive carpets of mosses that effectively blanket the ground in places. The most abundant mosses are *Rhytidiadelphus triquetrus*, *Pleurozium schreberi* and *Hylocomium splendens* but others such as *Dicranum majus*, *R. loreus*, *R. squarrosus*, *Pseudoscleropodium purum*, *Thuidium tamariscinum* and *Plagiothecium undulatum* are very common throughout and some in places can locally dominate. Other lower plants scattered through the carpet in some stands include *D. scoparium*, *Polytrichastrum formosum*, *Hypnum* spp., *Mnium hornum*, *Atrichum undulatum*, *Lophocolea bidentata*, *Polytrichum commune*, *Ptilium crista-castrensis*, *Cladonia* spp. and rarely small patches of *Sphagnum* sp.
- 5.2.32 Above the mossy carpet there are a few constant species which are characteristic of the field layer of the two sub-communities recorded. In the heathy W17b Typical sub-community the most common of these are abundant to frequent *Calluna vulgaris*, *Vaccinium myrtillus* and *Vaccinium vitis-idaea*. Stands of the W17c *Anthoxanthum odoratum* – *Agrostis capillaris* sub-community lack this sub-shrub element and instead are characterised more by *A. odoratum*, *Agrostis* spp., *Holcus* spp. and *Oxalis acetosella*. There can be some overlap between species in these sub-communities, whereas other species are common to all sub-communities, such as *Deschampsia flexuosa* which is common throughout.
- 5.2.33 Other species noted as scattered throughout some stands of W17 include *Blechnum spicant*, *Galium saxatile*, *Pteridium aquilinum*, *Festuca ovina*, *Deschampsia cespitosa*, *Juncus squarrosus*, *Luzula sylvatica*, *L. pilosa* and *Primula vulgaris*.

W18 *Pinus sylvestris* – *Hylocomium splendens* woodland

Communities/sub-communities recorded: W18, W18a, W18b, W18c, W18d

- 5.2.34 W18 *Pinus sylvestris* – *Hylocomium splendens* woodland is a community of strongly leached, lime-free, podzolic soils in the central and western Highlands of Scotland. Variation in composition is generally related to the density and age of the pine canopy, but climate, soils and the incidence of browsing, grazing and burning are also important. *P. sylvestris* is always the most abundant tree, though *Betula* spp. may be common. There is a heathy field layer and bryophytes are abundant (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}).
- 5.2.35 W18 is the most extensive woodland type and one of the most extensive communities throughout the whole Study Area. It is present in large blocks all along the Tomatin to Moy stretch of the A9. All the W18 woodland appears to be of planted origin, with many large even aged stands. Many of the maturing stands have been thinned out; this has allowed light penetration and the development of a ground flora which allows the classification of the stands as W18 woodland instead of blocks of dense plantation which do not align to any NVC community. Other areas of W18 are quite young and evidently planted, with a canopy that has not yet closed and shaded out the ground flora.

- 5.2.36 Many stands of W18 were classified to community level only, owing to their planted nature or the presence of a mosaic of sub-communities. However, many stands were classified to sub-community level, with the **W18b *Vaccinium myrtillus* - *Vaccinium vitis-idaea* sub-community** and the **W18c *Luzula pilosa* sub-community** being by far the most common types. There are also some small pockets of the **W18a *Erica cinerea* – *Goodyera repens* sub-community** and **W18d *Sphagnum capillifolium* / *quinquefarium* – *Erica tetralix* sub-community** present too.
- 5.2.37 The canopy is dominated by *Pinus sylvestris* and this is commonly the sole tree species. Locally other species occur as scattered individuals, or there are small pockets of other planted species. Other species most often present among the *P. sylvestris* are *Betula* spp. and *Larix* spp.; rarely there is some *Sorbus aucuparia*, *Abies* sp., *Pinus contorta* and *Picea sitchensis*.
- 5.2.38 The W18b *V. myrtillus* – *V. vitis-idaea* sub-community is very widespread throughout the stands. These areas are characterised by a ground flora with abundant *V. myrtillus*, *V. vitis-idaea*, *Calluna vulgaris*, *Empetrum nigrum* and *Deschampsia flexuosa* over a dense moss carpet including *Hylocomium splendens*, *Rhytidiadelphus triquetrus*, *R. loreus*, *R. squarrosus*, *Pleurozium schreberi*, *Hypnum* spp., *Dicranum majus*, *D. scoparium*, *Polytrichastrum formosum*, *Plagiothecium undulatum* and *Pseudoscleropodium purum*.
- 5.2.39 The other common variant present, the W18c *Luzula pilosa* sub-community, also contains many patches of the mosses as listed above, but the vascular flora is generally grassier and lacks the sub-shrub elements of the other sub-communities. Within areas of W18c the field layer is characterised more by abundant to frequent *Deschampsia flexuosa*, *Agrostis* spp., *Festuca ovina*, *Anthoxanthum odoratum*, *Galium saxatile*, *Oxalis acetosella* and occasional *Holcus* spp., *Rumex acetosa*, *Luzula sylvatica*, *Pteridium aquilinum* and *Dryopteris* spp.
- 5.2.40 A couple of patches of the W18a *Erica cinerea* – *Goodyera repens* sub-community were noted, these are superficially quite similar to the W18b sub-community described above, however the vegetation also contains frequent *Erica cinerea*.
- 5.2.41 Also present are a couple of small areas of the W18d *Sphagnum capillifolium* / *quinquefarium* – *Erica tetralix* sub-community. This is damper woodland and amongst many of the species already listed above are patches of *Erica tetralix*, *Molinia caerulea*, *Eriophorum vaginatum* and *Sphagna*.
- 5.2.42 None of the stands of W18 woodland within the Study Area were considered to be candidates for Annex I habitat; this is because of their planted origin.

W19 *Juniperus communis* – *Oxalis acetosella* woodland

Communities/sub-communities recorded: W19, W19a, W19b

Annex I – *Juniperus communis* formations on heaths or calcareous grasslands

- 5.2.43 This is a community of medium to high altitudes, mostly within the cooler and relatively dry parts of northern Britain. It occurs on a wide variety of free-draining soils, and edaphic differences, together with grazing and browsing, have important influences on the floristics of the vegetation (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). The main centre of distribution of W19 is in the east-central Highlands, particularly the hills of the Cairngorm and Monadhliath ranges. *Juniperus communis* is always the most abundant woody species in this community, although some stands can also have an open canopy of *Betula* spp. (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}). Stands of W19 can have less than 60% cover of *J. communis* and extensive stretches of a closed canopy are

exceptional; the usual situation is of a varied, patchy cover with some more open areas. Within a stand of W19 the individual bushes can have very varied growth forms. The other major elements in W19 are ericoids, ferns, herbs, and bryophytes (which almost always make a prominent contribution to the vegetation) (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Hall *et al* 2004^{ix}).

5.2.44 A few patches of W19 are present within the Study Area, mainly on the slopes to the west of the existing A9. Both the **W19a *Vaccinium vitis-idaea* – *Deschampsia flexuosa* sub-community** and **W19b *Viola riviniana* – *Anemone nemorosa* sub community** were recorded. Areas of W19a are stands with a heathy ground flora and W19b have a grassy and more herb-rich ground flora.

5.2.45 Within the Study Area the community is dominated by *Juniperus communis* and there are often a few scattered *Betula*. The ground flora includes *Hylocomium splendens*, *Pleurozium schreberi*, *Hypnum jutlandicum*, *Rhytidiadelphus squarrosus*, *R. triquetrus*, *Polytrichum commune*, *Festuca ovina*, *Agrostis capillaris*, *Achillea millefolium* and *Vaccinium vitis-idaea*.

W23 *Ulex europaeus* – *Rubus fruticosus* scrub

Communities/sub-communities recorded: W23

5.2.46 The W23 community is generally dominated by *Ulex europaeus* (locally *Cytisus scoparius*) and has a usually sparse and species-poor ground flora, or in some places no ground flora at all. It is a community of acidic and free draining soils on gentle to steep, rocky slopes at low altitudes. The vegetation often develops after woodland clearance of, or on, abandoned pasture (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Averis *et al* 2004^x).

5.2.47 W23 was recorded as infrequent small patches within the Study Area, mainly along roadsides or associated banks. In each stand of W23 present, *Cytisus scoparius* is the main shrub; occasionally there may also be a few small scattered trees. In these areas of W23 there is a U4 grassland-type ground flora.

W24 *Rubus fruticosus* – *Holcus lanatus* underscrub

Communities/sub-communities recorded: W24

5.2.48 W24 underscrub is a very typical community of abandoned and neglected ground in the British lowlands, where it can be found on a wide variety circumneutral and less oligotrophic soils (Rodwell (Ed) *et al* 1991ⁱⁱⁱ). The community is typically dominated by mixtures of brambles, rank grasses and tall dicotyledons, forming a cover of variable height, but usually less than 1m. It is commonly found in close association with taller woody vegetation, in successions and zones around woodland and other scrub margins (although it generally lacks these woody species in the community itself) (Rodwell (Ed) *et al* 1991ⁱⁱⁱ).

5.2.49 W24 is sparse within the Study Area; it was found occasionally around woodland edges and roadsides. These stands are dominated by either *Rubus fruticosus* or *R. idaeus* (the latter labelled as W24 Rid) quite often with grasses such as *Holcus lanatus* or patches of pleurocarpous mosses growing throughout and underneath.

5.3 Mires and Flushes

5.3.1 Various mire types and associated flush communities are present within the Study Area, most often occupying flatter, wetter and gently sloping peaty areas. Many areas of mire

tend to be fragmented, but there are a few larger expanses of blanket bog habitat. These areas and the associated communities are described in further detail below.

M2 Sphagnum cuspidatum/fallax bog pool community

Communities/sub-communities recorded: M2, M2b

Annex I, SBL - Blanket bog

- 5.3.2 This community is typically found in pools and lawns on the surface of very wet and base-poor peats on ombrogenous and topogenous mires in the less oceanic parts of Britain (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}; Averis *et al* 2004^x). M2 is typically dominated by soft wet carpets of *Sphagnum cuspidatum* or *S. fallax*, or both. This community has been reduced by widespread drainage and cutting of mires, so that often just small and modified fragments remain within predominantly agricultural landscapes. However, this community also readily colonises shallow flooded mine workings (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.3.3 Only a few bog pools of M2 were recorded within the Study Area, most commonly within wider areas of M17 *Trichophorum germanicum* – *Eriophorum vaginatum* blanket mire, and usually of the **M2b *Sphagnum fallax* sub-community**.
- 5.3.4 The areas of M2 tend to be dominated by *Sphagnum fallax* and *S. cuspidatum*, sometimes with a little *S. papillosum*. Throughout the carpet of Sphagna there are often scattered shoots of *Eriophorum angustifolium*, *Carex nigra* and *C. rostrata*.

M3 Eriophorum angustifolium bog pool community

Communities recorded: M3

Annex I, SBL - Blanket bog

- 5.3.5 The M3 *Eriophorum angustifolium* bog pool community is typically found as small stands on barer exposures of acid peat in depressions, erosion channels or shallow peat cuttings on a wide range of mire types (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). It can occur in permanently flooded pools and natural hollows on surfaces of more or less intact mires, and on dried-up hollows and among erosion features where the peat has been worn down in gullies or redistributed (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}; Averis *et al* 2004^x). The typical species, *Eriophorum angustifolium*, can occur as dense and often tall swards, but equally commonly it occurs as sparser shoots scattered over expanses of bare peat (Averis *et al* 2004^x).
- 5.3.6 M3 is rare within the Study Area, being recorded only as a small component of two polygons. As is typical for the community these areas where dominated by swards of *E. angustifolium*, locally with *Sphagnum cuspidatum*.

M4 Carex rostrata - Sphagnum fallax mire

Communities recorded: M4

Annex I – Transition mires and quaking bogs; SBL – Upland flushes, fens and swamps

- 5.3.7 The M4 community is characteristic of pools and seepage areas on peat soils of topogenous and soligenous mires where the waters are fairly acid and only slightly enriched. It can occur in bog pools on the surface of basin mires, but is more common in soligenous areas as in mire laggs and the wettest parts of water-tracks (Rodwell (Ed) *et*

al 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). This mire typically has a cover of sedges (including abundant to dominant *Carex rostrata*) over a carpet of semi-aquatic *Sphagnum* spp.

- 5.3.8 M4 is sparsely scattered throughout the Study Area, mostly as small stands marking the passage and localised ponding of surface water in depressions. The M4 community as a whole is readily recognised within the Study Area by the tall swards of *Carex rostrata* over lawns of *Sphagnum fallax*, *S. palustre* and *S. cuspidatum*, and it varies little from this dominance of defining species. Other species present are limited by the waterlogged substrate and by shade from the *C. rostrata*; they include *Carex nigra*, *Myrica gale*, *Juncus effusus*, *Cirsium palustre* and *Ranunculus ficaria*. Rarely, there are large tussocks of *Carex paniculata* in this community within the Study Area (see Target Notes 1 and 2 – Annex A). Within the lawns of *Sphagnum* spp., *S. teres*, *S. subnitens*, *S. denticulatum* and *S. subsecundum* are also occasional along with other mosses such as *Polytrichum commune*, *Straminergon stramineum* and *Aulacomnium palustre*.

M6 *Carex echinata* - *Sphagnum fallax/denticulatum* mire

Communities/sub-communities recorded: M6, M6a, M6b, M6c, M6d

GWDTE status – High; SBL – Upland flushes, fens and swamps

- 5.3.9 This mire is the major soligenous community of peats and peaty gleys irrigated by base poor waters in the sub-montane zone of northern and western Britain. It typically occurs as small stands among other mire communities, grasslands and heaths, and is sometimes found with swamp and spring vegetation. It is commonly found in tracts of unenclosed upland pasture, particularly between 200m and 400m above sea level (although it may also be found much higher) and is ubiquitous in upland Britain (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). The M6 community has a distinct general character but includes a wide variation in species composition, expressed as four sub-communities (two of which are visually similar to the M23 community). It is essentially a poor-fen with small sedges or rushes dominating over a carpet of oligotrophic and base-intolerant Sphagna (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.3.10 M6 is widespread throughout the Study Area, usually as small flushes, runnels or soakways, and along and within occluding ditches and minor watercourses. All four sub-communities occur within the Study Area, but the majority are of the mainly species-poor **M6c *Juncus effusus* sub-community**.
- 5.3.11 M6c is scattered throughout the Study Area in wet depressions, usually in small, linear extents associated with surface waters and on floodplains in association with other mire and swamp communities. A tall sward of *Juncus effusus* over a species-poor lawn of *Sphagnum fallax* and *Polytrichum commune* indicates this sub-community. In many stands its extent encompasses little more than the three species already listed. Other occasional associates that enrich the sward to varying levels include *Eriophorum vaginatum*, *E. angustifolium*, *Viola palustris*, *Potentilla erecta*, *Myrica gale*, *Molinia caerulea*, *Erica tetralix*, *Rumex acetosa*, *Succisa pratensis*, *Cirsium palustre*, *Agrostis* spp., *Holcus lanatus*, *Deschampsia cespitosa*, *Cardamine* spp., *Galium saxatile* and the mosses *Kindbergia praelonga*, *Hylocomium splendens*, *Rhytidiadelphus squarrosus*, *Sphagnum palustre*, *S. denticulatum* and *S. subnitens*.
- 5.3.12 The **M6d *Juncus acutiflorus* sub-community** is much less common within the Study Area; its species composition essentially mimics that of M6c above but with *J. acutiflorus* replacing *J. effusus* as the main rush species.
- 5.3.13 The **M6a *Carex echinata* sub-community** is infrequent within the Study Area and tends to be dominated by *Sphagnum fallax* (often looking like M2 – see above); the

relatively sparse associates include *Carex echinata*, *Eriophorum angustifolium*, *Agrostis capillaris*, *Juncus* spp. and *Polytrichum commune*.

- 5.3.14 The **M6b *Carex nigra* - *Nardus stricta* sub community** was recorded on only a few occasions, usually as small runnels within areas of mire. This sub-community is quite similar to the M6a sub-community as described above, but *Eriophorum angustifolium*, *Carex rostrata* and *Nardus stricta* are more prominent and there is abundant *Carex nigra* in the sward.
- 5.3.15 In particular, the M6c and M6d sub-communities are of very limited grazing value and of little economic importance. In some places M6 is associated with drainage but more generally it reflects the topography-influenced passage or retention of surface water.

M10 *Carex dioica* - *Pinguicula vulgaris* mire

Communities/sub-communities recorded: M10a

GWDTE status – High; Annex I – Alkaline fens; SBL – Upland flushes, fens and swamps

- 5.3.16 The M10 *Carex dioica* – *Pinguicula vulgaris* mire is a soligenous mire of mineral soils and shallow peats kept very wet by base-rich, calcareous and oligotrophic waters (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). The community includes a range of distinctive calcicolous flush vegetation in which the bulk of the sward is composed of small sedges, dicotyledons and bryophytes. It is essentially a small sedge mire and is usually found as small stands. The community typically occurs in unenclosed uplands, and most of the stands are grazed and trampled by large herbivores (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). The community can occur wherever there is flushing with base-rich water, either below a springhead or where water emerges more diffusely from the ground, most stands being constantly irrigated (Averis *et al* 2004^x).
- 5.3.17 Only three stands of M10 were recorded within the Study Area, all of the **M10a *Carex viridula* - *Juncus bulbosus/kochii* sub-community**. Areas of M10a were usually present as small runnels or small patches. In one location, around Dalmagarry Farm, the habitat was stony and the community maintained by poaching, trampling and grazing by livestock.
- 5.3.18 The stands tend to be dominated by small sedges, particularly *Carex panicea* and *C. viridula* over characteristic mosses, including *Campylium stellatum*, *Bryum pseudotriquetrum*, *Scorpidium revolvens*, *Calliergonella cuspidata*, *Philonotis fontana*, *Aulacomnium palustre*, *Straminergon stramineum* and *Sphagnum denticulatum*. In places the sward is slightly enriched with *Juncus bulbosus*, *J. squarrosus*, *Pinguicula vulgaris*, *Cirsium palustre*, *Ranunculus flammula*, *Scorzoneroides autumnalis* and *Erica tetralix*.
- 5.3.19 This community is a GWDTE, due to its dependency on base-rich groundwater seepages (which are often associated with a definite source point).

M17 *Trichophorum germanicum* – *Eriophorum vaginatum* blanket mire

Communities/sub-communities recorded: M17, M17a, M17b, M17c

Annex I, SBL – Blanket bog

- 5.3.20 M17 *Trichophorum germanicum* – *Eriophorum vaginatum* blanket mire is the characteristic blanket bog vegetation of the more oceanic parts of Britain. It is typically

found on deposits that are maintained in a permanently waterlogged state by a high and generally stagnant water table (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). It usually occurs on peats greater than 2m in depth overlying flat or gently sloping ground (Rodwell (Ed) *et al* 1991ⁱⁱⁱ). However, it can also occur extensively on shallower peat. The peats show varying degrees of humification but are typically highly acidic, with a surface pH usually not much above 4 (Rodwell (Ed) *et al* 1991ⁱⁱⁱ).

- 5.3.21 This community is dominated by mixtures of monocotyledons, ericoid sub-shrubs and *Sphagnum* spp. It can occur as extensive, relatively uniform tracts, or as hummock and hollow complexes, with this community giving way to bog pool vegetation in the hollows (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). Among the bulkier vascular species, the most common are *Trichophorum germanicum*, *Eriophorum vaginatum*, *E. angustifolium*, *Molinia caerulea*, *Calluna vulgaris* and *Erica tetralix*. *Sphagnum* spp. are an important component of the ground layer and can form extensive lawns. Burning, marginal peat-cutting and drainage have often resulted in surface drying of the peat and hence a modification of the vegetation (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.3.22 M17 is common within the Study Area, although its distribution is localised and it rarely covers large areas. One of the largest and wettest examples of this community within the Study Area is to be found north-west of Dalmagarry Farm, to the east of the B9154 road. Scattered fragments of this mire type also occupy depressions, level areas and gentle inclines on the peaty slopes surrounding the A9. The majority of areas align with the **M17a *Drosera rotundifolia* - *Sphagnum* spp. sub-community**. The M17a sub-community is distinguished by extensive wet lawns of *Sphagnum* spp. and frequent *Drosera rotundifolia*.
- 5.3.23 The vascular vegetation cover in M17a is an assemblage of the shrubs, grasses and sedges already listed above. *Calluna vulgaris* is only rarely prominent in the vegetation. Some stands contain abundant *Myrica gale*. Other species recorded commonly throughout these areas include *Narthecium ossifragum*, *Empetrum nigrum*, *Juncus squarrosus*, *Carex nigra* and *Drosera rotundifolia*. The M17a moss layer is dominated by Sphagna, especially *S. capillifolium* and *S. papillosum*. *Sphagnum cuspidatum*, *S. fallax*, *S. subnitens*, *S. palustre*, *S. magellanicum*, *S. compactum* and *S. denticulatum* are locally abundant in patches. Where there are low hummocks, pleurocarpous mosses such as *Hylocomium splendens* and *Pleurozium schreberi* are prominent. Other moss species, including *Aulacomnium palustre* and *Polytrichum commune*, occur occasionally.
- 5.3.24 Although M17a is the most common mire type here, the **M17b *Cladonia* sub-community** is also occasional, predominately in mosaics with M17a and with M17b forming a smaller percentage cover of the mosaic. This sub-community indicates a drier situation than that of M17a. Within M17b the characteristic M17 species remain, but *Sphagnum* cover and diversity is much reduced, with the main *Sphagnum* species in M17b in the Study Area being *Sphagnum capillifolium*. The reduced cover of *Sphagnum* is also accompanied by *Cladonia* spp. increasing in prominence over an often more exposed peat surface.
- 5.3.25 A few stands of the **M17c *Juncus squarrosus* - *Rhytidiadelphus loreus* sub-community** were recorded, distinguished by a higher cover of *Juncus squarrosus* and pleurocarpous mosses. The stands included mixtures of *Eriophorum vaginatum*, *E. angustifolium*, *Calluna vulgaris*, *Myrica gale*, *Erica tetralix*, *Juncus squarrosus*, *Molinia caerulea*, *Hylocomium splendens*, *Pleurozium schreberi*, *Aulacomnium palustre*, *Cladonia* spp., *Sphagnum capillifolium*, *S. fallax* and occasional *S. papillosum*.
- 5.3.26 M17 is likely to have been reduced in extent in certain parts of the Study Area by agricultural improvement, and probably also by grazing, peat cutting and drainage.

M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire

Communities/sub-communities recorded: M19, M19a, M19b, M19c

Annex I, SBL – Blanket bog

- 5.3.27 This is the typical blanket bog vegetation of high-altitude ombrogenous peats in the wet and cold climate of the uplands of northern Britain. In particular, it occurs on high-level plateaux and broad watersheds, usually above 300m, and is confined to deeper peats on flat or gently-sloping ground (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). It is generally dominated by mixtures of *Eriophorum vaginatum* and ericoid sub-shrubs (especially *Calluna vulgaris*). *Sphagnum* spp. can be prominent over wetter ground but are not as luxuriant or rich as in M17 mire (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.3.28 M19 mire is very common within the Study Area and is as extensive as the M17 mire above. It is commonly found in mosaics with M17, occurring marginally to these areas of M17 where drying has shifted the community towards M19 (indicated by tussocks of *E. vaginatum* having become widespread along with an increase in *C. vulgaris* cover). M19 is also frequently found in mosaics with the wet heath communities M15 and M16, these heaths probably having been derived from M19 under certain treatments.
- 5.3.29 The most common form of M19 here is the M19a *Erica tetralix* sub-community, although some other stands were classified as M19b *Empetrum nigrum* sub-community and M19c *Vaccinium vitis-idaea* - *Hylocomium splendens* sub-community; differences between the sub-communities are often subtle in the field.
- 5.3.30 The areas of M19 within the Study Area are generally characterised by a dominance of *Eriophorum vaginatum* and *Calluna vulgaris*. Associated species vary greatly in their abundance, but most stands typically include some *Erica tetralix*, *Deschampsia flexuosa*, *Eriophorum angustifolium*, *Empetrum nigrum*, *Myrica gale*, *Vaccinium myrtillus*, *Juncus squarrosus* and *Molinia caerulea*.
- 5.3.31 The most common mosses present are *Sphagnum capillifolium*, *S. fallax*, *S. palustre*, *Hylocomium splendens*, *Pleurozium schreberi*, *Polytrichum commune*, *Aulacomnium palustre*, *Hypnum jutlandicum* and *Rhytidiadelphus loreus*, along with some *Cladonia* spp. (lichens). Rarely there is some *Sphagnum papillosum*.
- 5.3.32 The areas mapped as M19b contain higher abundances of *Empetrum nigrum*. Rarely, stands of M19c were mapped; these were distinguished by a notable presence of *Vaccinium vitis-idaea*, and *Nardus stricta* was also found to be more common within this sub-community.
- 5.3.33 M19 varies greatly in its quality within the Study Area, from bog in relatively good condition adjoining the areas of M17 mire to areas where the vegetation has been intensively grazed so that the *Calluna* is a short cropped sward. In many areas there is also encroachment from native trees such as *Betula* spp. and invasion of the mire surface from self-seeded conifers such as *Pinus sylvestris*.

M20 *Eriophorum vaginatum* blanket mire

Communities recorded: M20, M20a

Annex I, SBL – Blanket bog

- 5.3.34 M20 *Eriophorum vaginatum* blanket mire is a community characteristic of ombrogenous peats on bogs where certain treatments have greatly affected the vegetation; grazing and burning have been of greatest significance, but drainage has also played a part in the development of M20 (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). It is commonest on blanket mires where these factors have contributed both to floristic impoverishment and to erosion of the peats. The peats are generally drier than in M17 and most M19 bogs, often showing surface oxidation (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.3.35 M20 is scattered throughout the Study Area, mostly as isolated patches or as smaller pockets within other mires, particularly M17. The vegetation is quite species poor and was often recorded to community level only; however a number of areas were mapped as the **M20a Species-poor sub-community**.
- 5.3.36 The vegetation is typically dominated by *E. vaginatum*, the tussocks of which form an open or closed canopy 10-30cm high. Throughout the tussocks there are sometimes sparse sprigs of *Calluna vulgaris*, *Eriophorum angustifolium*, *Carex nigra*, *Deschampsia flexuosa*, *Erica tetralix*, *Molinia caerulea*, *Potentilla erecta* and *Trichophorum germanicum*.
- 5.3.37 Mosses also vary in abundance; some tussocks are carpeted in *Hylocomium splendens*, *Hypnum jutlandicum*, *Rhytidiadelphus loreus* and *Pleurozium schreberi*. Between the tussocks there is often *Polytrichum commune*, *Aulacomnium palustre*, *Sphagnum fallax*, *S. capillifolium* and, rarely, *S. papillosum*.

M23 *Juncus effusus/acutiflorus* – *Galium palustre* rush-pasture

Communities/sub-communities recorded: M23a, M23b

GWDTE status – High; SBL – Upland flushes, fens and swamps (M23a only)

- 5.3.38 This rush-pasture is a community of gently-sloping ground in and around the margins of soligenous flushes, as a zone around topogenous mires and wet heaths, and in poorly drained, comparatively unimproved or reverted pasture. It can be found on a variety of moderately acid to neutral soils that are kept moist to wet for most of the year (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). As a result this community can be, at least partially, potentially dependent on groundwater; however, it is also commonly associated with surface water flows and surface water collection. This vegetation is characterised by the abundance of either *Juncus effusus* or *J. acutiflorus* (sometimes both), with a ground layer of mesophytic herbs common in moist or permanently wet grasslands; associates are quite diverse. *Acidophilous Sphagna* and *Polytrichum commune* are rare in the M23 community (Averis *et al* 2004^x).
- 5.3.39 M23 is not extensive within the Study Area but forms scattered patches. Only one small area of the **M23a *Juncus acutiflorus* sub-community** was recorded, all other examples of the community being of the **M23b *Juncus effusus* sub-community**.
- 5.3.40 M23b consists of a tall, tussocky rush sward dominated by *J. effusus* with a low to moderate diversity of herbaceous associates. The field layer beneath the rush sward is highly variable between and within stands, and is often strongly influenced by the water

level. Many stands are almost wholly dominated by *J. effusus*, but where the field layer beneath the rushes is better developed there is a variable assemblage of the species listed in the next paragraph; these are widely frequent to occasional but are abundant locally. Among these associated species the grasses are most abundant in relatively dry, marginal areas of the habitat, while more mixed forb-rich assemblages are common in the wetter areas.

- 5.3.41 The species commonly found in this community include: *Agrostis capillaris*, *A. stolonifera*, *Ranunculus repens*, *R. ficaria*, *Cardamine pratensis*, *Viola palustris*, *Deschampsia cespitosa*, *Cirsium palustre*, *Valeriana officinalis*, *Rumex acetosa* and *Holcus lanatus*. Where the field layer is not overly dense there can be an abundant sward of the mosses *Calliergonella cuspidata* and *Brachythecium rivulare* and, more occasionally *Aulacomnium palustre*, *Kindbergia praelonga*, *Brachythecium rutabulum*, *Hylocomium splendens*, *Plagiomnium ellipticum*, *Warnstorfia exannulata*, *Bryum pseudotriquetrum* and *B. weigelii* (in very small quantities).
- 5.3.42 The one area of M23a found in this survey is characterised by a sward of *Juncus acutiflorus* with *J. effusus*, *Carex rostrata*, *Cardamine pratensis*, *Ranunculus flammula*, and the mosses *Brachythecium rivulare*, *Calliergonella cuspidata*, *Rhytidiadelphus squarrosus* and *Dichodontium palustre*.

M25 *Molinia caerulea* – *Potentilla erecta* mire

Communities/sub-communities recorded: M25, M25a, M25b

GWDTE status – Moderate; Annex I, SBL – Blanket bog (M25a)

- 5.3.43 M25 mire is a community of moist, but usually well aerated, acid to neutral peats and peaty soils (Rodwell (Ed) *et al* 1991ⁱⁱⁱ). It generally occurs over gently-sloping ground, marking out seepage zones and flushed margins of topogenous mires, but also extends onto the fringes of ombrogenous mires (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}; Averis *et al* 2004^x). *Molinia caerulea* is the most abundant species found in this community. The associated flora is usually species-poor, and consists largely of *Juncus* spp. and a few dicotyledons. Occasionally sub-shrubs can be quite common, particularly *Calluna vulgaris* and *Erica tetralix*. *Myrica gale* is local but can be quite extensive and dense in co-dominance with *M. caerulea*. Treatments such as burning, grazing and drainage are likely to be largely responsible for the development of this community over ground that would naturally host some other kind of mire or wet heath vegetation (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.3.44 M25 is not extensive within the Study Area, although it is common in smaller patches as marginal areas and in mosaics with blanket bog, wet heath and calcifugous grassland.
- 5.3.45 M25 sub-communities are defined according to the *M. caerulea* associates, and within the Study Area the community predominately takes the form of the **M25a *Erica tetralix* sub-community** (indicated here by the presence of a range of wet heath and bog associates) or the grassier **M25b *Anthoxanthum odoratum* sub-community**.
- 5.3.46 Within the M25a in the Study Area, *M. caerulea* is typically dominant because of the density of its tall tussocks and leaf litter. The sparse associates include *E. tetralix*, *C. vulgaris*, *Eriophorum vaginatum*, *Potentilla erecta*, *Juncus effusus*, *J. squarrosus*, *Trichophorum germanicum*, *Cirsium palustre*, *Carex echinata* and *C. binervis*. *Myrica gale* is locally abundant and co-dominant in some places. Many *Molinia* tussocks also contain *Hylocomium splendens*, *Pleurozium schreberi*, *Polytrichum commune* and *Rhytidiadelphus* spp. *Sphagna* are present in some areas and are mainly of the species *S. fallax*, *S. capillifolium* and *S. palustre*.

- 5.3.47 Grasses are also often sparsely present within the patches of M25a, but their abundance increases in M25b where *M. caerulea* is typically accompanied by *Nardus stricta*, *Agrostis* spp. and *Festuca* spp. and occasional *Deschampsia cespitosa* with patches of pleurocarpous mosses.

5.4 Wet Heaths

- 5.4.1 Wet heath makes up a relatively small proportion of the Study Area, occupying some of the upland and peaty gently sloping areas and the fringes of blanket bogs. It often forms mosaics and transitions with other mire types as well as dry heaths and calcifugous grasslands. Wet heath tends to be found on shallower peats than blanket bog but this is not always the case; the impacts of certain treatments such as grazing and drainage can result in the development of wet heath communities on deeper peat (see below).

M15 *Trichophorum germanicum* – *Erica tetralix* wet heath

Communities/sub-communities recorded: M15, M15a, M15b, M15c, M15d

GWDTE status – Moderate; Annex I – Northern Atlantic wet heath or blanket bog; SBL – Upland heathland or blanket bog

- 5.4.2 This wet heath community is characteristic of moist and generally acid and oligotrophic peats and peaty mineral soils in the wetter western and northern parts of Britain. It is also associated with thinner or better drained areas of ombrogenous peat (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). It is a vegetation type with few constant species and wide variation in its flora and dominant species. *Calluna vulgaris*, *Molinia caerulea*, *Trichophorum germanicum* and *Erica tetralix* are usually all of high frequency, and it is mixtures of these species that give the vegetation its general character. However, sometimes one or two of them may be missing and their relative proportions can be very varied (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). The shrubby species *Erica cinerea*, *Vaccinium myrtillus* and *Myrica gale* are important in particular sub-communities. Other species found commonly in M15 are *Potentilla erecta*, *Polygala serpyllifolia*, *Narthecium ossifragum* and *Eriophorum angustifolium*. By contrast *E. vaginatum* is notably scarce. M15 is an extremely variable community in terms of dominants, constants and co-dominants, which can vary markedly over short distances. Grazing and burning have important effects on the floristics and structure of this community, and draining and peat-cutting have extended its coverage to formerly deeper and wetter peats in which blanket mire communities (i.e. M17-M19) were probably initially present (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.4.3 M15 occurs throughout the Study Area, particularly to the west of the existing A9, and shows considerable variation highlighted by the presence of all four sub-communities; in order of decreasing abundance, M15b, M15a, M15c and M15d. Each sub-community is discussed further below.
- 5.4.4 The **M15a *Carex panicea* sub-community** is more a soligenous mire than a wet heath (Averis *et al* 2004^x). It occurs within the Study Area as narrow, obviously flushed areas within the other sub-communities of M15 and other mires, as well as occurring as some sizeable discrete stands. M15a has a thinner canopy of the characteristic species described above, though within the Study Area often lacking much *Calluna vulgaris* due to the wetter soils. In the Study Area this sub-community is distinguished from the other sub-communities of M15 by the presence of species indicative of flushing. Especially characteristic here are the small sedges *Carex panicea*, *C. viridula* and *C. hostiana*. *Myrica gale* is also frequent within many stands of M15a. Other species common within M15a here are *Erica tetralix*, *Narthecium ossifragum*, *Empetrum nigrum*, *Eriophorum*

angustifolium, *Potentilla erecta*, *Juncus squarrosus*, *Carex nigra*, *Pinguicula vulgaris*, *Juncus effusus*, *Nardus stricta* and the mosses *Sphagnum denticulatum*, *S. subnitens*, *Scorpidium revolvens*, *Campylium stellatum*, *Ctenidium molluscum*, *Aulacomnium palustre* and *Hylocomium splendens*.

- 5.4.5 The most common sub-community of M15 within the Study Area is the **M15b Typical sub-community**. M15b here consists mainly of a sward with variable amounts of the main characteristic species: *Calluna vulgaris*, *Molinia caerulea*, *Trichophorum germanicum* and *Erica tetralix*. The relative proportions of these species can be very varied within small areas, and each one of these species can attain local dominance. *Myrica gale* is also frequent and locally dominant within this shrubby canopy. Many other species are frequently to occasionally scattered in these M15b heaths: they include *Carex binervis*, *C. nigra*, *Narthecium ossifragum*, *Juncus squarrosus*, *J. effusus*, *Eriophorum angustifolium*, *Nardus stricta*, *Erica cinerea*, *Vaccinium myrtillus*, *Arctostaphylos uva-ursi*, *Anthoxanthum odoratum*, *Festuca ovina*, *Deschampsia flexuosa*, *Potentilla erecta*, *Galium saxatile* and *Blechnum spicant*. *Eriophorum vaginatum* is present only as sparse occasional tufts.
- 5.4.6 The M15b field layer often contains *M. caerulea* litter among and beneath the vascular plants, but in this same zone mosses can be common, with the following species found in varying abundances: *Sphagnum capillifolium*, *S. fallax*, *S. subnitens*, *S. palustre*, *Dicranum scoparium*, *Plagiothecium undulatum*, *Aulacomnium palustre*, *Hypnum jutlandicum*, *Pleurozium schreberi*, *Hylocomium splendens*, *Rhytidiadelphus squarrosus* and *Polytrichum commune*. *Cladonia* spp. (lichens) are locally abundant. *Sphagnum denticulatum*, *S. fallax* and *S. palustre* are locally frequent to abundant in wet depressions and soakways. *Sphagnum papillosum* and *S. magellanicum* are rare.
- 5.4.7 Only a few small stands of the **M15c Cladonia spp. sub-community** were found in this survey. M15c is drier than M15a and M15b and in the Study Area has a generally open and short cropped sward, with *Calluna vulgaris* the most abundant of the four main constituent species. Along with the *Calluna* tends to be some *Trichophorum germanicum*, *Molinia caerulea*, *Erica tetralix*, *Empetrum nigrum*, *Carex nigra*, *Juncus squarrosus*, *Vaccinium myrtillus*, *V. vitis-idaea* and *Nardus stricta*. The ground layer largely lacks the Sphagna of the wetter sub-communities (apart from sparse patches of *Sphagnum capillifolium*) and the Sphagna are generally replaced here by mixes of *Pleurozium schreberi*, *Hylocomium splendens*, *Hypnum jutlandicum*, *Racomitrium lanuginosum* and abundant *Cladonia* lichens including *Cladonia portentosa* and *C. uncialis*.
- 5.4.8 A few areas of the **M15d Vaccinium myrtillus sub-community** were also recorded within the Study Area. Like M15c this sub-community is at the drier end of the M15 continuum, but it differs from M15c in containing more graminoids. Many of the characteristic species remain common in this sub-community, but within the Study Area it is often distinguished by an abundance of *Juncus squarrosus*.
- 5.4.9 The M15 community as a whole has been impacted by burning, grazing and drainage.

M16 *Erica tetralix* – *Sphagnum compactum* wet heath

Communities/sub-communities recorded: M16d

GWDTE status – High; Annex I – Northern Atlantic wet heath or blanket bog; SBL – Upland heathland or blanket bog

- 5.4.10 This wet heath community is found on acid and oligotrophic mineral soils or shallow peats that are moist and at least seasonally waterlogged. M16 typically occurs on

sloping ground, although it can cover almost level ground too. In Scotland it extends onto thin ombrogenous peats at higher altitudes. Grazing and burning are important in maintaining the vegetation (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). This community is characteristically dominated by mixtures of *Erica tetralix*, *Calluna vulgaris*, *Trichophorum germanicum* and *Molinia caerulea*, but their proportions are very variable, being influenced by differences in the water regime and trophic state of the soils, and also by grazing and burning.

- 5.4.11 A few stands of M16 were recorded in this survey, on the peaty slopes to the west of the existing A9. All of these were of the **M16d *Juncus squarrosus* - *Dicranum scoparium* sub-community**. Here, the vegetation consists of a mix of abundant *Calluna vulgaris* and *Erica tetralix* along with *Juncus squarrosus* and *Nardus stricta*. The moss layer contains *Sphagnum capillifolium*, *S. compactum*, occasional *S. tenellum*, *Hylocomium splendens*, *Dicranum scoparium*, *Racomitrium lanuginosum*, *Hypnum jutlandicum* and *Aulacomnium palustre*.

5.5 Dry Heaths

- 5.5.1 There are some substantial areas of dry heath within the Study Area, particularly on higher, steeper and drier slopes with thinner soils to the west of the existing A9. The dry heath commonly forms mosaics and transitions with various mire, wet heath and grassland communities. The dry heath across the majority of the Study Area is overwhelmingly dominated by *Calluna vulgaris*. Six recognised dry heath NVC communities, and one intermediate community, have been identified within the Tomatin to Moy Study Area, as per below.

H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath

Communities/sub-communities recorded: H9, H9a, H9b, H9c

Annex I – European dry heaths; SBL – Upland heathland

- 5.5.2 This heath is a characteristic sub-shrub vegetation of acid and impoverished soils at low to moderate altitudes. It is normally found on very base-poor soils with a surface acidity generally of pH 3-4, highly oligotrophic and at least moderately free-draining, often excessively so, which have been derived from a wide variety of parent materials (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). The cool and wet climate has some influence on the floristics of this community, but much of its character derives from a combination of frequent burning and grazing. *Calluna vulgaris* is typically the most abundant plant in this community, often forming a fairly low and open canopy. No other sub-shrubs are consistently frequent throughout, although some can be quite common and locally abundant. The only other vascular constant is *Deschampsia flexuosa*, although even in open *Calluna* it often occurs only as sparse tufts, and under dense canopies it can almost disappear. Other herbs are also few and are of low cover. Bryophytes and lichens are rarely abundant and associated species diversity is low (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.5.3 A few stands of H9 were mapped within the Study Area. Three sub-communities were recorded: H9a *Hypnum cupressiforme* sub-community, H9b *Vaccinium myrtillus* – *Cladonia* spp. sub-community and H9c Species-poor sub-community.
- 5.5.4 Many stands are very similar in composition to species-poor H12 heath and H9-H12 intermediate heath (see community descriptions below). All stands of H9 here are completely dominated by *Calluna vulgaris* with only occasional *Deschampsia flexuosa*. Beneath the *Calluna* there is generally a sparse growth of *Hypnum jutlandicum*,

Polytrichum spp., *Hylocomium splendens*, *Dicranum scoparium*, *Racomitrium lanuginosum*, *Rhytidiadelphus* spp. and *Cladonia* spp.

H10 *Calluna vulgaris* – *Erica cinerea* heath

Communities/sub-communities recorded: H10a

Annex I – European dry heaths; SBL – Upland heathland

- 5.5.5 H10 *Calluna vulgaris* – *Erica cinerea* heath is a dry heath community that occurs widely throughout the more oceanic (western) parts of Scotland and around the east-central part of the Highlands. It is characteristic of acid to circumneutral and generally free-draining soils, and is typically dominated by *Calluna vulgaris*. *Erica cinerea* is another constant but is generally subordinate to *C. vulgaris*. H10 is commonly found in zonation and mosaics with grasslands, other heath types and mire communities (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.5.6 H10 heath is sparse within the Study Area, generally being found on steeper sloping ground and thin soils, and all stands aligning with the **H10a Typical sub-community**. In these areas *Calluna vulgaris* is the canopy dominant and *Erica cinerea* is also abundant, and co-dominant in places. More occasional within H10a here are *Vaccinium myrtillus*, *V. vitis-idaea*, *Arctostaphylos uva-ursi*, *Luzula multiflora* and *Blechnum spicant*. The ground layer is a carpet of mosses: typically *Hylocomium splendens*, *Pleurozium schreberi*, *Racomitrium lanuginosum*, *Dicranum scoparium*, *Hypnum jutlandicum* and *Cladonia* spp.

H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath

Communities/sub-communities recorded: H12, H12a, H12b, H12c

Annex I – European dry heaths; SBL – Upland heathland

- 5.5.7 H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath is a common sub-shrub community of acidic to circumneutral, free-draining mineral soils throughout the cold and wet sub-montane zone, generally between 200m and 600m above sea level. H12 is generally dominated by *Calluna vulgaris* although the cover of this species can be open and degenerate. *Vaccinium myrtillus* is constant, though it is usually subordinate to *C. vulgaris*. The ground layer is generally characterised by bulky mosses (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). H12 heaths are rather uniform and they cover extensive areas throughout large parts of Scotland.
- 5.5.8 Within the Study Area the H12 vegetation consists of dense canopies of *C. vulgaris* with shoots of *V. myrtillus* and *V. vitis-idaea* where the *Calluna* is not overly dominant. There can also be other sub-shrubs, especially in heaths recovering after a fire. Herbs are usually inconspicuous below the canopy, and there is a dense carpet of pleurocarpous mosses including *Hylocomium splendens*, *Hypnum jutlandicum*, *Pleurozium schreberi* and *Rhytidiadelphus loreus*. Levels of grazing on this type heath vary considerably within the Study Area, with areas of light grazing containing large and leggy stands of *Calluna*, whereas intensively grazed areas have very short swards of close cropped *Calluna* (see Annex C – Photograph C29 and

- 5.5.9 Photograph C30).
- 5.5.10 The slopes to the west of the existing A9 have the most extensive cover of H12, where the topography of mounds, ridges and slopes provides the appropriate free-draining conditions, with wet heath and blanket bog often occupying the intervening depressions, flats and hollows.
- 5.5.11 All three sub-communities were recorded within the Study Area. Most stands are of the H12a *Calluna vulgaris* sub-community and H12b *Vaccinium vitis-idaea* – *Cladonia portentosa* sub-community; rarely there are some areas of the H12c *Galium saxatile* – *Festuca ovina* sub-community.
- 5.5.12 The vegetation of a considerable proportion of the H12a consists of little more than *Calluna vulgaris* over a lawn of pleurocarpous mosses with a few sprigs of *Vaccinium myrtillus* (which itself can be locally absent). Other typical associates in very variable abundances in H12a within the Study Area include *Vaccinium vitis-idaea*, *Erica cinerea*, *Deschampsia flexuosa*, *Festuca ovina*, *Agrostis capillaris*, *Nardus stricta*, *Galium saxatile*, *Pteridium aquilinum*, *Blechnum spicant*, *Luzula multiflora*, *Juniperus communis* and *Carex binervis*. The most common mosses here are *Hylocomium splendens*, *Hypnum jutlandicum*, *Pleurozium schreberi*, *Dicranum scoparium*, *Pseudoscleropodium purum*, *Racomitrium lanuginosum*, *Rhytidiadelphus triquetrus* and *R. loreus*. *Cladonia* spp. (lichens) are also quite frequent.
- 5.5.13 Stands of H12b within the study contain many of the species listed above but are distinguished by a noticeable abundance of *Vaccinium vitis-idaea* with some occasional *Empetrum nigrum* and *Arctostaphylos uva-ursi*; there is also a mossy carpet consisting largely of *Hylocomium splendens*.
- 5.5.14 Areas of H12c tend to have a shorter, grazed and more open sward of *Calluna* with an increased abundance of the graminoids listed above. In this sub-community relatively high levels of grazing have reduced the cover of the *Calluna* canopy, so that elements of U4 and U5 calcifugous grasslands have become established in the intervening spaces. This sub-community is usually associated with pastoral management.

H9 - 12 Intermediate heath

Annex I – European dry heaths; SBL – Upland heathland

- 5.5.15 There is a widespread and common type of heathland in Scotland that is often termed H9-12 intermediate heath as it does not fit readily within conventional NVC community codes or habitat descriptions. The H9-12 intermediate classification arises from the similarity of the vegetation both H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath and H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath but the vegetation does not allow the true classification of either. The canopy resembles that of H9 in being dominated by *Calluna vulgaris* with no accompanying dwarf shrub species, but the moss carpets are of the H12 type which is more developed and more floristically diverse than in H9.
- 5.5.16 This is a common type of heath within the Study Area. It is species-poor across its extent; the vascular cover is almost exclusively *Calluna vulgaris* with, at best, an extremely sparse and low cover of grasses (*Deschampsia flexuosa*/*Nardus stricta*/*Festuca ovina*) or other herbaceous associates (*Potentilla erecta*). The basal layer consists of carpets of bulky mosses, typically including *Hylocomium splendens*, *Hypnum jutlandicum*, *Pleurozium schreberi* and *Rhytidiadelphus loreus*, and sometimes *Cladonia* lichens too.

H16 *Calluna vulgaris* – *Arctostaphylos uva-ursi* heath

Communities/sub-communities recorded: H16

Annex I – European dry heaths; SBL – Upland heathland

- 5.5.17 H16 *Calluna vulgaris* – *Arctostaphylos uva-ursi* heath is a typical sub-shrub community of circumneutral to base-poor soils at moderate altitudes, and is generally found between 240m and 600m above sea level in the cold continental climate of the east-central Highlands, with especially good representation around Speyside (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). H16 is characterised by the relative abundance of *A. uva-ursi* alongside typical heath vegetation including *C. vulgaris*, and in lower abundances *Erica cinerea*. It is an important part of grouse moors in the east-central Highlands; in this area the vegetation type is most commonly a secondary heath developing after burning (Elkington *et al* 2001^{xi}; Averis *et al* 2004^x).
- 5.5.18 H16 was found in four places in the Study Area, all of these being within mixed and partly burned dry heath mosaics to the west of the existing A9. The H16 heaths here have the characteristic mix of *C. vulgaris* with extensive low, creeping mats of *A. uva-ursi*, dotted with *E. cinerea*, *Vaccinium vitis-idaea*, *Empetrum nigrum* and *Carex panicea*, and accompanied by variably extensive carpets of the pleurocarpous mosses *Hylocomium splendens*, *Pleurozium schreberi* and *Hypnum jutlandicum*. The lichen *Cladonia portentosa* is quite common here too.
- 5.5.19 The H16 heath within the Study Area is evidently transitory, occupying a middle to late stage in the succession from muirburn to restoration of the surrounding H12 *Calluna vulgaris* canopy. *Arctostaphylos uva-ursi* is evidently able to take advantage of the temporarily open conditions and form its distinctive extensive mats.

H18 *Vaccinium myrtillus* – *Deschampsia flexuosa* heath

Communities/sub-communities recorded: H18a

Annex I – European dry heaths; SBL – Upland heathland

- 5.5.20 H18 *Vaccinium myrtillus* – *Deschampsia flexuosa* heath is typical of moist but free draining acid to neutral mineral soils, humic rankers and dry peats over steeper slopes at moderate to high altitudes (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Averis *et al* 2004^x). H18 includes moss-rich and grassy sub-shrub vegetation in which *V. myrtillus* is the most frequent and generally the most abundant ericoid (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). H18 can be a near-natural heath as in the montane zone, or one that is clearly anthropogenic as seen at lower altitudes where it is evidently a derivative of H12 *Calluna vulgaris* – *Vaccinium myrtillus* heaths that have been burned and then grazed too hard to allow *Calluna vulgaris* to re-establish (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Averis *et al* 2004^x).
- 5.5.21 Only a few small patches of H18 heath were recorded within the Study Area. All of these are of the **H18a *Hylocomium splendens* – *Rhytidiadelphus loreus* sub-community**. This heath is identified by a mossy sward in which the shoots of *Vaccinium myrtillus* are the vascular dominant. The bryophytes are typically pleurocarpous with an assemblage of *Rhytidiadelphus loreus*, *Hylocomium splendens*, *Hypnum jutlandicum* and *Pleurozium schreberi*. Within the Study Area, along with the *V. myrtillus*, there is also abundant *Vaccinium vitis-idaea*; there is little to no *Calluna vulgaris*.

H21 - *Calluna vulgaris* – *Vaccinium myrtillus* – *Sphagnum capillifolium* heath

Communities/sub-communities recorded: H21a

Annex I – European dry heaths; SBL – Upland heathland

- 5.5.22 The H21 community generally has a mixed canopy of sub-shrubs, usually 30-50cm high, with a damp layer of luxuriant bryophytes. *Calluna vulgaris* is usually the dominant ericoid, although *Vaccinium myrtillus* can also be common. Bryophytes form an extensive and lush carpet; particularly distinctive is the high frequency and local abundance of *Sphagnum capillifolium* (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}). This heath is highly characteristic of fragmentary humic soils in situations with a cool but equable climate and a consistently shady and humid atmosphere. It is widespread at low to moderate altitudes in upland Britain. It is found mainly on steep, shady slopes of north-west to easterly aspect, often with rock outcrops (Rodwell (Ed) *et al* 1991ⁱⁱⁱ; Elkington *et al* 2001^{xi}).
- 5.5.23 H21 heath occurs very frequently within the Study Area, particularly on the *Calluna*-clad slopes to the west of the existing A9 where it is in mosaics with the other *Calluna* dominated heaths and as mounds within M19 *Calluna vulgaris* – *Eriophorum vaginatum* mire. All stands are of the **H21a *Calluna vulgaris* - *Pteridium aquilinum* sub-community**.
- 5.5.24 The vegetation is typically species-poor and consists of dominant rank *Calluna vulgaris* with occasional shoots of *Vaccinium myrtillus* and some *Deschampsia flexuosa* over an extensive carpet of *Sphagnum capillifolium* mixed with the pleurocarpous mosses *Hylocomium splendens*, *Hypnum jutlandicum*, *Rhytidiadelphus loreus*, *Plagiothecium undulatum* and *Pleurozium schreberi*.

5.6 Calcifugous Grasslands and bracken-dominated vegetation

- 5.6.1 Calcifugous grasslands are common throughout the Study Area, forming extensive areas as well as mosaics with other open habitat types. These grasslands make up the largest areas of rough grazing and tend to be found on thinner dry to damp soils.

U2 *Deschampsia flexuosa* grassland

Communities/sub-communities recorded: U2, U2a

- 5.6.2 This grassland is characteristic of base poor soils that are free draining but not parched and are sometimes quite moist. It occurs through the upland fringes and in moderately oceanic parts of the lowlands. The community is often seen in close association with some heaths and mires, and can grade into them. *Deschampsia flexuosa* grassland comprises swards in which often tussocky *D. flexuosa* is the obvious dominant with a number of sparse associates (Rodwell *et al* 1992ⁱⁱⁱ). Many stands of U2 grassland have evidently been derived from some sort of disturbance in previous heath, mire or woodland, and the community often appears to be transitional post-disturbance vegetation (Averis *et al* 2004^x).
- 5.6.3 A number of relatively small stands of U2 are present within the Study Area. Some of these are stands of secondary vegetation where the community exists as result of recolonization of plantation clear felled areas; these areas were classified to NVC community level only. There are also some stands away from felled plantations; all of

these belong to the more graminoid-rich **U2a *Festuca ovina* – *Agrostis capillaris* sub-community** (the other sub-community is more heathy).

5.6.4 The areas of U2a are typically dominated by *Deschampsia flexuosa*, and the frequent associates within the Study Area include *Agrostis capillaris*, *Nardus stricta*, *Holcus mollis* and *Galium saxatile*; one stand in the southern part of the Study Area also contains frequent sprigs of *Vaccinium vitis-idaea*.

5.6.5 Underneath the grasses bryophytes are common, the most abundant species being *Rhytidiadelphus* spp., *Hylocomium splendens* and *Pleurozium schreberi*.

U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland

Communities/sub-communities recorded: U4, U4a, U4b, U4d, U4e

5.6.6 The U4 *Festuca ovina* - *Agrostis capillaris* - *Galium saxatile* grassland is a form of predominately upland grassland of well-drained, acidic and base-poor mineral soils throughout the wet and cool regions of north-west Britain where it dominates extensive areas of pastureland (Rodwell *et al* 1992ⁱⁱⁱ; Cooper 1997^{xii}). Throughout this geographic range the community can often be found forming a distinctive component of larger mosaics of grasslands, heaths, and mires.

5.6.7 U4 grassland is generally identified by the presence of an often close-cropped, grass-rich sward dominated by various combinations of *A. capillaris*, *F. ovina* and *Anthoxanthum odoratum*, with *G. saxatile* and *Potentilla erecta* consistent associates. A well-developed moss layer is also characteristic, but in the U4b sub-community described below it may be limited by the dense, relatively productive sward of grasses.

5.6.8 U4 is the most widespread and extensive community along the length of the Study Area. It covers both extensive areas that are used for grazing and smaller discrete patches in mosaics with mire, heath and other grassland communities. In the latter case the U4 grasslands often occupy the best-drained situations that are grazed by sheep. Two sub-communities are widespread within the Study Area (U4a and U4b), and a further two (U4d and U4e) were recorded rarely, as described further below.

5.6.9 Overall, the stands of U4 within the Study Area tend to have variable amounts of the grasses *A. capillaris*, *F. ovina*, *H. lanatus* and *A. odoratum*, and the mosses *Rhytidiadelphus squarrosus*, *R. loreus*, *Pseudoscleropodium purum*, *Hylocomium splendens* and *Pleurozium schreberi*. Typical quantities of these species and associate species differ between the respective sub-communities. A number of U4 grasslands also contain scattered trees of various species, particularly *Betula* spp. and *Pinus sylvestris*.

5.6.10 The **U4a Typical sub-community** is one of the most common types of U4 within the Study Area. It is mostly relatively species-poor and it has no distinguishing species. Along with the above grasses the sward is often thick with mosses; and *Galium saxatile* and *Potentilla erecta* are very common. Other occasional associates include *Nardus stricta*, *Juncus effusus*, *J. squarrosus*, *Deschampsia cespitosa*, *D. flexuosa*, *Calluna vulgaris*, *Plantago lanceolata*, *Conopodium majus*, *Pedicularis sylvatica*, *Luzula campestris*, *L. multiflora*, *Euphrasia* spp., *Viola riviniana*, *Trifolium repens*, *Campanula rotundifolia*, *Succisa pratensis*, *Veronica serpyllifolia*, *Rumex acetosella*, *R. acetosa*, *Lotus corniculatus* and the mosses *Brachythecium rutabulum*, *Rhytidiadelphus triquetrus* and *Dicranum scoparium*.

5.6.11 Within the Study Area, U4a is generally associated with extensive grazing. It is commonly associated with dry heath, from which it is probably derived through the influence of grazing in places. U4 also occurs on raised, free-draining mineral mounds

protruding through wet heath, blanket bog and other forms of mire. Moderate levels of grazing are responsible for the maintenance of this sub-community; under more intensive levels of grazing around the farmsteads, potentially in association with liming and/or fertiliser applications, the U4b sub-community described below is more common.

- 5.6.12 The **U4b *Holcus lanatus* - *Trifolium repens* sub-community** is the most common form of U4 within the Study Area. It is common around the more managed farmland and is virtually a ubiquitous strip along the road verges of the existing carriageway. Some agricultural improvement is evident in the U4b sub-community; this is most apparent in the presence of a relatively productive, broadleaved grass sward including abundant *Holcus lanatus*. The abundance of *Trifolium repens* within the sward also serves as a characteristic point of distinction.
- 5.6.13 These two species, along with lesser amounts of *A. capillaris* and *A. odoratum*, are a feature of these areas. This semi-improved U4b grassland also sees the appearance of species such as *Poa pratensis*, *Cynosurus cristatus*, *Lolium perenne*, *Achillea millefolium*, *Plantago lanceolata*, *Bellis perennis*, *Ranunculus repens*, *R. acris*, and occasional patches of *Urtica dioica* and *Rumex obtusifolius* where there is localised enrichment of the soil. Valuable as pasture, this sub-community is managed by relatively continuous grazing, although other treatments such as ploughing and fertiliser/manure application may have been applied in the past to bring it into its semi-improved condition. In areas where this grassland has been neglected, or ungrazed for a period of time, there can be some invasion by large tussock-forming grasses such as *Arrhenatherum elatius* and *Dactylis glomerata*, representing a transition towards MG1 *Arrhenatherum elatius* grassland.
- 5.6.14 Rarely some stands of the **U4d *Luzula multiflora* - *Rhytidiadelphus loreus* sub-community** were noted. These are mossy areas that contain many of the community constants as described above, but also with much *Luzula multiflora* and *Deschampsia cespitosa*.
- 5.6.15 Two small areas of the **U4e *Vaccinium myrtillus* – *Deschampsia flexuosa* sub-community** were recorded. These are also mossy stands of vegetation and are characterised by scattered sprigs of *Vaccinium vitis-idaea* along with some *Calluna vulgaris*.

U5 *Nardus stricta* – *Galium saxatile* grassland

Communities/sub-communities recorded: U5, U5a, U5b, U5d

- 5.6.16 U5 grassland tends to be found on damp mineral soils which have peaty upper horizons. U5 typically occupies slopes where the depth and wetness of the soil are intermediate between those of the drier podsol under U4 grasslands and wet shallow peats found under U6 grassland. The underlying rock can be anything from acid to basic, but the soils are generally acidic (Rodwell *et al* 1992ⁱⁱⁱ; Averis *et al* 2004^x). U5 is common on the higher hill slopes of the cool, wet north and west of Britain (Rodwell *et al* 1992ⁱⁱⁱ; Cooper, 1997^{xii}). It is also commonly found on well-drained but moist alluvial soil along the margins of streams (Averis *et al* 2004^x).
- 5.6.17 The sward of the U5 community is dominated by *Nardus stricta* in association with the same main species as listed above for U4, albeit at a lower cover. The prominence of *N. stricta* defines U5 and the associated flora defines the sub-communities.
- 5.6.18 U5 grassland is widespread throughout the Study Area. It is commonly found in mosaics with other calcifugous grasslands and dry heaths. Three sub-communities of U5 were

recorded within the Study Area. U5a is by far the most abundant of these, but there are some stands of U5b and U5d, as described below.

- 5.6.19 The **U5a Species-poor sub-community** lacks any of the species distinctive to the other sub-communities; U5a is readily identified on this basis alone. The sward is dominated almost exclusively by *Nardus stricta*, and the sub-community is visible from a distance on the basis of its light appearance. *Agrostis capillaris* and *Anthoxanthum odoratum* can be locally frequent to abundant, and the following species are generally rare to occasional: *Festuca ovina*, *Juncus squarrosus*, *Galium saxatile*, *Viola riviniana*, *Potentilla erecta*, *Carex binervis*, *Pedicularis sylvatica*, *Molinia caerulea* and *Deschampsia cespitosa*. Mosses such as *Hypnum jutlandicum*, *Hylocomium splendens* and *Pleurozium schreberi* are very common.
- 5.6.20 Areas of the **U5b *Agrostis canina* – *Polytrichum commune* sub-community** were also quite frequently recorded. These stands of *Nardus stricta* grassland have a high cover of *Polytrichum commune* within the sward; *Juncus squarrosus* is also frequent.
- 5.6.21 The **U5d *Calluna vulgaris* – *Danthonia decumbens* sub-community** was also recorded. This form of U5 within the Study Area is distinguished by containing a scattering of *Calluna vulgaris*, *Vaccinium vitis-idaea* and *Erica tetralix*. Rarely there are some scattered bushes of *Juniperus communis*.

U6 *Juncus squarrosus* – *Festuca ovina* grassland

Communities/sub-communities recorded: U6, U6a, U6b, U6c, U6d, U6z

GWDTE Status – Moderate

- 5.6.22 U6 *Juncus squarrosus* - *Festuca ovina* grassland is characteristic of moist peats and peaty mineral soils, almost always base-poor and infertile, over gentle slopes and plateaux at higher altitudes (400m to 800m) in the cool and wet north and west of Britain (Rodwell *et al* 1992ⁱⁱⁱ; Cooper, 1997^{xii}). U6 is often a secondary vegetation type, strongly encouraged by particular kinds of grazing and burning treatments in damper upland pastures and on the drying fringes of blanket mires. The spread of *Juncus squarrosus* in upland pastures tends to be encouraged where uncontrolled heavy and selective grazing has been applied over rather ill-drained ground (Rodwell *et al* 1992ⁱⁱⁱ; Cooper, 1997^{xii}).
- 5.6.23 U6 is widely scattered in the Study Area, as generally small stands, often in mosaics and transitions with the local mire and wet heath communities. U6 often appears to have been derived from these habitats by grazing. U6 was often recorded to community level only due to the small size of habitat patches. However, all four sub-communities were recorded, as was another non-NVC variant of U6, as described below.
- 5.6.24 As would be expected *Juncus squarrosus* is the dominant species in each stand, irrespective of sub-community. It is frequently accompanied by varying amounts of the grasses *Festuca ovina*, *Nardus stricta*, *Agrostis* spp. and *Anthoxanthum odoratum*, and the herb *Galium saxatile*.
- 5.6.25 The most common sub-community here is the **U6d *Agrostis capillaris* – *Luzula multiflora* sub-community**. This is the most grass rich form of U6. It is essentially very similar to the U4a *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland. Typical sub-community as described above but with abundant *J. squarrosus* in the sward.

- 5.6.26 A number of damper examples of the U6 community on more peaty soils and around mires correspond to the **U6a *Sphagnum* sub-community**. U6a is common here as small stands and is characterised by an abundance of Sphagna, particularly *Sphagnum fallax*, *S. capillifolium* and *S. palustre* but also some *S. cuspidatum* and *S. subnitens*. There can be occasional tussocks of *Eriophorum vaginatum* and some *Erica tetralix* and *Aulacomnium palustre*.
- 5.6.27 The other sub-communities are much rarer within the Study Area. There is a stand of the **U6b *Carex nigra* - *Calypogeia azurea* sub-community** in the region of Dalmagarry Farm. Here, the stand consists of very heavily grazed *Juncus squarrosus* with abundant *Luzula multiflora* and occasional *Nardus stricta*, *Carex nigra*, *C. binervis*, *Festuca ovina*, *Anthoxanthum odoratum*, *Polygala serpyllifolia*, *Galium saxatile*, some sparse *Trichophorum germanicum* and some very short, heavily browsed *Calluna vulgaris*. Mosses are common and include *Sphagnum capillifolium*, *Hylocomium splendens*, *Pleurozium schreberi* and *Aulacomnium palustre*.
- 5.6.28 A single small stand of the **U6c *Vaccinium myrtillus* sub-community** was recorded where the sward also included *Deschampsia flexuosa* and some sub-shrubs.
- 5.6.29 A further variant of U6, which is not described by any of the existing sub-communities of U6, was termed **U6z**. This is a heathy form of U6 in which the *Juncus squarrosus* is accompanied by frequent *Calluna vulgaris* and *Erica tetralix*. The associated moss layer contains widespread *Sphagnum capillifolium* and frequent *Hylocomium splendens* and *Pleurozium schreberi*.

U20 *Pteridium aquilinum* – *Galium saxatile* community

Communities/sub-communities recorded: U20, U20a

- 5.6.30 The U20 *Pteridium aquilinum* – *Galium saxatile* community occurs on well aerated and often moist soils that are base-poor to circumneutral (Rodwell *et al* 1992ⁱⁱⁱ; Cooper, 1997^{xii}). *Pteridium aquilinum* is the sole dominant and is overwhelmingly abundant in some stands. This is a community of mostly low ecological value.
- 5.6.31 This community is infrequent within the Study Area and it extends over small areas. It was mostly recorded to NVC community level but some areas were mapped as the **U20a *Anthoxanthum odoratum* sub-community** in which *P. aquilinum* grows abundantly with a grassy assemblage floristically similar to the U4 community described above.

5.7 Mesotrophic Grasslands

MG1 *Arrhenatherum elatius* grassland

Communities/sub-communities recorded: MG1

- 5.7.1 MG1 is essentially ungrazed grassland in which coarse-leaved tussock grasses are dominant in the sward. It is found on circumneutral and free draining soils throughout the British lowlands. Key to its development is the irregularity or absence of grazing (Rodwell *et al* 1992ⁱⁱⁱ).
- 5.7.2 MG1 is infrequently scattered throughout the Study Area, in small stands. It tends to occur along road and track sides, road embankments (particularly those that have been more neglected and unmown) and on ungrazed riverbanks. It is often found in mosaics

with other grasslands such as unmanaged U4b; in places its transition with U4b probably represents U4b developing into MG1 as a result of the cessation of grazing.

- 5.7.3 The MG1 vegetation within the Study Area generally lacks abundant *Arrhenatherum elatius*, although this species is present. More commonly the vegetation is a co-dominant mix of *Dactylis glomerata* and *Holcus lanatus*; occasionally there is some *Juncus effusus*, *Poa trivialis* and *Anthriscus sylvestris*.

MG6 *Lolium perenne* – *Cynosurus cristatus* grassland

Communities/sub-communities recorded: MG6

- 5.7.4 MG6 is the major permanent pasture type on moist but freely draining circumneutral brown soils in lowland Britain, and is often found in enclosed farmland. It has usually been subjected to some form of agricultural improvement such as fertiliser application and drainage, and many stands have been derived from historical ploughing and re-seeding (Rodwell *et al* 1992ⁱⁱⁱ).
- 5.7.5 In the Study Area, MG6 is present within agriculturally improved fields, particularly the enclosed fields at Dalmagarry. These fields are used for hay/silage or livestock grazing, and have probably been treated with periodic fertiliser applications. The vegetation is dominated by a sward of *Lolium perenne*, with occasional *Cynosurus cristatus*, *Holcus lanatus*, *Achillea millefolium*, *Trifolium repens*, *Bellis perennis*, *Plantago lanceolata*, *Luzula campestris*, *Poa pratensis* and, rarely, some tussocks of *Juncus effusus*.
- 5.7.6 In some places *Holcus lanatus* attains such local abundance that the community grades into the U4b grassland *Holcus lanatus* - *Trifolium repens* sub-community. The MG6 community is maintained by agricultural practices and intensive grazing.

MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland

Communities/sub-communities recorded: MG9

GWDTE Status – Moderate

- 5.7.7 MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland is characteristic of permanently moist, gleyed and periodically inundated circumneutral soils across large areas of the British lowlands. It can exist on level to moderately sloping ground in areas of pasture or meadow, but can also be found along woodland rides and fen/wetland margins. MG9 typically contains a coarse and tussocky sward dominated by *D. cespitosa* (Rodwell *et al* 1992ⁱⁱⁱ; Cooper, 1997^{xii}).
- 5.7.8 MG9 is patchily present as small stands in and around wetter parts of the Study Area; it is mostly in mosaics with MG10 and M23 *Juncus*-dominated vegetation and is often grazed by livestock. It is often included within mapped mosaic polygons on account of its patchy distribution.
- 5.7.9 The vegetation is dominated by *Deschampsia cespitosa*, and *Holcus lanatus* is locally abundant between the tussocks. Within the sward established by these two grasses, other species are occasional to locally frequent, including *Agrostis capillaris*, *A. canina*, *Festuca* spp., *Carex nigra*, *Juncus acutiflorus*, *J. effusus*, *Nardus stricta*, *Anemone nemorosa*, *Ranunculus ficaria*, *R. repens*, *Primula vulgaris*, *Ajuga reptans*, *Valeriana officinalis*, *Chamerion angustifolium*, *Rumex acetosa*, *R. obtusifolius*, *Potentilla erecta*, *Prunella vulgaris*, *Epilobium palustre*, *Cirsium palustre* and the mosses *Brachythecium rutabulum*, *Calliergonella cuspidata*, *Kindbergia praelonga* and *Rhytidiadelphus squarrosus*.

MG10 *Holcus lanatus* – *Juncus effusus* rush-pasture

Communities/sub-communities recorded: MG10a

GWDTE Status – Moderate

- 5.7.10 MG10 is a form of rush-pasture characteristic of areas with strongly impeded drainage over a wide range of usually acid to neutral mineral soils on level to gently sloping ground (Rodwell *et al* 1992ⁱⁱⁱ; Cooper, 1997^{xii}). This community requires consistently high soil moisture (Rodwell *et al* 1992ⁱⁱⁱ). It occurs across most of the British lowlands, with the typical sub-community being particularly prominent towards the north and west. Although found on various soil types including brown earth and calcareous earth throughout its range, this habitat can also have close associations with various types of mire vegetation and can form significant parts of rush-dominated mire mosaics in areas of suitably moist soils.
- 5.7.11 MG10 is characterised by an assemblage in which tussocks of *Juncus effusus* are abundant in species-poor swards of *Holcus lanatus*, *Agrostis stolonifera*, *Poa trivialis* and forbs including *Ranunculus acris*, *R. repens*, *Rumex acetosa*, *Cardamine pratensis* and *Trifolium repens*. Mosses such as *Brachythecium rutabulum*, *Calliergonella cuspidata*, *Kindbergia praelonga* and *Rhytidiadelphus squarrosus* often form diffuse wefts over the damp soil and among the larger plants (Rodwell *et al* 1992ⁱⁱⁱ; Cooper, 1997^{xii}).
- 5.7.12 MG10 is very common within the Study Area. It forms both extensive and small stands, mostly within wetter hollows, flow lines and poorly drained parts of fields where *Juncus effusus* has taken over (e.g. within U4 and MG6 grasslands). It also occurs in mosaics with other wet grasslands (MG9) and *Juncus* spp. mires (M6 and M23).
- 5.7.13 The vegetation within the Study Area belongs to the **MG10a Typical sub-community**. This reflects both the species-poor nature of the vegetation as well as absence of the species characteristic of the other sub-communities (i.e. no *Juncus inflexus* or *Iris pseudacorus*). The vegetation is typically dominated by dense tussocks of *J. effusus*, with frequent to occasional *H. lanatus* and tussocks of *Deschampsia cespitosa* and the typical species already listed for the community as a whole. Other occasional associates include *Rumex obtusifolius*, *R. acetosa*, *Plantago lanceolata*, *Cardamine pratensis*, *Agrostis stolonifera*, *Glyceria* sp., *Ranunculus repens* and *Cirsium palustre*. The sward throughout the Study Area is generally species-poor.

5.8 Swamps

Communities/sub-communities recorded: S9, S9a

SBL – Upland flushes, fens and swamps

- 5.8.1 S9 swamp is generally a community of the north and west of Britain. The vegetation is typically a swamp of shallow to moderately deep, mesotrophic to oligotrophic standing waters with organic substrates. It also occurs more fragmentarily in peat cuttings (Rodwell *et al* 1995ⁱⁱⁱ). The S9 community is readily recognised by the tall, dense growth of *Carex rostrata* rooted in shallow water. Separation from other communities in which *C. rostrata* is present is based on its almost exclusive dominance in this community and the low cover and diversity of associates.
- 5.8.2 S9 was recorded rarely within the Study Area, and only as very small stands, generally of the **S9a *Carex rostrata* sub-community**. Here, S9a is identified by the dominance of

C. rostrata and absence or extremely low cover and numbers of associates. Many stands are of *C. rostrata* only, in shallow water.

5.9 Vegetation of Open Habitats

OV24 *Urtica dioica* – *Galium aparine* community

Communities/sub-communities recorded: OV24

- 5.9.1 OV24 is a tall-herb weed community that occurs widely throughout lowland Britain; under suitable conditions it is also found in the upland fringes. It typically occurs on disturbed, nutrient-rich soils and is frequently found around dumps of rich soil, dung or farm waste, in neglected gardens and around abandoned buildings, on waste land, and on disturbed verges and tracks (Rodwell *et al* 2000ⁱⁱⁱ).
- 5.9.2 Within the Study Area there are some small areas of OV24, usually found on disturbed or nutrient-enriched lowland ground, or by tracks. The vegetation is dominated by the characteristic species, *Urtica dioica* and *Galium aparine*.

OV25 *Urtica dioica* – *Cirsium arvense* community

Communities/sub-communities recorded: OV25

- 5.9.3 OV25 is a tall-herb weed community. It is found throughout lowland Britain, on disturbed, nutrient-rich soils, usually where there are patches of bare or lightly covered ground in which *Cirsium* spp. can establish themselves. It is typically found in poorly managed meadows, on abandoned arable land or waste land, on disturbed verges and tracks, and in cleared woodland or young plantations (Rodwell *et al* 2000ⁱⁱⁱ).
- 5.9.4 OV25 was recorded rarely in this survey, mainly as small stands along roadsides or as patches of vegetation within intensively grazed grassland that shows signs of localised ground enrichment. The OV25 vegetation within the Study Area typically has dominant *Urtica dioica* and *Cirsium arvense*. *Rumex obtusifolius* is a frequent associate.

OV27 *Chamerion angustifolium* community

Communities/sub-communities recorded: OV27, OV27a

- 5.9.5 OV27 *Chamerion angustifolium* tall-herb vegetation is a community that occurs on damp, fertile, disturbed soils in woodlands, on heaths and along road verges and railway embankments (Rodwell *et al* 2000ⁱⁱⁱ). It is also common in regenerating conifer plantation clear-fell areas. The OV27 community is marked by the dominant tall growth of *C. angustifolium*.
- 5.9.6 A number of patches of OV27, including the **OV27a *Holcus lanatus* – *Festuca ovina* sub-community**, were recorded within the Study Area, mainly along road and railway embankments. Apart from some *Holcus lanatus*, no distinctive associates are present in these stands because the tall thick growth of *C. angustifolium* suppresses other plant growth.

5.10 Non-NVC Communities & Categories

- 5.10.1 A number of non-NVC vegetation types or features were mapped during the survey. These were classified as follows. Codes used in Figure 12.2a-k are given in parentheses:
- conifer plantation (CP)
 - forestry plantation clear fell (CF)
 - *Juncus effusus* acid grassland community (Je)
 - private gardens/lawns (PG)
 - privet *Ligustrum vulgare* (Pr)
 - bare ground, bare rock, shingle (BG)
 - disturbed ground (DG)
 - standing water (SW)
 - running water (RW)
 - buildings and associated driveways (BD)
- 5.10.2 The plantation areas are generally unremarkable in terms of their flora and species composition. In dense and mature plantations, of *Picea sitchensis* in particular, or where planted *P. sylvestris* has not been thinned, there is often no ground flora except for some scattered mosses; the ground instead is blanketed in woody debris and conifer needles.
- 5.10.3 These dense woodland plantation areas (classed as 'CP'), along with areas of bare/disturbed ground, a stand of *Ligustrum vulgare* and buildings and associated gardens/lawns are floristically poor, not semi-natural, and of negligible natural botanical importance. These non-NVC types recorded in the Study Area are therefore not discussed further within this report.
- 5.10.4 A number of forested areas within the Study Area have been clear-felled in the recent past; some of these areas are now re-vegetating with secondary semi-natural vegetation. The majority of re-vegetating clear-fell areas are denoted by the '>' symbol within Figure 12.2a-k and these also detail the community to which the clear-felled area is developing towards, e.g. 'CF > M19' indicates that mire vegetation resembling the M19 community is recolonising the clear-fell area.
- 5.10.5 The other bulleted non-NVC vegetation type above, Je, is described below.

***Juncus effusus* (Je) acid grassland community**

- 5.10.6 The Je acid grassland community is present within the Study Area as vegetation in which very dominant and tall tussocks of *J. effusus* grow abundantly among shorter 'acid grassland' swards including frequent to occasional *Agrostis capillaris*, *Holcus lanatus*, *Rumex acetosa*, *Potentilla erecta*, *Galium saxatile*, *Hylocomium splendens*, *Pleurozium schreberi* and *Rhytidiadelphus squarrosus*. This vegetation does not fit into any NVC community as it lacks the wetland element of M6 and M23 *Juncus* mires and has a more acidophilous flora than MG10 *Juncus effusus* rush-pasture. It is therefore classed separately.
- 5.10.7 This vegetation is of limited botanical interest, but in light of the SEPA classification of potential GWDTEs the non NVC type Je should also qualify for potential GWDTE status.

The classification of moderate sensitivity is in line with other similar rushy grassland communities (e.g. MG10); see below.

6. Evaluation of Nature Conservation Importance and Other Sensitivities

6.1 Overview

- 6.1.1 The NVC communities recorded have been compared with two habitat classifications in order to inform the assessment of conservation importance:
- Habitats Directive (92/43/EEC) Annex I habitats
 - Scottish Biodiversity List (SBL) priority habitats
- 6.1.2 In addition, SEPA has classified a number of NVC communities as potentially dependent on groundwater (SEPA, 2014aⁱ, 2014bⁱⁱ). Many of the NVC communities on the list are very common habitat types across Scotland, and some are otherwise of low ecological value. Designation as a GWDTE does not therefore infer an intrinsic biodiversity value, and GWDTE status has not been used as a criteria to determine conservation importance. There is however a statutory requirement to consider GWDTEs and the data gathered during the NVC surveys has been used to inform this assessment (see Section 6.5 and Chapter 10 Geology Soils and Groundwater).
- 6.1.3 A summary of all NVC communities recorded and any respective sensitivity is provided in Table A7.1.

6.2 Annex I Habitats

Overview

- 6.2.1 A number of NVC communities correlate to various Annex I habitat types. However, the fact that an NVC community can be attributed to an Annex I type does not necessarily mean all instances of that NVC community constitute Annex I habitat. Its Annex I status can depend on various factors such as quality, extent, species assemblages, geographical setting, substrates and so on.
- 6.2.2 Using Joint Nature Conservation Committee (JNCC) Annex I habitat listings and descriptions¹, which have then been compared with survey results and field observations, the NVC communities within the Study Area which constitute Annex I habitat are shown in Table A6.1.

Table A6.1: Study Area Annex I Habitats

NVC Code	Community Name	Annex Code	I Annex I Title
W7, W7a, W7c	Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum woodland	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior
W19, W19a, W19b	Juniperus communis – Oxalis acetosella woodland	5130	Juniperus communis formations on

¹ <http://jncc.defra.gov.uk/page-1523>

NVC Code	Community Name	Annex Code	I Annex I Title
			heaths or calcareous grasslands
M2, M2b	Sphagnum cuspidatum / fallax bog pool community	7130	Blanket bog
M3	Eriophorum angustifolium bog pool community	7130	Blanket bog
M4	Carex rostrata - Sphagnum fallax mire	7140	Transition mires and quaking bogs
M10a	Carex dioica - Pinguicula vulgaris mire	7230	Alkaline fens
M15, M15a, M15b, M15c, M15d	Trichophorum germanicum – Erica tetralix wet heath	4010, or 7130	Northern Atlantic wet heaths with <i>Erica tetralix</i> , or blanket bog where peat depth is greater than 0.5m
M16d	Erica tetralix – Sphagnum compactum wet heath	4010, or 7130	Northern Atlantic wet heaths with <i>Erica tetralix</i> , or blanket bog where peat depth is greater than 0.5m
M17, M17a, M17b, M17c	Trichophorum germanicum – Eriophorum vaginatum blanket mire	7130	Blanket bog
M19, M19a, M19b, M19c	Calluna vulgaris - Eriophorum vaginatum blanket mire	7130	Blanket bog
M20, M20a	Eriophorum vaginatum blanket mire	7130	Blanket bog
M25, M25a, M25b	Molinia caerulea – Potentilla erecta mire	7130	Blanket bog, where peat depth is greater than 0.5m – M25a only
H9, H9a, H9b, H9c	Calluna vulgaris – Deschampsia flexuosa heath	4030	European dry heaths
H10a	Calluna vulgaris - Erica cinerea heath	4030	European dry heaths
H9-12	H9 to H12 Intermediate heath	4030	European dry heaths
H12, H12a, H12b, H12c	Calluna vulgaris – Vaccinium myrtillus heath	4030	European dry heaths
H16	Calluna vulgaris - Arctostaphylos uva-ursi heath	4030	European dry heaths
H18a	Vaccinium myrtillus – Deschampsia flexuosa heath	4030	European dry heaths
H21a	Calluna vulgaris – Vaccinium myrtillus – Sphagnum capillifolium heath	4030	European dry heaths

6.2.3 The locations of these Annex I habitat types are also shown on Figure 12.2a-k, in which all polygons containing an Annex I habitat type are shaded, irrespective of the percentage cover of Annex I habitat within that polygon. Each polygon is shaded according to the dominant Annex I type within the polygon; however, many polygons

contain multiple Annex I habitat types, so the communities listed should be cross-referenced to Table A6.1.

- 6.2.4 Further details on the inclusion or omission of certain NVC communities/sub-communities and/or Annex I types are also provided below.

91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*

- 6.2.5 This Annex I type comprises woods dominated by *Alnus glutinosa* and *Salix* spp. on floodplains in a range of situations from islands in river channels to low-lying wetlands alongside the channels. The habitat typically occurs on moderately base-rich, eutrophic soils subject to periodic inundation. Many such woods are dynamic, being part of a successional series of habitats. Their structure and function are best maintained within a larger unit that includes the open communities, mainly fen and swamp, of earlier successional stages. On the drier margins of these areas other tree species such as *Fraxinus excelsior* and *Ulmus* spp., may become abundant. In other situations the *Alnus glutinosa* woods occur as a stable component within transitions to surrounding dry-ground forest.
- 6.2.6 The ground flora is correspondingly varied. Some stands are dominated by tall herbs, reeds and sedges, with species such as *Urtica dioica*, *Phragmites australis*, *Carex paniculata* and *Filipendula ulmaria*. Other stands have lower-growing communities with *Ranunculus repens*, *Galium palustre*, *Chrysosplenium oppositifolium* and *Caltha palustris*.
- 6.2.7 In the UK this Annex I habitat falls mainly within the W2a, W5, W6 and W7 NVC types. Riparian trees are excluded from the Annex I type except where these form part of a wider network of alluvial woodland and wetland communities.
- 6.2.8 A few areas of W6 and W7 woodland are present within the Study Area, although all stands are relatively small and often isolated and fragmented. Each polygon in which these communities have been recorded has been assessed on a case-by-case basis, to ascertain if it may be classified as this Annex I type, based on community size, location, flora etc. Thin strips of riparian trees or stands (possibly of planted origin) away from floodplains or the appropriate setting for this Annex I type have been excluded.
- 6.2.9 As a result of this process no stands of W6 woodland and just two stands of W7 woodland within the Study Area were considered to possibly belong to this Annex I habitat type. Figure 12.2a-k shows the polygons that have been attributed to the Annex I type 91E0 alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*.

91C0 Caledonian forest

- 6.2.10 Caledonian forest comprises relict indigenous pine forests of *Pinus sylvestris*, and associated *Betula* spp. and *Juniperus communis* woodlands of northern character. The majority of this habitat corresponds to NVC type W18 *Pinus sylvestris* – *Hylocomium splendens* woodland.
- 6.2.11 W18 woodland is extensive within the Study Area, but all of it is of planted origin. Thinning of the canopy over time has allowed the development of a ground flora in many stands, but because of their planted origin none of the W18 within the Study Area has been deemed a candidate area for Annex I H91C0 Caledonian forest status.

91D0 Bog woodland

- 6.2.12 Under certain combinations of physical circumstances, scattered trees can occur across the surface of a bog in a relatively stable ecological relationship as open woodland, without the loss of bog species. This true bog woodland is much rarer than the progressive invasion of bogs by trees through natural colonisation or afforestation following changes in the drainage pattern which leads eventually to the loss of the bog vegetation.
- 6.2.13 Secondary *Betula* spp. woodland on degraded bogs, and woodland encroachment resulting from falling water tables, are excluded from the Annex I definition. A few NVC types (e.g. W3, W4c and W18) could fall within this Annex I type, but none of these communities within the Study Area were considered to be Annex I Bog woodland. Within the Study Area, trees found within mire habitats were due to *Betula* spp. and scrub invasion of drying mire surfaces.

91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles

- 6.2.14 This habitat type comprises a range of woodland types dominated by mixtures of *Quercus* spp. and *Betula* spp. It is characteristic of base-poor soils in areas of at least moderately high rainfall in northern and western parts of the UK. The habitat corresponds particularly to NVC types W10e, W11, W16b and W17.
- 6.2.15 Extensive areas of W11 and W17 were recorded within the Study Area, but they were not deemed to be of Annex I status because they are birchwoods with little or no oak and they generally lack any characteristics such as a rich bryophyte assemblage which would refer to them as 'old sessile oak woods'.

5130 *Juniperus communis* formations on heaths or calcareous grasslands

- 6.2.16 In Scotland *Juniperus communis* is found on a wide range of acidic substrates supporting acidophilous plant communities. In many places these are thinly scattered bushes of *J. communis* among heathland or grassland, but where the *J. communis* has evidently been established for longer it thickens up to form patches of NVC type W19 *Juniperus communis* – *Oxalis acetosella* woodland. All records of W19 within the Study Area have been assigned to this Annex I type. Such vegetation is typically dominated by *J. communis*, with *Betula pubescens* often scattered throughout.

7130 Blanket bog

- 6.2.17 Annex I type 7130 Blanket bog correlates directly with a number of NVC communities within the Study Area such as the M17, M19 and M20 mires. However, 7130 Blanket bog can also include bog pool communities (M1-M3) where these occur within blanket mires such as M17-M20. As such M2 and M3 within the Study Area is also assigned to the blanket bog Annex I type, as it is typically associated with areas of M17, M19 and M20 mire.
- 6.2.18 M25a mire and M15² and M16 wet heaths can also fall within the 7130 Blanket bog Annex I type where the peat depth underlying these communities is greater than 0.5m. In the absence of detailed peat depth data for areas of M25a mire, these have also been classified as potential Annex I Blanket bog where the habitat patch resembles mire or is in a mosaic with other mire communities.

² Excluding the M15a *Carex panicea* sub-community, due to its flushed nature over shallower substrates.

- 6.2.19 M15 and M16 also fall under the 4010 Northern Atlantic wet heaths with *Erica tetralix* Annex I type, so these NVC communities do not need blanket bog status to be recognised as of Annex I conservation interest.

7140 Transition mires and quaking bogs

- 6.2.20 All examples of M4 *Carex rostrata* - *Sphagnum fallax* mire within the Study Area were assigned to the Annex I type Transition mires and quaking bogs. The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is intermediate between acid bog and alkaline fen.

7230 Alkaline fens

- 6.2.21 Alkaline fens consist of a complex assemblage of vegetation types characteristic of sites where there is tufa and/or peat formation with a high water table and a calcareous base-rich water supply. The core vegetation is short sedge mire. All examples of M10a mire in the Study Area fall within this Annex I habitat type.

4010 Northern Atlantic wet heaths with *Erica tetralix*

- 6.2.22 All examples of M15 and M16 wet heaths were included within the 4010 Northern Atlantic wet heaths category. However, as per above, in areas where peat depth is greater than 0.5m these areas could fall within the 7130 blanket bog classification.

4030 European dry heaths

- 6.2.23 European dry heaths typically occur on freely-draining, acidic to circumneutral soils with generally low nutrient content. Ericaceous dwarf shrubs dominate the vegetation. The most common dwarf shrub is *Calluna vulgaris*.
- 6.2.24 All dry heath in the Study Area is semi-natural and evidently derived from woodland or scrub through a long history of grazing and burning. The dry heath communities recorded – H9, H10, H12, H9-12, H16, H18 and H21 – all fall within this Annex I type. These NVC types can also be included within the Annex I type H4060 Alpine and Boreal heaths, but only where they are at higher altitudes and include arctic-alpine floristic elements. These communities within the Study Area are lower altitudinal examples so they all fall under the 4030 European dry heaths Annex I type.
- 6.2.25 The most common forms of dry heath in the Study Area, as noted in the community descriptions above, are species-poor, relatively botanically impoverished forms of *Calluna* dominated heath.

6.3 Scottish Biodiversity List Priority Habitats

- 6.3.1 The SBL is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. The SBL was published in 2005 to satisfy the requirement under Section 2(4) of The Nature Conservation (Scotland) Act 2004.
- 6.3.2 The SBL identifies habitats which are the highest priority for biodiversity conservation in Scotland: these are termed 'priority habitats'. Some of these priority habitats are quite broad and include several NVC types.

- 6.3.3 The relevant SBL priority habitat types (full descriptions of which can be found on the Biodiversity Scotland website³), and associated NVC types recorded within the Study Area are as follows:
- wet woodland: W4b, W4c, W6 and W7
 - upland birchwoods: W4 (at community level), W11 and W17
 - upland mixed ashwoods: W9
 - lowland mixed deciduous woodland: W10
 - blanket bog: M17, M19, M20, M2 and M3 (M2 and M3 where associated with M17/M19/M20), and M15⁴/M16/M25a where peat depth is greater than 0.5m
 - upland flushes, fens and swamps: M4, M6, M10, M23a and S9
 - upland heathland: H9, H10, H12, H9-H12 intermediate, H16, H18 and H21; M15 and M16 where peat depths are less than 0.5m deep
- 6.3.4 These SBL priority habitats correspond with UK Biodiversity Action Plan (BAP) Priority Habitats⁵.
- 6.3.5 This information is also summarised in Table A7.1. The locations of these SBL priority habitats are also shown on Figure 12.5a-k, in which all polygons containing a SBL priority habitat type are shaded, irrespective of the percentage cover of SBL priority habitat within that polygon. Each polygon is shaded according to the dominant SBL priority habitat type within the polygon; however, many polygons contain multiple SBL priority habitat types, so the communities listed should be cross-referenced to Table A7.1.

6.4 Nature Conservation Evaluation

- 6.4.1 An evaluation of the nature conservation importance of NVC communities and sub-communities is provided below, in accordance with the guidance described in Section 3.2. The NVC communities and sub-communities have been grouped according to their equivalent JNCC Phase 1 habitat classification.

Woodland and Scrub

Semi-natural and plantation broadleaved woodland

- 6.4.2 Broadleaved woodland within the Study Area comprises NVC communities W4, W6, W7, W9, W10, W11, and W17. It is predominantly birch dominated woodland of semi-natural origin, although small areas of plantation origin are also present. The pockets of W7 woodland qualify as Annex I habitat (91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*), although this community is very limited in extent within the Study Area (0.35ha / 0.04% of the Study Area). The majority of the other broadleaved woodland qualifies as SBL habitat (either Upland Birchwoods, Wet Woodland, Upland Mixed Ashwoods, or Lowland Mixed Deciduous Woodland). Notable examples occur within the vicinity of Tomatin Junction, adjacent to Dalmagarry Burn, and as mixed woodland with Scots pine in the vicinity of Moy and Lynebeg.
- 6.4.3 The quality and extent of broadleaved woodland is not notable at the context of the region, particularly as far larger areas of birch woodland exist to the south of the Proposed Scheme within the Cairngorms National Park. Semi-natural broadleaved

³ <http://www.biodiversityscotland.gov.uk/advice-and-resources/habitat-definitions/priority/>

⁴ Excluding the M15a *Carex panicea* sub-community, due to its flushed nature over shallower substrates.

⁵ <http://jncc.defra.gov.uk/page-5718>

woodland within the Study Area is therefore assessed as being of importance within the context of the Authority Area. Broadleaved woodland of plantation origin is of limited extent within the Study Area (4.4ha / 0.4% of the Study Area). This habitat is assessed as being of less than local importance.

Coniferous plantation woodland

- 6.4.4 Coniferous woodland within the Study Area comprises NVC community W18 and the non-NVC category CP. It is the most extensive woodland type and one of the most extensive communities throughout the whole Study Area. All the W18 woodland appears to be of planted origin, with many large even aged stands. None of the stands of W18 woodland within the Study Area were considered to be candidates for Annex I habitat; this is because of their planted origin.
- 6.4.5 Coniferous woodland is a common habitat type within the Study Area and at other geographical scales, including within the local and authority area and the region. The extent and quality of the coniferous woodland within the Study Area is not considered to be notable within the context of the authority area, which supports a far larger area and quality of coniferous woodland. However, the extent and quality of the W18 stands within the Study Area, which includes some maturing stands with a developed ground-flora, is assessed as being of importance at the Local scale.
- 6.4.6 The dense stands of coniferous woodland, denoted as 'CP', exhibit limited intrinsic biodiversity value, and are therefore assessed as being of less than local importance.

Recently-felled woodland

- 6.4.7 The areas of clear-felled woodland predominantly occur to the north of the Study Area and are now re-vegetating with secondary semi-natural vegetation – mire and heath habitats. These areas may develop into established mire and heath which could qualify as Annex I and SBL habitat, although it is likely that they will be reforested in the future and revert to coniferous plantation woodland. They are therefore assessed as being of Local importance.

Dense and scattered scrub

- 6.4.8 Scrub habitat within the Study Area comprises NVC communities W19 (juniper scrub) and W23 (gorse scrub). The juniper scrub qualifies as an Annex I habitat (5130 *Juniperus communis* formations on heaths or calcareous grassland) and covers approximately 1 ha or 0.1% of the Study Area. This habitat type is of a very limited extent within the Study Area and is therefore assessed as being of importance at the Local scale only.
- 6.4.9 Gorse scrub was recorded infrequently and in very small patches within the Study Area. It does not qualify as Annex I or SBL habitat and is therefore assessed as being of less than local importance.

Other tall herb and fern and ruderal habitat

- 6.4.10 This habitat includes NVC communities W24, OV24, OV25, OV27, and the non-NVC category 'Pr' (an area dominated by privet). The vegetation communities are common within the local area and comprise commonly occurring plant species. They do not qualify as Annex I or SBL priority habitat and are of a limited extent within the Study Area. These habitats are therefore assessed as being of less than Local importance.

Heathland and Mire Mosaic

- 6.4.11 Heathland and mire habitat within the Study Area generally occurs as a mosaic often accompanied with patches of acid grassland, and is therefore considered as a single habitat type within this section. This mosaic encompasses five Phase 1 habitat types which comprise the following NVC communities: dry dwarf shrub heath (H9, H10, H11, H12, H16, H18, and H21), wet dwarf shrub heath (M15 and M16), blanket bog (M2, M3, M17, M19, and M20), wet modified bog (M25), and flushes and springs (M4 and M6). These habitats are extensive within the Study Area, with large areas recorded to the west of the existing A9, south of Loch Moy, and north of Moy to the east and west of the existing A9. These habitats qualify as Annex I habitat and SBL priority habitat and therefore exhibit a notable intrinsic value. Considering the extensive coverage of these habitats within the Study Area and their intrinsic value, they are assessed as being of importance at the Authority Area scale.

Grassland

Unimproved, semi-improved, and species poor semi-improved acid grassland

- 6.4.12 Unimproved acid grassland within the Study Area includes NVC communities U2, U4, U5, and U6. Areas of U2 grassland are present as relatively small stands, generally as secondary vegetation resulting from recolonization of plantation clear felled areas. U4 is the most widespread and extensive of the acid grassland communities within the Study Area, covering both extensive areas used for grazing and smaller discrete patches in mosaics within other habitats. U5 grassland is also widespread throughout the Study Area, often occurring within mosaics with other acid grassland and dry heath communities. U6 grassland has a more scattered distribution within the Study Area, generally occurring as small stands as transitions or mosaics with mire or wet heath communities.
- 6.4.13 The unimproved acid grassland communities recorded within the Study Area do not qualify as Annex I or SBL priority habitat. They are of an extent and quality which are not notable within the region and the authority area. This habitat type is therefore assessed as being of importance at the Local scale.
- 6.4.14 Areas of semi-improved acid grassland comprise stands of the NVC community U4b. This community is common around the more managed farmland and as a strip along the road verges of the existing carriageway. Some agricultural improvement is evident in the U4b sub-community; with consequent lower levels of species diversity when compared to the unimproved areas. Acid grassland of a better quality is abundant within the local area (see unimproved acid grassland above). This habitat is therefore assessed as being of less than local importance.

Unimproved and semi-improved neutral grassland

- 6.4.15 Unimproved neutral grassland comprises areas of NVC community MG9, which generally occurs in small stands in and around the wetter parts of the Study Area. This habitat type does not qualify as an Annex I habitat or an SBL priority habitat, but is relatively uncommon within the local area. Given its rarity at this scale, it is assessed as being of Local importance.
- 6.4.16 Semi-improved neutral grassland includes the NVC communities MG1 and MG10a. These communities do not qualify as Annex I or SBL priority habitat and have a relatively limited intrinsic value in terms of floristic diversity. This habitat is therefore assessed as being of less than local importance.

Improved grassland

- 6.4.17 Improved grassland within the Study Area is comprised of NVC community MG6. It is present within agriculturally improved fields, particularly the enclosed fields at Dalmagarry. This habitat type is floristically species-poor and is common at various geographical scales. It is assessed as being of less than local importance.

Marshy grassland

- 6.4.18 Marshy grassland (MG9, MG10, U6), which is generally more rank, occurs on the floodplain of the River Findhorn and within mosaics of mire, wet heath, and other grassland habitats. This grassland is more floristically diverse and is uncommon within the local area. It is therefore assessed as being of importance at the Local scale.

Swamp and Tall-herb Fens

- 6.4.19 Swamp habitat includes NVC communities S9 and S9a, which qualify as SBL priority habitat. This habitat is very limited in extent within the Study Area, generally occurring within a mosaic with mire and heath habitat. Given its limited coverage, swamp habitat is assessed being of Local importance.

Other Habitat

- 6.4.20 Other habitats in the Survey Area include private gardens / lawns, bare ground / bare rock / shingle, disturbed ground, buildings and associated driveways. These habitats exhibit limited intrinsic value although they may offer supporting value for animal species (such as bats and invertebrates). They are therefore assessed as being of less than local importance.

6.5 Other Sensitivities: Groundwater Dependent Terrestrial Ecosystems (GWDTE)

- 6.5.1 SEPA has classified a number of NVC communities as potentially dependent on groundwater (SEPA, 2014aⁱ, 2014bⁱⁱ). Wetlands or habitats containing these particular NVC communities are to be considered GWDTE unless further information can be provided to demonstrate this is not the case. Many of the NVC communities on the list are very common habitat types across Scotland, and some are otherwise of low ecological value. Furthermore, some of the NVC communities may be considered GWDTE only in certain hydrogeological settings.
- 6.5.2 Using SEPA's (2014aⁱ, 2014bⁱⁱ) guidance, Table A6.2 shows which communities recorded within the Study Area may, depending on hydrogeological setting, be considered GWDTE.

Table A6.2: Study Area Potential GWDTE Communities⁶

NVC Code	NVC Community Name
W4	Betula pubescens – Molinia caerulea woodland
W7	Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum woodland
M6	Carex echinata – Sphagnum fallax/denticulatum mire
M10	Carex dioica - Pinguicula vulgaris mire

⁶ Red - NVC communities that are likely to be considered high or sensitive GWDTE in certain hydrogeological settings. Yellow – NVC communities that may have limited (moderate) dependency on groundwater in certain settings

NVC Code	NVC Community Name
M23	Juncus effusus/acutiflorus – Galium palustre rush pasture
M16	Erica tetralix – Sphagnum compactum wet heath
W6	Alnus glutinosa – Urtica dioica woodland
M15	Trichophorum germanicum – Erica tetralix wet heath
M25	Molinia caerulea – Potentilla erecta mire
U6	Juncus squarrosus – Festuca ovina grassland
MG9	Holcus lanatus – Deschampsia cespitosa grassland
MG10	Holcus lanatus – Juncus effusus rush pasture
Je ⁷	<i>Juncus effusus</i> acid grassland

- 6.5.3 The location and extent of all identified potential GWDTE are provided on Figure 12.4a-k.
- 6.5.4 Within Figure 12.4a-k the potential GWDTE sensitivity of each polygon containing a potential GWDTE is classified on a four-tier approach as follows:
- ‘Highly – dominant’ where potential high GWDTE(s) dominate the polygon.
 - ‘Highly - sub-dominant’ where potential high GWDTE(s) make up a sub-dominant percentage cover of the polygon.
 - ‘Moderately – dominant’ where potential moderate GWDTE(s) dominate the polygon and no potential high GWDTEs are present.
 - ‘Moderately - sub-dominant’ where potential moderate GWDTE(s) make up a sub-dominant percentage cover of the polygon and no potential high GWDTEs are present.
- 6.5.5 Where a potential high GWDTE exists in a polygon it outranks any potential moderate GWDTE communities within that same polygon.
- 6.5.6 GWDTE sensitivity has been assigned solely on the SEPA listings (SEPA, 2014aⁱ, 2014bⁱⁱ). However, depending on a number of factors such as geology, superficial geology, presence of peat and topography, many of the potential GWDTE communities recorded may in fact be only partially groundwater fed or not dependent on groundwater. Determining the actual groundwater dependency of particular areas or habitat is considered further within Chapter 10 Geology, Soils, and Groundwater.

7. Summary

- 7.1.1 MacArthur Green carried out NVC surveys within the Tomatin to Moy Study Area from 2nd to 6th May 2016 inclusive and on the 17th and 18th May 2016. The aim of the NVC surveys was to identify and map the vegetation communities present in order to identify those areas of greatest ecological interest: i.e. potential GWDTE, Annex I habitats and SBL priority habitats.
- 7.1.2 The surveys revealed the presence of a wide range of habitat types, culminating in 43 NVC community types within the Study Area, along with a wide range of further sub-communities. Several non-NVC types were also recorded.

⁷ In light of the SEPA classification on potential GWDTEs the non NVC type ‘Je’ should also qualify for potential GWDTE status. The classification of moderate sensitivity is keeping in line with other similar Juncus spp. dominated grassland communities (e.g. MG10).

7.1.3 This report has described in more detail these vegetation communities as found in the Study Area. The survey results have also been compared to a number of sensitivity classifications, indicating the presence of Annex I, SBL and potential GWDTE habitats, as summarised in Table A7.1.

Table A7.1: Summary of Study Area NVC Communities & Sensitivities

NVC Codes Recorded	Potential GWDTE Status	Annex I Type Code	SBL Priority Habitat Type
Woodland and Scrub			
W4, W4b, W4c	High	N/A	Upland birchwoods (for W4 at community level) or Wet woodland (stands of W4b or W4c)
W6	Moderate	N/A	Wet woodland
W7, W7a, W7c	High	91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i>	Wet woodland
W9a	N/A	N/A	Upland mixed ashwoods
W10	N/A	N/A	Lowland mixed deciduous woodland
W11, W11c, W11d	N/A	N/A	Upland birchwoods
W17, W17b, W17c	N/A	N/A	Upland birchwoods
W18, W18a, W18b, W18c, W18d	N/A	N/A	N/A
W19, W19a, W19b	N/A	5130 <i>Juniperus communis</i> formations on heaths or calcareous grasslands	N/A
W23	N/A	N/A	N/A
W24	N/A	N/A	N/A
Mires and Wet Heath			
M2, M2b	N/A	7130 Blanket bogs	Blanket bog
M3	N/A	7130 Blanket bogs	Blanket bog
M4	N/A	7140 Transition mires and quaking bogs	Upland flushes, fens and swamps
M6, M6a, M6b, M6c, M6d	High	N/A	Upland flushes, fens and swamps
M10a	High	7230 Alkaline fens	Upland flushes, fens and swamps
M15, M15a, M15b, M15c, M15d	Moderate	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> or 7130 Blanket bogs (where peat is greater than 0.5m deep) (*M15a excluded from blanket bog)	Upland heathland <u>or</u> blanket bogs (where peat is greater than 0.5m deep) (*M15a excluded from blanket bog)
M16d	High	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> or 7130 Blanket bogs (where peat is greater than 0.5m	Upland heathland <u>or</u> blanket bogs

NVC Codes Recorded	Potential GWDTE Status	Annex I Type Code	SBL Priority Habitat Type
		deep) (*M15a excluded from blanket bog)	(where peat is greater than 0.5m deep) (*M15a excluded from blanket bog)
M17, M17a, M17b, M17c	N/A	7130 Blanket bogs	Blanket bog
M19, M19a, M19b, M19c	N/A	7130 Blanket bogs	Blanket bog
M20, M20a	N/A	7130 Blanket bogs	Blanket bog
M23a, M23b	High	N/A	Upland flushes, fens and swamps (applies to M23a only)
M25, M25a, M25b	Moderate	7130 Blanket bogs (where peat is greater than 0.5m deep – M25a only)	Upland flushes, fens and swamps (applies to M23a only)
Dry Heaths			
H9, H9a, H9b, H9c	N/A	4030 European dry heaths	Upland heathland
H10a	N/A	4030 European dry heaths	Upland heathland
H9-12 Intermediate	N/A	4030 European dry heaths	Upland heathland
H12, H12a, H12b, H12c	N/A	4030 European dry heaths	Upland heathland
H16	N/A	4030 European dry heaths	Upland heathland
H18a	N/A	4030 European dry heaths	Upland heathland
H21a	N/A	4030 European dry heaths	Upland heathland
Calcifugous Grasslands			
U2, U2a	N/A	N/A	N/A
U4, U4a, U4b, U4d, U4e	N/A	N/A	N/A
U5, U5a, U5b, U5d	N/A	N/A	N/A
U6, U6a, U6b, U6c, U6d, U6z	Moderate	N/A	N/A
U20, U20a	N/A	N/A	N/A
Mesotrophic grasslands			
MG1	N/A	N/A	N/A
MG6	N/A	N/A	N/A
MG9	Moderate	N/A	N/A
MG10a	Moderate	N/A	N/A
Swamps and Tall-Herb Fens			
S9, S9a	N/A	N/A	Upland flushes, fens and swamps

NVC Codes Recorded	Potential GWDTE Status	Annex I Type Code	SBL Priority Habitat Type
Vegetation of Open Habitats			
OV24	N/A	N/A	N/A
OV25	N/A	N/A	N/A
OV27, OV27a	N/A	N/A	N/A

- 7.1.4 No habitats of above regional importance have been recorded within the Study Area. The following habitats of Local and Authority Area importance were recorded:
- heath and mire mosaic (including dry dwarf shrub heath, wet heath, blanket bog, wet modified bog, flush and spring habitat) – Authority Area
 - semi-natural and plantation broadleaved woodland – Authority Area
 - coniferous plantation woodland – Local
 - areas of juniper scrub – Local
 - unimproved acid grassland – Local
 - unimproved neutral grassland – Local
 - marshy grassland - Local
 - swamp – Local
- 7.1.5 BroadleavedAll other habitat within the Study Area is assessed as being of less than local importance.

8. Glossary

acidophilous: plants/bryophytes that prefer to grow in an acidic environment.

base-poor: environments which have few chemical bases, they are dominated by environmental acids (usually organic acids) and so are acidic.

base-rich: environments which are neutral or alkaline.

base-richness: the level in soil or water of chemical bases, such as calcium or magnesium ions. Chemical bases are alkalis. Many plants and bryophytes are restricted to base-rich or base-poor environments.

calcareous: (of soil or water) contains calcium carbonate; calcareous grassland forms on soils that are base-rich.

calcicolous: a plant that grows and thrives in soil rich in lime.

calcifugous: growing or living in acid soil.

circumneutral soil: nearly neutral, having a pH between 6.5 and 7.5.

dicotyledon: a plant that produces flowers and has two cotyledons (i.e. embryonic leaves).

forb: a herbaceous flowering plant that is not a graminoid (grasses, sedges and rushes).

graminoid: grasses; monocotyledonous, usually herbaceous plants with narrow leaves growing from the base. They include the true grasses, of the family Poaceae (also called Gramineae), as well as the sedges (Cyperaceae) and the rushes (Juncaceae).

humic rankers: shallow soils with an organic-rich (humose) surface layer overlying a weakly developed, thin subsoil on to rock.

lagg: zone where water draining a bog meets that from adjoining mineral soils. A characteristic of the lagg zone is that normally it has more available plant nutrients, is more alkaline and hence shows greater species diversity.

mesophytic: a land plant that grows in an environment having a moderate amount of moisture, neither a particularly dry nor particularly wet environment.

mesotrophic grassland: neutral grassland, characterised by vegetation dominated by grasses and herbs on a range of circumneutral soils.

monocotyledons: flowering plants group which have just one cotyledon.

mor: forest humus that forms a layer of largely organic matter distinct from the mineral soil beneath.

mosaic: a pattern of two or more vegetation types disposed in intimate relationships with one another.

oligotrophic: lacking in plant nutrients.

ombrogenous: dependant on rain for its formation. Ombrogenous bog is a peat-forming vegetation community lying above groundwater level: it is separated from the mineral soil, and is thus dependent on rain water for mineral nutrients. The resulting lack of dissolved bases gives strongly acidic conditions. Two types of ombrogenous bogs are commonly distinguished: raised bogs and blanket bogs.

palaeochannel: a remnant of an inactive river or stream channel that has been either filled or buried by younger sediment. The sediments that the ancient channel is either cut into or buried by can be either unconsolidated, semi-consolidated, consolidated, or lithified.

plagioclimax community: an area or habitat in which anthropogenic influences have prevented the habitat/ecosystem developing further. It may have been prevented from reaching its full climatic climax or shifted towards a different climax type by activities such as burning, grazing, vegetation clearance etc.

pleurocarpous: A type of moss in which the female sex organs and capsules are borne on short, lateral branches, and not at the tips of branches. Pleurocarpous mosses tend to form spreading carpets rather than erect tufts.

podsol: a soil that develops in temperate to cold moist climates under coniferous or heath vegetation; an organic mat over a grey leached layer.

siliceous: containing abundant silica; (plants) growing in or needing soil rich in silica.

soligenous: where water movements are predominantly lateral. Produced by inflow of surface water or rise of groundwater and not completely by locally precipitated water.

topogenous mire: a type of mire that forms under climatic conditions of reduced rainfall, with consequent lower humidity and summer drought, which restrict the growth of wetland vegetation to areas where precipitation is concentrated (e.g. valley bottoms).

9. References

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Annex A. Target Notes

NVC Target Notes

A number of target notes were made during the NVC surveys, often to pinpoint springs/flushes, or areas of interest. These target notes are shown on Figure 12.2a-l and detailed in Table A.1. A representative sample of corresponding target note photographs is provided in Annex B.

Table A.1: NVC Target Notes

Target Note ID	Easting	Northing	NVC Type	Description	Photo Ref.
TN 1	73701	34552	M4	Carex paniculata in M4 mire.	B1
TN 2	73664	34543	M4	Carex paniculata in M4 mire.	
TN 3	76334	34353	M4	Part of an ancient woodland polygon. <i>Pinus sylvestris</i> road shelterbelt strip. All trees less than 20m height, relatively young with a very sparse ground flora of mosses: <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus triquetrus</i> , <i>Galium saxatile</i> and <i>Deschampsia flexuosa</i> . Heathy <i>Nardus stricta</i> grassland in more open habitat within ancient woodland polygon area also.	
TN 4	76510	34245	W18b	Part of an ancient woodland polygon with well-developed ground-flora of heath and acid grasses / pleurocarpous mosses. No ancient or specimen trees present, all of semi-natural or plantation origin.	B2
TN 5	76710	34135	W18c	Part of an ancient woodland polygon. <i>Pinus sylvestris</i> canopy with large clearing of U2 grassland and M6 flush. No specimen ancient trees. Understorey of mosses and acid grasses.	
TN 6	79012	31793	M23b	M23b <i>Juncus</i> flush, with flora including the uncommon northern/upland moss <i>Bryum weigelii</i> showing as small pinkish patches in foreground (near lower edge of photo).	B3
TN 7	79195	31612	M10a	M10a flush.	B4
TN 8	79258	31507	M10a/ M15a	Narrow M10a flush surrounded by M15a flushed wet heath.	B5
TN 9	79269	30863	W19	Area of <i>Juniperus communis</i> scrub.	B6
TN 10	79445	30579	W18/W11	Part of an ancient woodland polygon. <i>Pinus sylvestris</i> plantation but tinned out and field layer present with <i>Deschampsia flexuosa</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus triquetrus</i> , <i>Sphagnum capillifolium</i> (R), <i>Hypnum</i> spp., <i>Vaccinium myrtillus</i> (O-R), <i>Blechnum spicant</i> , <i>Plagiothecium undulatum</i> . Canopy is <i>Pinus sylvestris</i> with odd <i>Betula</i> spp. and <i>Picea sitchensis</i> . Occasional <i>Luzula sylvatica</i> and <i>Primula vulgaris</i> . Patch of W11 around burn, grassy with <i>Agrostis</i> spp. and <i>Holcus</i> spp. and mosses as above. Also has <i>Conopodium majus</i> , <i>Oxalis acetosella</i> (F). Also some occasional <i>Populus tremula</i> here.	
TN 11	79473	30438	W18	Part of an ancient woodland polygon. <i>Pinus sylvestris</i> canopy with trees spaced c.10m apart,	B7



Target Note ID	Easting	Northing	NVC Type	Description	Photo Ref.
				no understorey shrubs and grassy ground flora of <i>Holcus lanatus</i> , <i>Agrostis capillaris</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> , <i>Dicranum scoparium</i> , <i>Galium saxatile</i> , <i>Deschampsia flexuosa</i> and <i>Dryopteris filix-mas</i> .	
TN 12	80439	29445	W18	Part of an ancient woodland polygon but the woodland is <i>Pinus sylvestris</i> plantation that aligns to W18 woodland. Stand has been thinned out and has a shrubby understorey.	

Annex B. Target Note Photographs

Target Note Photographs

The following photographs correlate to the target notes (TNs) described in Annex A. Photographs are not provided here for all TNs, due to the similarity between many photographs; instead a number of photographs are provided in order to give a general characterisation of certain features.

Photograph B1: TN 1

Tussocks of *Carex paniculata* in M4 mire



Photograph B2: TN 4

W18 *Pinus sylvestris* – *Hylocomium splendens* woodland (plantation) – sub-shrub variant



Photograph B3: TN6

M23b *Juncus effusus* flush with flora including uncommon moss *Bryum weigelii*



Photograph B4: TN7

M10a flush



Photograph B5: TN 8

M10a flush surrounded by M15a flushed wet heath



Photograph B6: TN 9

W19 Juniperus communis – Oxalis acetosella scrub



Photograph B7: TN 11

W18 *Pinus sylvestris* – *Hylocomium splendens* woodland – grassy variant (plantation)



Annex C. General Community Photographs

NVC Community Photographs

The following selected photographs are provided to give a visual representation to a number of the main community types present within the Study Area.

Photograph C1

W4c *Betula pubescens* – *Molinia caerulea* woodland Sphagnum spp. sub-community



Photograph C2

W7a *Alnus glutinosa* – *Fraxinus excelsior* – *Lysimachia nemoreum* woodland *Urtica dioica* sub-community and W11 *Quercus petraea* – *Betula pubescens* – *Oxalis acetosella* woodland.



Photograph C3

W7c *Alnus glutinosa* – *Fraxinus excelsior* – *Lysimachia nemoreum* woodland *Deschampsia cespitosa* sub-community



Photograph C4

W11 *Quercus petraea* – *Betula pubescens* – *Oxalis acetosella* woodland



Photograph C5

W17b *Quercus petraea* – *Betula pubescens* – *Dicranum majus* woodland Typical sub-community



Photograph C6

W17c *Quercus petraea* – *Betula pubescens* – *Dicranum majus* woodland *Anthoxanthum odoratum* – *Agrostis capillaris* sub-community



Photograph C7

W18 *Pinus sylvestris* – *Hylocomium splendens* woodland (with abundant sub-shrubs)



Photograph C8

W18 *Pinus sylvestris* – *Hylocomium splendens* woodland (grass and moss field layer)



Photograph C9

W18 *Pinus sylvestris* – *Hylocomium splendens* woodland (moss only field layer)



Photograph C10

M4 *Carex rostrata* - *Sphagnum fallax* mire



Photograph C11

M6 *Carex echinata* - *Sphagnum fallax/denticulatum* mire *Juncus effusus* sub-community (rushes in the hollow)



Photograph C12

M10 *Carex dioica* - *Pinguicula vulgaris* mire *Carex viridula* – *Juncus bulbosus/kochii* sub-community (open habit maintained by livestock poaching)



Photograph C13

M15a *Trichophorum germanicum* – *Erica tetralix* wet heath *Carex panicea* sub-community



Photograph C14

M15b *Trichophorum germanicum* – *Erica tetralix* wet heath Typical sub-community



Photograph C15

M15c *Trichophorum germanicum* – *Erica tetralix* wet heath *Cladonia* spp. sub-community



Photograph C16

M16d *Erica tetralix* – *Sphagnum compactum* wet heath *Juncus squarrosus* - *Dicranum scoparium* sub-community



Photograph C17

M17a *Trichophorum germanicum* – *Eriophorum vaginatum* blanket mire *Drosera rotundifolia* - *Sphagnum* spp. sub-community



Photograph C18

M17b *Trichophorum germanicum* – *Eriophorum vaginatum* blanket mire *Cladonia* sub-community (in foreground)



Photograph C19

M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire (in forest ride)



Photograph C20

M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire (planted and invaded with young conifers)



Photograph C21

M20 *Eriophorum vaginatum* blanket mire



Photograph C22

M25a *Molinia caerulea* – *Potentilla erecta* mire *Erica tetralix* sub-community



Photograph C23

M25b *Molinia caerulea* – *Potentilla erecta* mire *Anthoxanthum odoratum* sub-community



Photograph C24

M17 mire, M20 mire and U5 *Nardus stricta* – *Galium saxatile* grassland mosaic (U5 = light patches)



Photograph C25

Example of M6 flush (bright green line) weaving through M17 blanket mire



Photograph C26

Mosaic of M20 mire (flat area to right), M6c flush (line of *Juncus effusus*) and U5 grassland (on slope to left)



Photograph C27

H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath (foreground slope) with M19 mire in distance on flatter ground



Photograph C28

Example of H9-12 Intermediate heath



Photograph C29

Example of ungrazed/very lightly grazed H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath (associate sub-shrubs hidden under and through vigorous *Calluna* canopy).



Photograph C30

Example of intensively grazed H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath



Photograph C31

H16 *Calluna vulgaris* – *Arctostaphylos uva-ursi* heath. The *A. uva-ursi* can be seen in the open patches through the *Calluna*.



Photograph C32

U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland



Photograph C33

U4b *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland *Holcus lanatus* - *Trifolium repens* sub-community (the more productive and semi-improved U4 sub-community)



Photograph C34

U5 *Nardus stricta* – *Galium saxatile* grassland



Photograph C35

U6 *Juncus squarrosus* – *Festuca ovina* grassland (in foreground). Species-poor and intensively grazed, even the rosettes of *J. squarrosus* have been clipped by grazing in this stand.



Photograph C36

Example of a large stand of the non-NVC type, *Juncus effusus* acid grassland community.



Photograph C37

MG6 *Lolium perenne* – *Cynosurus cristatus* grassland



Photograph C38

MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland



Photograph C39

MG9 grassland (foreground) with M15 and H12 wet and dry heaths on slope in distance



Photograph C40

MG10a *Holcus lanatus* – *Juncus effusus* rush-pasture Typical sub-community



Photograph C41

S9 *Carex rostrata* swamp in shallow standing water.



Photograph C42

Example of fine scale habitat mosaics and variability within Study Area: photograph shows U4 and U5 grasslands in foreground, M6c flush denoted by strip of rushes at base of slope, W19 *Juniper communis* scrub to left middle distance, M17 blanket mire with patches of *Myrica gale* to right middle distance, and W18 *Pinus sylvestris* woodland in distance.

