A9 Dualling Central Section – Glen Garry to Kincraig

Minimising the Impacts of Nationally Important Infrastructure on Peatland

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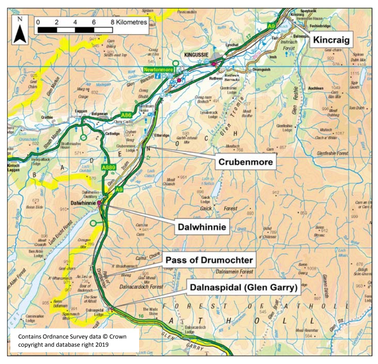
The proposed schemes – improving the A9

The A9 trunk road forms a strategic link between the Scottish Highlands and the Central Belt; vital to the economy and communities in the north of Scotland. The Scottish Government has committed to dualling the A9 between Perth and Inverness.

The CH2M Fairhurst Joint Venture (CFJV) has provided environmental, design and management services to Transport Scotland for three dualling projects between Glen Garry and Kincraig, in areas where one of the principal environmental challenges is the presence of peatland; including extensive blanket bog in the Drumochter Hills and other designated ecological sites within the Cairngorms National Park.

The A9 through the Pass of Drumochter



Location of the proposed schemes

This poster outlines the survey and assessment work undertaken by CFJV with Transport Scotland, to understand the extent and character of the peatland around each proposed scheme, assess potential risks associated with peat landsliding, and works undertaken in the preparation of Outline Peat Management Plans through the design development and Environmental Impact Assessment process. These have sought to minimise the impact on peatlands and, where excavation of peat cannot be avoided, to ensure environmentally beneficial and sympathetic re-uses of that peat within each proposed scheme can be achieved.

Baseline conditions – establishing the extent and nature of peaty soils and peat

Baseline conditions were determined through desk-based data assessments, ground investigations, walkovers and dedicated ecology and peat field surveys.

British Geological Survey (BGS) mapping identified areas of peat potentially greater than 1 m depth:

- two adjacent to and to the west of the existing A9 in the Pass of Drumochter;
- one 130 m east of the existing A9 between Dalwhinnie and Cuaich;
- another adjacent to and to the west of the A9 near Cuaich; and
- others northward of Crubenmore towards Kincraig.

Published soil mapping also indicated the presence of larger areas of complex peaty soils and a notable area of dystrophic basin and valley peat to the east of Dalwhinnie.

Scottish Natural Heritage (SNH) Carbon and Peatland mapping showed Class 1 and 2 priority peatland (nationally important carbon-rich, peaty soils and deep peat) in several places near the proposed schemes, along with several areas of Class 3 and Class 5 (not priority peatland habitat, but soils are carbon-rich, peaty soil and deep peat).

Phase 1 Habitat and National Vegetation Classification (NVC) surveys also identified peatland habitats such as mire, blanket bog and wet heaths, or mosaics of these, swamp and fen; including areas within the Drumochter Hills Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA) and other ecological designations.

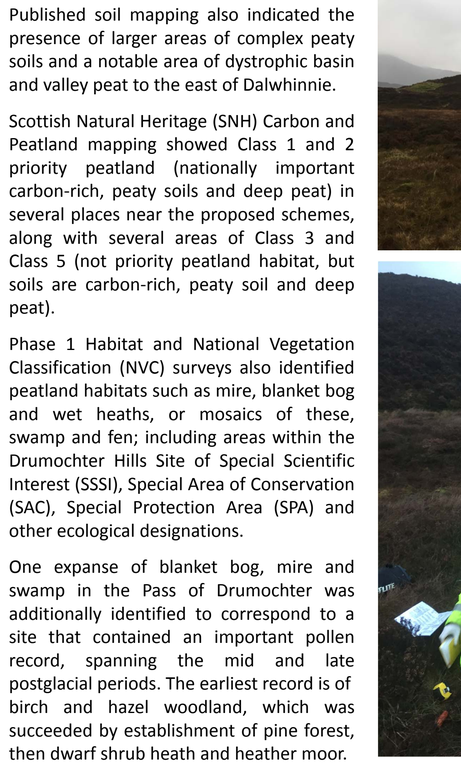
One expanse of blanket bog, mire and swamp in the Pass of Drumochter was additionally identified to correspond to a site that contained an important pollen record, spanning the mid and late postglacial periods. The earliest record is of birch and hazel woodland, which was succeeded by establishment of pine forest, then dwarf shrub heath and heather moor.

Peat depth probing in the Pass of Drumochter

Peat cores recovered for detailed logging

Based on the sensitive conditions indicated, historical ground investigation information was collated and then supplemented with additional investigation, peat probing and coring survey efforts in the vicinity of the proposed schemes to generate a depth and characteristic dataset collectively comprised of more than 8,000 peat depth probes, 169 peat cores with von Post and Troels-Smith descriptions of peat and substrate, and over 350 boreholes and trial pits with either basic, von Post and/ or Troels-Smith descriptions. Dedicated walkovers were also undertaken to assess peatland areas, their condition, understand morphology, degradation and stability features, and to identify potential peat re-use and restoration opportunities.

Peat data coverage at the pollen record site and an area of quaking bog in the Pass of Drumochter



Peat depth model development and methods

Using all the collated and obtained survey data, a peat depth model was generated for the proposed schemes using ArcGIS software. A Triangular Irregular Network (TIN) was used to connect the coverage of data points. The TIN was then converted into a raster to allow further analysis.

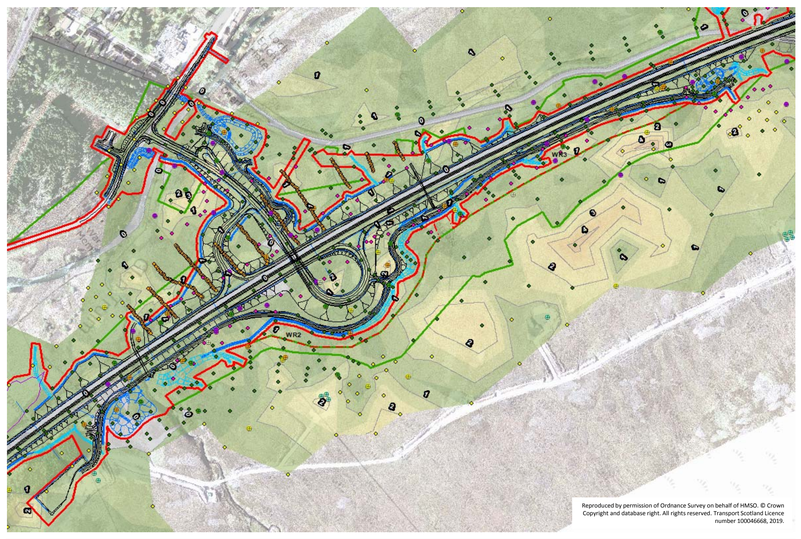
This method was chosen following previous CH2M/ Jacobs analysis of interpolation methods at a proposed wind farm site in Mid Wales, which showed that TIN to raster was preferable to others due to:

- Its mathematical simplicity
- The reduced likelihood of it reducing the size of, or 'smoothing out' completely, smaller areas of deeper peat
- It being true to the measured dataset used to create it, in that the value of the model surface at a measured point will always be equivalent to the value at that point.

A raster resolution of 1 m was used for the peat depth model in each proposed scheme to avoid sudden step changes in peat depth (where none is present in reality), make excavation volume calculations more straight-forward and to reduce inaccuracy in these where the footprint of proposed infrastructure elements overlapped partially with a grid cell.

Watercourses incised to substrate and existing roads or tracks where no peat is present, were 'reduced to zero' peat depth in the model. Existing embankments and cutting slopes on the A9 were deliberately not 'reduced to zero' peat depth, as means to account for the possibility that dressing of these had been undertaken with peat or peaty soil.

Numerous iterations of the model were generated as data progressively became available through the Environmental Impact Assessment process and were used as key tools to inform engineering as well as environmental elements of the developing designs.



Peat depth model coverage at Dalwhinnie

Design development and outline peat management planning

Due to their baseline sensitivity, peat and associated peatland habitats were given significant consideration during the design development process for each proposed scheme, together with other environmental and engineering constraints.

A series of inter-disciplinary workshops were held throughout this, which facilitated recognition and application of the hierarchy of management approaches in relation to developments on peat, as required by the Scottish Environment Protection Agency (SEPA) and others (including SNH). This culminated, where possible, in environmentally-led designs/ design elements and the preparation of thorough Outline Peat Management Plans, which were also informed by consultations undertaken with SEPA, SNH, the Cairngorms National Park Authority and other stakeholders.

These plans were published as part of the Environmental Statements for the proposed schemes, and describe how prevention and reduction, re-instatement and re-use were adopted as the core peat management principles, together with some temporary storage, as means to manage peat that will unavoidably be excavated during construction.

Prevention and Reduction

Prevention of peat excavation and disturbance was achieved by using the peat depth models, to inform aspects of infrastructure layouts (such as the mainline, drainage basins and compensatory flood storage areas) or to inform alternative arrangements for certain scheme elements (such as junction locations, size or configuration) (see example below).

Although it is difficult to be precise, it is estimated that design changes across each proposed scheme have resulted in the collective avoidance of up to 70,000 m^3 of peat excavation, reduced encroachment into associated peatland habitats and also reduced other environmental impacts.

Certain areas of some proposed schemes were also identified, where peat depth and conditions may permit even further reductions to be achieved during detailed design and construction, through consideration and use of piling, bridging and floated track construction techniques.

Re-instatement

Although the proposed scheme layouts have prevented and reduced peat excavation and disturbance where practicable, the nature of various other constraints along each has meant that some infrastructure is located within or adjacent to areas where peat is present.

As this cannot be avoided in these areas, the first management option is to re-instate the peat at the point of excavation where possible and in specific circumstances (such as at the toe of proposed embankments or in re-instatement of compensatory flood storage).

Re-use

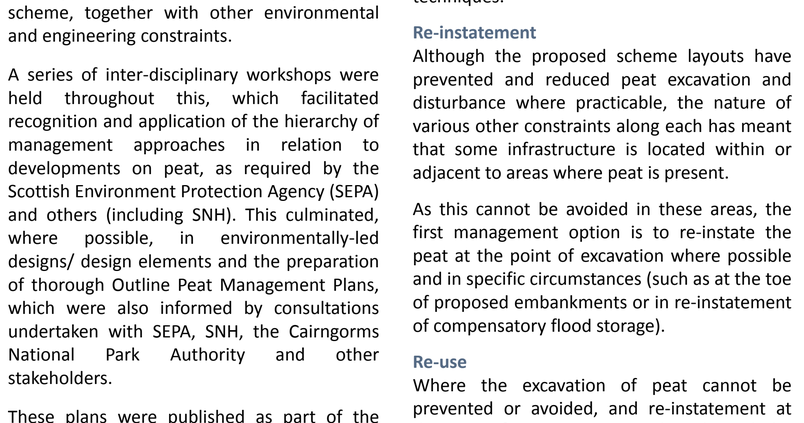
Where the excavation of peat cannot be prevented or avoided, and re-instatement at the point of excavation cannot be achieved, the management option for each proposed scheme is for excavated peat to be re-used in suitable and environmentally beneficial ways that aim to maintain their provisioning, regulating, cultural and ecosystem services.

The following opportunities were therefore variably identified and proposed for these purposes:

- Landscaping restoration
- Habitat re-instatement, restoration and creation, with specific candidate sites identified
- Sustainable Drainage System (SuDS) basins and compensatory flood storage areas.

Temporary Storage

Provisional locations for temporary storage were also identified for instances where it may be required, taking into account available land, setbacks from excavations, watercourses and ecological constraints, proximity to points of excavation and the level of peat landslide hazard that had been determined.



Excavation volume calculations and visualisations for Dalwhinnie junction, before (left) and after (right) design development alterations, which resulted in an estimated 5,000 m^3 reduction

References

Transport Scotland (2017). A9 Dualling Glen Garry to Dalwhinnie, DMRB Stage 3 Environmental Impact Assessment.
Transport Scotland (2017). A9 Dualling Dalwhinnie to Crubenmore, DMRB Stage 3 Environmental Impact Assessment.
Transport Scotland (2018). A9 Dualling Crubenmore to Kincraig, DMRB Stage 3 Environmental Impact Assessment
Scottish Government (2017). Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments. Scottish Government.
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Scottish Renewables and Scottish Environment Protection Agency (2012). Developments on Peatland: Guidance on the assessment of peat volumes, re-use of excavated peat and the minimisation of waste, Version 1
Walker, M J C (1975). A Pollen Diagram from the Pass of Drumochter, Central Grampian Highlands, Scotland, pp. 335-343, Transactions of the Botanical Society of Edinburgh, 42 (3), 1975

Some peat is planned to be re-used to restore selected sections of the disturbed Beauly-Denny Powerline track through the Pass of Drumochter

Peat balance and proposed re-uses

The comprehensive and dedicated survey, depth modelling, design development and management planning work completed for each proposed scheme, has meant that it is estimated, that no, or very little surplus peat will be generated during construction; resulting in no, or very limited residual net losses.

The Outline Peat Management Plans, supplemented with Outline Habitat Management Plans and various other committed mitigation, also mean that residual peat and associated peatland habitat impacts can be appropriately off-set in the longer-term, once the proposals for beneficial peat re-use (as summarised below) become firmly established.

Landscaping Restoration

Re-instatement and re-use of peaty soils and topsoil as dressing on earthworks slopes and verges will assist in creating tie-ins with the surrounding topography, landscape and habitats to reduce visual impacts. Proportions of excavated and sympathetically handled shallow peat finished with acrotelm peat turves could also be re-used for verge re-instatement on particular sections of access track, where consistent with adjacent soils and vegetation, and where the adjacent substrate (placed or *in situ*) is peat. Some more strongly decomposed peat could additionally be used as an add mixture to replanting areas as a soil improver.

Habitat re-instatement, restoration and creation

Candidate areas considered to be of suitable slope, existing and surrounding ecology and hydrology have been identified on some of the proposed schemes, where the re-use of peat, along with local water table restoration could re-instate, restore and/ or create peat-based habitats. These areas include blanket bog and wet heath/ mire mosaics (some or which are degraded) within or at the margins of the proposed scheme boundaries, or areas where temporary works will take place, together with selected sections of the disturbed Beauly-Denny Powerline track through the Pass of Drumochter within the Drumochter Hills SAC.

SuDS basins and compensatory flood storage areas

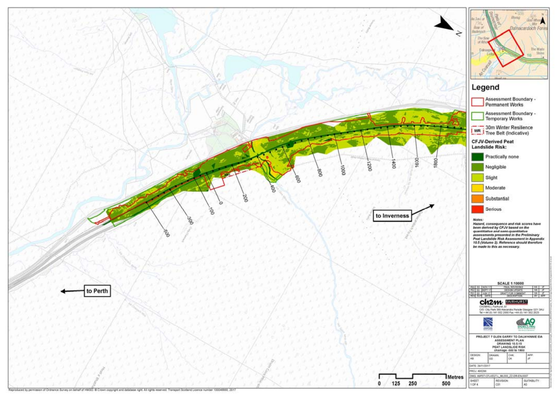
Re-use of peat as a natural filter material in the main basin of selected permanent SuDS basins, to reduce the rate at which road run-off is discharged and improve the quality of the water discharged to watercourses. This would be subject to further detailed design considerations, but if explored, would aim to maximise the filtration surface area and where possible, be lined with vegetated acrotelm turves.

Re-use of peat in compensatory flood storage areas, which by their nature, will be lower-lying than surrounding areas could also create wetland-based habitats. This would again be subject to further detailed design, which will include consideration of whether sufficient hydrological conditions can be achieved to maintain the condition of the peat.

Peat landslide risk assessment

In the absence of specific guidance on assessing peat landslide risks for road infrastructure, relevant aspects of 'Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments Guidance' published by the Scottish Government (2017) was followed. Qualitative and quantitative assessments were undertaken, which included:

- An assessment of peatland character, including thickness and extent of peat, and a demonstrable understanding of site hydrology and geomorphology
- An assessment of evidence for past landslide activity and present-day instability (e.g. pre-failure indicators)
- An assessment of the potential for peat landsliding or likelihood of future peat landslide activity (or a landslide susceptibility or hazard assessment)
- Identification of receptors (e.g. habitats, watercourses, infrastructure, human life) exposed to peat landslide hazards
- Assessments of potential consequences of peat landslides for the identified receptors, and provision of outline mitigation recommendations.



Peat landslide risk mapping example at Dalnaspidal, south of Drumochter

As part of Academy9, the educational framework delivered alongside the A9 Dualling Programme, school pupils learn about a variety of environmental and engineering issues associated with delivering this major infrastructure project. Here pupils (aged 14 to 16) learned about the importance of peatland habitats local to their area, from CFJV and other programme consultants. The timeline of peat formation was emphasised through this fun and interactive 'guess the era' game, where pupils dress-up as historical periods in time and align themselves with how long ago the peat in our 'peat core' started to form.

Peat formation – Guess the Era!