Best Practice Case Study: Ancient Woodland Translocation Works near Calvert, Buckinghamshire

Summary

HS2 is the biggest transport project undertaken in the UK for a generation. Its stated purpose is to create a world-class high-speed rail network to support sustainable growth in the UK.

Construction of Phase One of HS2 will affect remnants of the Bernwood Forest ancient woodland near Calvert in Buckinghamshire. Each woodland remnant supports a diverse mix of ecological features including ancient woodland, and ancient semi natural woodland, native plant species, wet woodland rides, and support for a wide variety of wildlife. These include ancient woodland sites situated East and West of the Aylesbury Link Rail Line.

Ancient woodland translocation work in this area was carried out by RSK Habitat Management on behalf of Fusion as part of the HS2 Area Central Enabling Works Contract. The work included translocation of ancient woodland soil with its associated seed bank, salvaged deadwood (fallen and standing) coppice stools and saplings, translocated from affected ancient woodlands, referred to as donor sites, to a compensatory area referred to as the receptor site. There were three separate donor sites that provided source material for the translocation. The receptor site (an agricultural field prior to works) is situated adjacent to Decoypond Wood ancient woodland (**Figure 1**).

This document contains a case study of work carried out by RSK Habitat Management in 2020 and 2021. It is accompanied by a series of best practice notes on the following topics:

- Placement of fallen deadwood
- Placement of standing deadwood
- Translocation of ancient woodland indicator species and saplings
- Donor and receptor cell feature mapping
- Photography and recording
- Surface water and silt management
- Semi-permanent water features
- Environmental management low carbon sustainable solutions
- Sustainable Solutions – Wool Tree Guards

This case study and the accompanying best practice notes contain knowledge that can be applied to other habitat translocations or habitat creation works.

Figure 1: Aerial photo prior to translocation works showing the donor areas (DT06 and DT09) in blue and the receptor site (RT06-09) in yellow east and west of the Aylesbury Link Rail Line.

Approach

A multi-disciplinary team from RSK, led by RSK Habitat Management, carried out a feasibility study between May 2019 and June 2020 to determine if the donor woodlands contained viable above ground woodland material and suitable soil required to carry out a successful translocation to the receptor site. Outputs from arboricultural, botanical, topographical and soil (resource and contamination) surveys were combined with information from historical surveys; the conclusion was that translocation was feasible although there were significant challenges to overcome.

The work on site was carried out between July 2020-May 2021 and the approach to the work, highlighting benefits, innovations and lessons learnt are set out below.

Site set-up and access

The first task involved re-marking vegetation and fallen deadwood which had previously been identified for translocation during the facility study. Saplings were removed by hand and transferred to a site holding nursery.

A system of track matting was then deployed across all working areas and haul routes. At the receptor site track mats were deployed on top of cut grass areas to preserve the underlying subsoil structure. Tracking over ancient woodland soils is to be avoided wherever possible; therefore, machines worked in front of themselves stripping an area of ancient woodland soils before deploying track mats. Although this method is slower, it reduced the risk of soil compaction which proved crucial in enabling works to continue as the weather worsened.

Low ground pressure plant was used, including Hydrema dumpers and excavators which were fitted with tilt rotator bucket which turns 360°, meaning that over-tracking is eliminated. Machines always worked from track mats and designated haul routes, with works carefully managed to avoid unnecessary tracking. This was crucial as the majority of the soil in donor areas was identified as having a low resilience to structural damage during soil handling.

Once track mats were in place, soil and woodland excavation and translocation could commence.

Decoypond Wood donor site (DT06) during felling and translocation works

Receptor site (RT06-09) before commencement of works, looking to south, Decoypond wood in background.

Aerial view of receptor site during works, looking to south, Decoypond wood in background. Track mat system visible in photo, with mats removed as areas completed

Soil translocation

In the receptor site, topsoil was stripped in sections to an average depth of 150mm to accommodate the shallower donor topsoil. Focusing works within strips minimised the period that the subsoil was exposed, reducing the potential for runoff and compaction from rainfall and protecting the subsoil from plant and machinery tracking.

In the donor areas, an excavator worked from the edge of the site inwards in order not to track on the ancient woodland topsoil, stripping in approximately 6 metre bands. Soil was stripped using toothless buckets up to, but not including the root protection zone around vegetation which was to be translocated.

The topsoil and intermediate layers were stripped separately to preserve their relative positions in the replaced soil profile, thereby helping to preserve the unique associations of fungal mycorrhizae which assist nutrient supply directly to tree roots. It is hoped this will make plants more resilient by providing a deeper horizon than just transporting the true topsoil layer. The donor soil was carefully tipped into dumpers which transferred it to the receptor site, where it was tipped and spread in order, i.e. intermediate layers placed first onto existing receptor subsoil, followed by the topsoil layer. The excavated agricultural topsoils were either immediately backfilled in the donor site or stockpiled for later backfilling.

All available ancient woodland soils were accommodated within the allocated receptor site. A difference between soil available from the donor site and the size of the receptor site allowed the opportunity to create a woodland ‘glade’ into which stumps were buried and a wildflower seed mix was introduced to create a natural woodland edge habitat.

Aerial view of completed receptor site, April 2021. Decoypond Wood in background. Fallen deadwood and standing monoliths apparent. Greener areas to left were completed earlier and show flush of bluebell emergence.

Feature translocations and tree protection

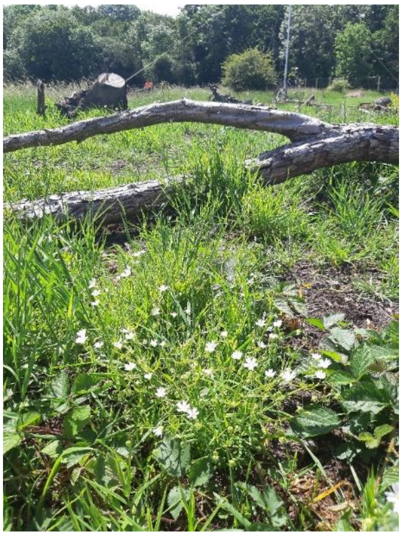
Once soils had been stripped up to the edge of tree protection zones, trees to be translocated as coppice stools were coppiced using an excavator mounted tree shear or chainsaw. The excavator used a specially designed rootball bucket to lift the coppice stool or tree to be translocated. Once lifted, the excavator placed the rootball bucket into the dumper and the bucket was released (via electronic and mechanical quick release system) and the bucket containing the intact rootball was carried to the receptor site where it was unloaded by an excavator which placed the tree into the prepared position (rootball dimensions having been radioed ahead so ground could be prepared).

Hand dug saplings and ancient woodland indicator plants were replanted at the receptor site; supplemented with whips supplied by a HS2 approved nursery during the following planting season. Nursery trees to be planted include 40-60 cm bare root field maple, dogwood, hazel and silver birch with containerised holly, blackthorn and English oak.

See Best Practice notes – Placement of fallen deadwood; placement of standing deadwood; Translocation of AWI species and saplings; Wool tree guards.

Deadwood habitat (right): fallen deadwood and brash piles in foreground, standing 'monolith' deadwood in background, left. Looking south east.

Regeneration of Ancient Woodland Indicator species from soil seedbank (below)



Detailed recording, drone footage and site photography was used to create a 'map' of the donor and receptor site so that features and soils at the receptor site could be traced back to their original donor site/ relative positions (**Figure 2**). Having accurate information about the spatial distribution and quantity of deadwood placed in the receptor site will enable comparisons to be made with monitoring results. Taking periodic measurements of the deadwood will help to determine when deadwood features are in need of 'topping up' until the mature woodland can produce its own source; introduced deadwood will need to be of specific types and from local areas, this will assist in sourcing suitable material and planning for introduction at a suitable time.

See Beast Practice notes – Donor and receptor cell feature mapping; Photography.

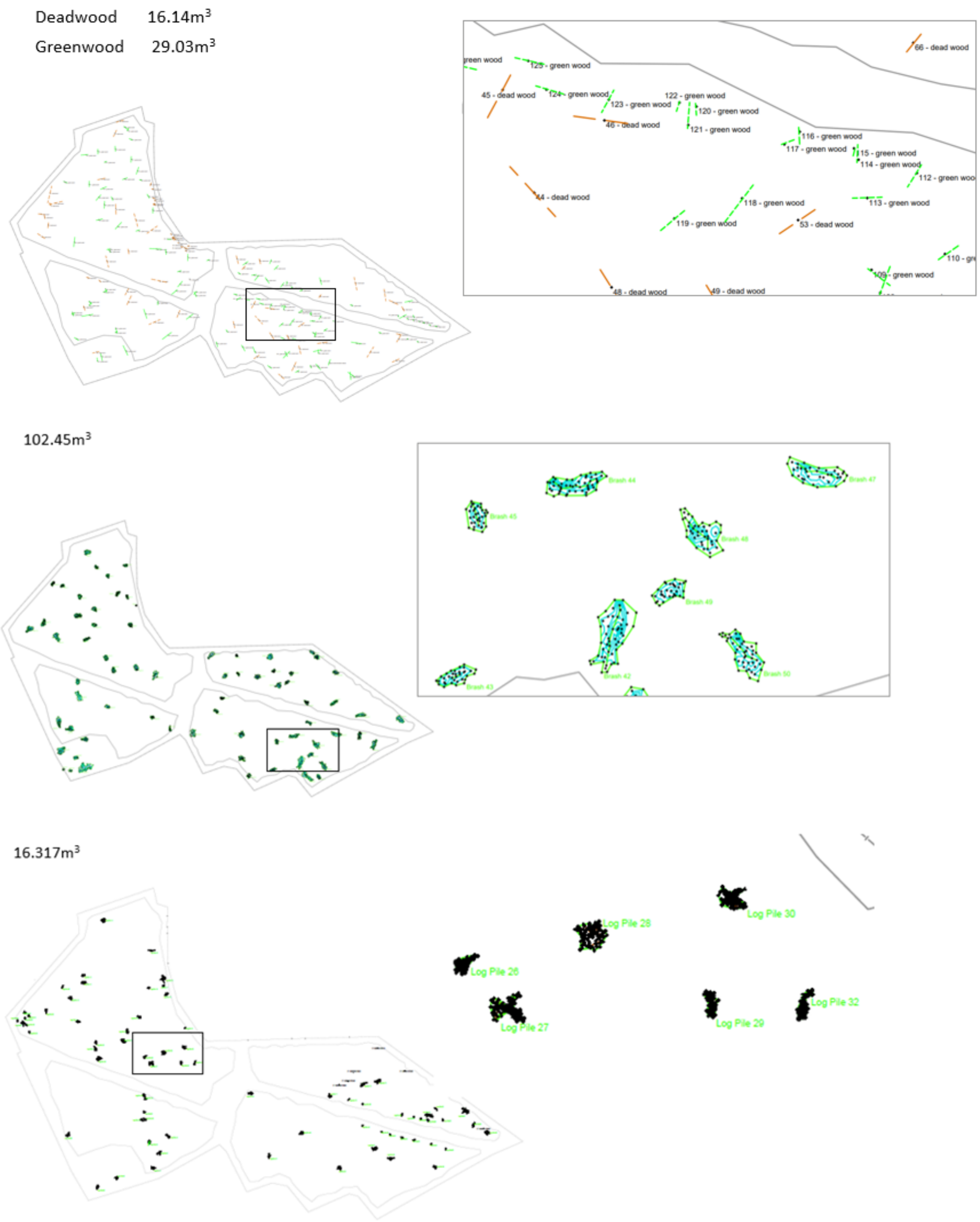


Figure 2: Excerpts from the as built survey mapping features at receptor site: top - deadwood/greenwood pieces, centre - brash piles, bottom - log piles at the receptor site

Table 2: Summary of statistics (areas and units) of features within the receptor site

Description		Unit
Habitat Type		
Woodland interior consisting of (i) translocated semi-mature trees[1] (ii) coppice stools (iii) ancient woodland indicator species and (iv) new whip & shrub planting		10,760m^3
Woodland edge new whip and shrub planting		3,300m^3
Protected ride new whip and shrub planting		775m^3
Main ride areas (seeded)		3,690m^3
Woodland glade (seeded)		650m^2
Landscape Feature		
Surface water features (scrapes plus associated network of ditches)		3 No. scrapes
Large standing / fallen deadwood trees placed as fallen deadwood		65 No.
Green poles placed as standing monoliths to become next generation of standing deadwood; veteranised as appropriate.		31 No.
Live stumps/ over-sized rootballs placed as planted stools/ placed above ground as habitat feature		81 No.
Green timber	Placed as fallen deadwood	117 No.
	Placed as log piles (mix of existing deadwood and green wood)	81 No.
	Placed as brash piles	75 No.
Planting Feature		
Translocated coppice stool		132 No.
Translocated semi-mature trees/ saplings		41 No.
AWI species translocated by hand Generally counted as clumps rather than individual plants	Primroses *(Primula vulgaris)*	985 No.
	Yellow Archangel *(Lamium galeobdolon)*	6 No.
	Lords and Ladies *(Arum maculatum)*	82 No.
	Wood Anemone *(Anemone nemorosa)*	108 No.
	Wood Sedge *(Carex sylvatica)*	90 No.
	Wild Strawberry *(Fragaria vesca)*	52 No.
	Speedwell *(Veronica chamaedrys)*	12 No.
	St Johns Wort *(Hypericum)*	22 No.
	Ribwort plantain *(Plantago lanceolata)*	10 No.
	Bugle *(Ajuga reptans)*	6 No.
	Wood/mountain speedwell *(Veronica montana)*	2 No.
AWI species translocated by turf bucket		64 No.
Seedlings/ saplings translocated by hand	Holly *(Ilex aquifolium)*	5 No.
	Blackthorn *(Prunus spinosa)*	77 No.
	Hazel *(Corylus avellana)*	77 No.
	Hawthorn *(Crataegus laevigata)*	60 No.
	Oak *(Quercus Sp.)*	10 No.
	Privet *(Ligustrum)*	17 No.
	Guelder rose *(Viburnum opulus)*	16 No.
	Dog Rose *(Rosa canina)*	64 No.
	Honeysuckle *(Lonicera periclymenum)*	143 No.
	Dogwood *(Cornus sanguinea)*	1 No.
	Wild service tree *(Sorbus torminalis)*	7 No.

[1] Each specimen was assessed in terms of suitability for translocation on the basis of tree health and Diameter at Breast Height (DBH). Semi-mature trees are defined by the British Standards Institution as having a DBH of 6cm or above (**Source – BSI: BS3936**). The term 'semi-mature' in the context of these works also referred to some specimens which would more usually be defined as 'saplings' if standard nursery stock measurements were used to assess size. For clarity, specimens ranged in size from 4cm DBH and above.

Tree re-use

All donor trees not suitable for translocation were cut to ground level and removed for timber re-use such as cordwood, timber logs, chipped arisings for use as biomass product or for us in other habitat enhancement / restoration schemes. RSK Habitats sister company, Salix has an on-going requirement for mature trees with rootballs for river restoration work.

Large wood is a critical component of a natural and healthy river system, driving natural processes, slowing the flow, storing fine sediments and creating niche habitats throughout the river system. Since large areas of river catchments are now devoid of a natural supply of wood into rivers, and often human intervention is required to add large wood back into our river systems to restore or rewild natural processes in our rivers. Diversity of habitats in rivers supports all forms of fish, insects, birds and mammals. Using large wood in rivers also a way of sequestering carbon. As the wood decays over decades its carbon becomes sequestered in the form of new soils, along with the significant volumes of fine sediment that the wood has trapped.

Twelve suitable oak trees were carefully extracted to approximately 5m lengths and between 350mm and 500mm diameter with rootballs still attached. These were section-felled using a long-reach excavator and grapple saw to the appropriate height. A second team of two excavators worked together to excavated the monolith with the rootball as intact as possible. The tree was then loaded on to a tractor and trailer and taken to a stockpile before being transported to the river restoration site. The timber was handled using large excavators with full lift-plans for the operation with an additional 25% factor of safety built into the calculations on top of the manufacturers margin of safety.

To off-set some of the disruption to local residents & businesses, RSK Habitat Management contributed to the overall community engagement commitment made by Fusion including:

- donation of felled (logged) timber to local residents and scout groups;
- donation of chipped timber to local schools for use in landscaping projects;
- free of charge arboricultural works for a village community orchard and habitat area.

Reuse of deadwood timber: preparation of oak trees to be used in off-site wetland restoration projects

Surface water and silt management

The most significant challenge was working with an underlying heavy clay soil that is impermeable, becomes easily saturated and liable to flood during heavy rainfall, compounded by a compressed timeframe which led to winter working. Excavation of soil can also cause surface water run-off, which has the potential to impact local watercourses.

According to best practice woodland translocation works should be carried out during the plant dormant season. High levels of winter rainfall and ecological (nesting birds) constraints means that an autumn (Sep-Oct) translocation is preferable to works in early spring (Jan-Mar). Ideally soil should also be moved in late autumn when plants are dormant but the soils still warm, to encourage root regrowth before the next growing season. Land and consenting issues and the requirement to carry out bat mitigation works (to comply with the terms of a Natural England bat licence) meant that translocation works could not commence until early November 2020.

The receptor site agricultural soil was at risk from saturation, which could lead to the subsoil becoming 'smeared' when the topsoil was removed. This would create an impermeable layer between the ancient woodland soils and the underlying subsoil.

it was inevitable that winter rain would pose a risk to programme, the worst-case scenario being that work would be delayed until spring when the soils were sufficiently dry. To reduce this risk, a series of micro drainage channels were formed in the receptor site which would allow the top 150mm of soil to drain laterally. The channels led to two on site 'sumps' or lagoons which were pumped into a silt settlement system. A remotely monitored automatic flocculent dosing system was used to ensure discharge waters were within consent parameters for suspended solids and water was then discharged to a ditch leading offsite.

The introduction of the micro-drainage system, along with the system of track mat deployment, ensured that the receptor site remained sufficiently dry in the top 150mm for works to continue. The project benefitted from having a soil scientist permanently on site, as it was possible to find areas to work even during very poor weather. Although this did mean that works were not as sequential as initially planned, only 12 number of days was lost to weather, even during the worst of the winter with snow as well as periods of heavy rain.

The introduction of the drainage system in the receptor site also gave an opportunity to create permanent water features. The sumps have been partially infilled, creating scrapes (shallow hollows) which are intended to be seasonally/ intermittently wet. Some of the micro-ditches were retained but re-profiled to make them shallower and more sinuous, with some draining into the scrapes. It is hoped that these features will contribute to the overall biodiversity of the site and provide habitat opportunities for flora and fauna.

See Best Practice notes – Surface water and silt management; Semi-permanent water features.

One of three seasonally wet 'scrapes'; at receptor site looking towards south with Decoypond Wood in background.

Key specialist machinery included:

- LGP long reach excavator with shears for veg clearance
- LGP tracked Mobile Elevated Working Platform (MEWP) on track mats for bat mitigation ahead of translocation
- Specialist excavator attachments:
  Scandinavian long edge buckets
  Turf bucket
  Auger for monoliths
- Bog mats and track matting
- Wheeled dumpers with swivel-tip skips for accurate placement and ability to tip off track mat route

Programme information:

- Overall translocation period (start of November 2020 to end of February 2021)
- 10 cells average were completed per day (approx. 350m2); soils taken in two layers from a cell at the donor site and placed at the receptor site in same order in same cell. Fully mapped and recorded for monitoring.
- 64 no. turves moved in total (approx. 128m2)
- Days unable to translocate due to weather: 12