Best practice example:	Silt and surface water management
Project:	Ancient woodland feature translocation
Client:	Fusion/HS2
Location:	Calvert, Buckinghamshire
Timescales:	2019 – 2020 (Feasibility study) 2020- 2021 (Translocation works)

Background

- The area is underlain by Oxford Clay meaning the soils do not freely drain and when wet create fine, silt particles which can pollute watercourses. Bisecting the Ancient woodland receptor site is a watercourse which connects to a main watercourse offsite and downstream of Fusion works.
- In accordance with Industry Best Practice for habitat translocation works (CIRIA C600) and to avoid ecological impacts to protected species, the works were programmed to take place during the autumn/winter season.

Issues to consider

Silt management – potential for reportable pollution incident

- The works involved stripping areas of topsoil at both the donor and receptor sites, therefore exposing the underlying clay.
- This was carried out in small sections, 'cells', to minimise the amount of stripped area in both donor and receptor sites. Within the receptor site, however, there was still a risk of rain generating silt run off with the potential to pollute the drainage ditch running through the site which led to a series of offsite ditches and ultimately to a main watercourse.
- Pollution of the ditch could therefore result in a reportable incident to the Environment Agency.

Surface water management – compliance with HS2 Technical Standards and CIRIA C600 guidance

- Clay soils are impermeable, so prevent rainfall from freely percolating through the soil horizons. This can result in wet 'plastic' soils which are prone to smearing and pooling surface water.
- In accordance with the HS2 Technical Standards and CIRIA C600 guidance, works would have to stop until the soils were sufficiently dried out to prevent smearing.
- Soils would not be sufficiently dry until the following spring, resulting in significant delays to programme.

Solutions

Receptor site:

- The overall area was divided into 4 No. main areas; either side of the central ditch which bisected the site and of the main haul route which was protected with trackmats and formed a central 'spine' through the site.
- RSK devised both a passive and an active surface water and silt management system as shown in **Figure 1**.

Passive system: Retaining 2-3m wide vegetation strips & placing silt barrier fencing parallel to the existing central drainage ditch, use of reeds and rushes within the ditch to act as natural filtration mechanisms & placing silt barrier fencing along the edges of the lowest working areas where water would naturally accumulate.

Active system: Creation of an extensive network of shallow drainage 'grips' across the receptor site which fed into collection 'sumps' and to a silt treatment system.

- Within each area, drainage 'grips' were formed by an excavator working from a series of bog mats which led from the main haul route. At no time did the excavator drive on unprotected soils; this would have led to soil compaction which would have exacerbated the drainage problems and soil plasticity effect.
- The grips comprised a series of shallow trenches excavated to a depth of approximately 180-200mm, depending on local conditions. This allowed free draining of the top 150mm of topsoil which was to be stripped and replaced by ancient woodland soils.
- The depth of the grip was above the subsoil layer at circa 200mm depth. Digging to expose the subsoil layer

would have caused surface 'smearing', creating an impermeable surface which would have prevented successful establishment of translocated and newly planted trees and plants.

- The grips connected to a central channel (at the same depth) running parallel to main haul route on each side which carried water to a collection point, consisting of deep excavated areas or 'sumps' capable of holding large amounts of water.
- From the sumps, water was pumped into a silt settlement tank and a flocculent solution was added to assist in silt settlement. Clean water was then pumped from the settlement tank and into the watercourse on site.

Figure 1: Active/ passive surface water and silt management system

<u>Donor sites:</u>

Surface water and silt management proved to be less of an issue at the donor sites even after trees were largely removed, as the leaf litter layer provided an effective level of protection in unstripped areas. Late in the programme accumulation of water became more of an issue due to adverse weather conditions. Sumps were created adjacent to works areas - water was pumped from flooded areas into the sumps and later over-pumping to the silt settlement and treatment area in the receptor site.

Benefits

- Once the grip network was in place, each 'cell' was drained on 3 sides so the network had the capability to rapidly drain standing pools of water and saturated soils in cells quickly, following heavy rainfall events.
- This allowed soils within cells to dry out quicker and meet HS2 Technical Standard parameters following heavy rainfall events; works could restart much sooner than would otherwise have been the case.
- The sumps and silt settlement tank meant there was capacity to hold large volumes of water prior to treatment and discharge, rather than an immediate pump, treat and discharge system. This proved very effective, with only 4 No. tankers required to physically tanker water away from site, when the system reached maximum holding and treatment capacity following a prolonged period of heavy rainfall.
- Due to access and ecological constraints, the main translocation works did not commence until November 2020 and was therefore continuing during the main winter months of January – March 2021. During this time there were both extreme rainfall and snow events, but the drainage system allowed for minimal loss of time. In total only 12 number of days were lost to weather through the entire works programme.


Above: Network of grips at edges of cells connect to central channels positioned left and right of main haulage route


Above: Pipes laid underneath haul route to allow movement of water from central channels to sumps

Above: Excavation of area on northern boundary to create drainage sump

Above: Silt laden sump being pumped out – pipe leads to silt treatment system off photo to right

Above: Taytech silt management and monitoring system

Above: Silt level monitoring device