



SILVERTON MILL: Case Study

Customer:
DS Smith
Contract Value: £9M

Executive Summary

Award winning regeneration project encompassing the formation of a new river channel, flood defense works, and ecological formation and biodiversity enhancements at a former paper mill.

Industrial Legacy

THE FORMER PAPER MILL SITE HAD A HEAVY INDUSTRIAL LEGACY DATING BACK TO THE 1800'S



Petroleum Hydrocarbons

CONTAMINANTS WERE PRESENT ALONGSIDE AND BELOW THE CULVERTED WATERCOURSE



Local Ecology

ECOLOGICAL SURVEYS UNDERTAKEN IDENTIFIED MATERNITY ROOSTS FOR DAUBENTON'S BATS WITHIN THE CULVERT, AND BROWN LONG-EARED BATS WITHIN THE MILL STRUCTURE



Flood Defences

THE TRANSFORMATION OF THE LARGE CULVERTED SECTION OF THE RIVER CULM INTO AN ATTRACTIVE RIVER CORRIDOR WAS NECESSARY TO IMPROVE FLOOD DEFENCES



Challenges

The former paper mill site had a heavy industrial legacy dating back to the 1800's, which had resulted in a harsh industrial landscape and negative visual impact. In addition to the adverse impact the site had on the local ecology, the site was contaminated with significant petroleum hydrocarbons. The contaminants were present alongside and below the culverted watercourse.

Ecological surveys undertaken prior to the commencement of the works identified maternity roosts for Daubenton's bats within a small section of culvert, and Brown Long-Eared bats within the mill structure itself. Whilst sensitive species such as reptiles and aquatic animals were not identified in significant numbers, care was required to avoid any potential negative impacts on all wildlife throughout the works.

The transformation of the large culverted section of the River Culm into a diverse and attractive river corridor was necessary to improve flood defences; as part of this the range of river and wildlife habitats introduced as part of the project also helped to enrich biodiversity.

Solution

The design of the newly created river channel required that an oversized, predominantly over-wide profile would be constructed, allowing some degree of natural freedom for the river to find a stable regime. The sizing of the newly created channel was determined by the width of the natural undisturbed channel upstream and downstream of the work area, along with the estimation of open channel flow rates.

Discussions with the Environment Agency and the National Trust promoted the construction of a flood defence embankment to protect lower ground and retained listed buildings on the downstream bank on the western edge (the former clock tower and adjacent culvert).

The river base was constructed as close to natural width as possible, but with gentle sloping banks to create a significantly widened flood stage channel. The over widening of the channel at flood levels was designed to reduce velocities and hence erosion pressure; these were important considerations with respect to long-term integrity of the 600mm clay liner, prevention of contaminant to the river, whilst ensuring that the newly placed artificial upper 'benthic' layer would not be prone to erosion.

Material selection was vital to the longevity of the river design and included the use of British Waterways approved blue lias clay, a 200mm thick layer formed of recycled no-fine aggregates generated from the demolition process, and carefully selected quarried limestone material ranging in size from cobbles to boulders weighing several tonnes.

A diverse and wildlife friendly seed mix was developed with input from the Environment Agency's Biodiversity Officer and wetland restoration specialists Salix. A variety of

native grasses, sedges, rushes, reeds and herbs was used, with seed mixes matched to anticipated wetness conditions on banks of the channel.

We maintained the existing habitats and restored or improved the diversity of habitats to increase the range of flora and fauna indigenous to the area. In consultation with the Environment Agency, stakeholders and the local community - we identified animal, amphibian and bird species that were underrepresented or under threat and provided suitable habitats to strengthen numbers as appropriate.

The area immediately surrounding the Silverton Mill was prone to severe flooding caused by the 160m long culvert and the lack of any suitable flood alleviation measures. Using a combination of historic analysis and the Environment Agency's flood data we ensured that adequate water storage was built into the new river and the adjacent floodplain, thereby reducing the risk of flooding for adjacent communities and with additional benefits for local wildlife.

Petroleum hydrocarbon impacted soils were excavated from the areas adjacent to the former culvert structures. Work was carried out under a Materials Management Plan (CL:AIRE Definition of Waste: Development Industry Code of Practice).

Once the remediation works were complete, the former culvert was removed and the new naturalised river channel created. This included a groundwater base flow alleviation system, rock armour flow protection and restoration of 'natural' embankments. Rather than relying on man-made products such as the HDPE liner for the completed river installation, we sourced impermeable clay and limestone from local quarries. The impermeable clay also formed part of the remedial design, which was utilised to mitigate the potential migration of residual low level hydrocarbon contamination located at depth below the new river formation.



REMEDICATION | REGENERATION | ENABLING

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Benefits

The former Silverton Mill site has now been cleared of built structures, contaminated ground remediated, and the river reinstated to promote biodiversity. Our sustainable and environmentally sensitive design achieved by an iterative process meets the aims of The National Trust and its members, as well as the Environment Agency, whilst being appealing to the public.

The solution to restore and enhance the River Culm corridor has reversed the loss of biodiversity, making it possible for species to grow in numbers and increase in range. It has also provided a means of managing surface water as a contribution to the regions flood defences.

The newly formed river banks were completed in July 2016 and the upper banks were completed in January 2017. The ecological system is therefore at a very early stage of establishment. However, as of June 2017, only 6 months after completion of seeding, there are reports of the presence of perch, pike, kingfisher, green sandpiper, dippers, grey wagtail, goosanders, geese, swallows, swans and dragonfly in the restored area.

The scheme has received positive feedback from the Environment Agency, who praised the “partnership approach to the project” and the “securing of a natural open channel feature”.

