Material change for a better environment

Case study: Landscape and regeneration

Royal Ordnance Munitions Factory, Chorley transformed into the village of Buckshaw

The case for greener brownfield regeneration

Mixing quality compost with sandy clay loam subsoil to create topsoil for the site.

Key facts

- Transformation of 265 hectare former munitions factory site into the village of Buckshaw, including light industry and residential housing, with large areas of public open space.
- Phase one was designed to show that quality compost could play a key role in restoring soil health. Results were positive; the soil supported rapid plant establishment and coverage which in turn helped to increase infiltration and reduce runoff.
- Phase two of the project was to look at the benefits of using compost in the wider regeneration of the site. The use of compost in soil manufacturing highlighted massive economic advantages and it is estimated that this method could save the whole project more than £300,000.
- The project also looked at carbon sequestration; the potential for storing carbon in organically poor brownfield soils when blended with a carbon rich compost source.

Top: Moving quality compost.

Bottom: Tipping and spreading the manufactured topsoil.

The Royal Ordnance Munitions factory at Chorley produced explosives between 1936 and 1990. It closed in 1990 following rationalisation of the industry. As one of the biggest brownfield sites in the North West, and as part of a drive in the region to restore natural areas and woodland, owners of the site, BAE Systems Ltd, has driven a £400 million programme to transform the 265ha site into the village of Buckshaw.

The development accommodates separate areas of light industry and residential housing, with large areas of soft landscaping and public open space.

Due to the site's previous use, there was a possibility that the topsoil could contain residual munitions such as small detonators. To eliminate this risk, the soil was removed in a 'confidence scrape' before the land could be regenerated.

Method

BAE Systems has been working with Envirolink Northwest, Liverpool John Moores University and Ecological Restoration Consultants to restore large areas of landscaped open space on the site.

Since topsoil arising from the 'confidence scrape' was housed in a specially constructed containment mound on site, there was a resulting deficit of suitable topsoil available to meet the site's landscaping elements, such as roadside verges, playing fields, parks and woodlands.

The partners wanted to avoid bringing natural topsoils on site, and instead wanted to trial the use of compost to manufacture soil as a more sustainable and economic option.

The project was undertaken in the following two phases:

Phase 1 (January 2005 – March 2006)

The first phase of the project, 'Creating Woodlands from Waste', was undertaken with WRAP (Waste & Resources Action Programme) as part of its regional market development funding programme, and was designed to show that quality compost, made from recycled garden waste, could play a key role in restoring soil health. The aim was to blend the compost with uncontaminated subsoil that was low in nutrients and organic matter, and produce a material equivalent to manufactured economy grade topsoil (as specified in the now superseded BS3882:1994).

The project also set out to evaluate the commercial benefits of using compost in land restoration, in particular the potential cost savings that could be made by recycling and re-using soil-forming materials, rather than disposing of them to landfill.

It was determined that the site would require 14,000 tonnes of topsoil, so some 7,036 tonnes of BSI PAS 100 compost was blended on site with an equivalent quantity of sandy clay loam subsoil in a series of batches.

Helen Rawlinson, market development manager at Envirolink Northwest, said:

"There was insufficient topsoil on site to meet all the landscaping requirements of the site, which included the creation of amenity grassland, new woodland and landscaped sustainable urban drainage systems (SUDS).

"We decided that the most practical and economically viable solution was to import quality BSI PAS 100 compost and mix it on site with existing subsoil to manufacture a soil that

could meet the landscaping needs. This process created a soil that was high in nutrients and had good water retention properties, making it ideal for plant growth."

Helen Rawlinson, continued: *"The results from the first phase of the project showed the method of soil manufacture was capable of supporting rapid vegetation establishment and coverage which in turn helped to increase infiltration and reduce runoff. The use of compost in soil manufacturing also highlighted the economic advantages – a reduction of around 50 per cent in costs compared to importing topsoil."*

Phase 2 (January 2007 – Present)
Following on from the success of the first phase of the project, the trial approach was extended across the site.

Helen continued: *"We learnt from the first phase of the project that introducing organic matter, such as compost, to organically deficient soils promoted improved soil structure, soil handling properties and created better conditions for plants to establish and grow sustainably.*

"We wanted to continue working with WRAP and be involved in their trailblazer programme, which aimed to investigate the financial and environmental benefits of specifying and using quality compost in brownfield regeneration."

The objective of the second phase was to look at the benefits of using compost in the wider regeneration of the site. This phase of the project involved manufacturing almost 37,000 tonnes of soil, using a blend of BSI PAS 100 compost with sandy clay loam subsoil. The manufactured soil was then spread across nine hectares of the purpose built mounds, enabling establishment of species-rich amenity grassland and wooded areas.

As well as investigating the full extent of the cost benefits of this method of soil manufacture, a team from Liverpool John Moores University researched the potential for carbon sequestration in the soil. The team modelled the potential for carbon to be stored in organically poor brownfield soils when blended with a carbon rich compost source. This research is on-going and is being supported with supplementary funding from Envirolink Northwest.

The compost for the second phase of the project was sourced from local suppliers, SITA UK, at Clifton Marsh and WRS Composting Ltd, Formby .

Results
Findings from the second phase of the project have backed up the successful results from the first phase.

Helen Rawlinson said: *"From the results of the second phase we have calculated that to manufacture one tonne of soil, by reusing and mixing existing on site materials with BSI PAS 100 compost, costs £5.08 compared to £15.07 for landfill disposal of subsoil as day cover and importing a tonne of topsoil. This is a massive cost saving and we estimate now that this could save the whole project more than £300,000."*

Top: Placed and seeded manufactured topsoil. When the grassland is established, the new landscape will blend into the old.

Bottom: Standard trees planted into the manufactured topsoil as part of the site-wide landscaping scheme. The landscaped containment mound is on the horizon.

Economic Appraisal – on site soil manufacture

Activity	Reuse (£)
16,055t of PAS 100 compost (purchase and haulage at £6.60/t)	106,020
20,870 of subsoil to landfill	0
Handling costs for receiving compost, moving subsoil to mixing location and blending compost/subsoil (based on actual operational costs)	81,545
Total cost to manufacture 36,925t of soil	187,565
Cost per tonne of soil ready for use	5.08

Economic benefits

	Landfill disposal and import topsoil (£)	Recycle soil and import topsoil (£)	Reuse soil and create own topsoil (£)
Cost per tonne of soil ready for use	15.07	12.57	5.08

The eastern edge of the Chorley site, looking towards the temple spire at Whittle-Le-Woods.

Conclusion

These trials clearly demonstrate that manufacturing soil using a mixture of quality BSI PAS 100 compost and sandy clay loam subsoil not only provides ideal plant growing conditions, it can also significantly reduce the cost of landscaping when compared with importing topsoil. The trials also suggest that longer term cost benefits could be derived from using a compost-based manufactured soil, such as reduced replacement costs for plants, with less of them being affected by drought and weeds, particularly during early establishment.

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