

# Anstey Wetland –

a compost case study



Department of  
**Environment and Conservation**



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## Introduction

The Anstey Wetland, situated along the Forrest Highway that links Perth to Bunbury, is an outstanding example of using compost to recycle valuable resources and help create thriving ecosystems.

The wetland development, which spans over 20 hectares, is so successful that it seems like it's always been there. It was constructed in 2008 through a collaborative partnership between the Western Australia Waste Authority, the Department of Environment and Conservation, Main Roads Western Australia and the compost industry. Composted products have been critical to establishing vegetation on the particularly challenging site.

## Why compost?

Approximately 50 per cent of the waste generated by the municipal, commercial and industrial sectors is organic. It includes cleared vegetation and degraded topsoil from major road infrastructure projects, which is commonly sent to landfill or used as 'spoil' under road surfaces. When constructing the Forrest Highway, these valuable organic resources were recycled, through composting, for use in landscaping. With advice and support from the compost industry, the Anstey Wetlands project partners decided to trial composting on site and use compost to create the wetland.

Compost had the potential to help overcome a number of challenging conditions at the site:



### Poor soils

The Bassendean bleached grey sands of the site were interspersed with pale yellow and weak iron-organic hardpans and lacked nutrients and organic matter. The low fertility, unstable structure and poor water-holding capacity of these soils make plant establishment very difficult.

### Limited native seed bank

The site was previously a pine plantation; it lacked a vegetation history that would naturally provide a seed bank of the native jarrah, marri, banksia and tea tree species. The entire site had to be vegetated by direct seeding or tubestock.



## Topography

The wetlands site lies in a slight valley that undulates towards the Serpentine River, which is situated close to the east boundary. Vegetation is prone to being windswept and sandblasted by winds sweeping over the relic dune system to the west.

Composted products could not only improve soil health and resilience and plant establishment, but also divert a valuable resource from landfill.

## Making and using compost

The Western Australian composting industry and waste management i.e waste management specialists, provided advice and support regarding on-site composting, selection of composted products, application rates, trial plot size and also carried out regular monitoring by scientific experts.

Vegetation cleared during highway construction was chipped to produce mulch that was turned several times during site construction allowing for pasteurisation temperatures to be generated. Composted soil conditioner was brought in from off-site and this met Australian Standards AS 4454 for composted soil conditioner and was also subject to a complete laboratory analysis by a National Association of Testing Authorities (NATA) accredited laboratory.

The Waste Authority and DEC commissioned a scientific study to assess the:

- impact of composted soil conditioner and mulch on vegetation survival and establishment
- environmental impacts of composted soil conditioner and mulch on the sensitive wetland area.



Composted products were trialled on 3.05 hectares of the wetland, in two different vegetation communities:

- dry land – Tuart dominated and planted as tube stock
- heath land – planted using direct seeding techniques.

Mulch was applied to dry land plots and composted soil conditioner to heath land plots, trialling different rates and blends. Control plots were also included where no composted products were applied (Table 1).

**Table 1: Trial plots and compost application rates**

Plot	Plot size (ha)	Application rate per equal sub plot	Compost type*	Application type
1. Dry land A	7500	20mm	40:60	Surface application
2. Dry land B	7500	30mm	40:60	
3. Dry land C	7500	40mm	40:60	
4. Dry Control	7500	Control	Control	Control
1. Heath land A	2000	20mm	Soil conditioner	Incorporated 50-100mm into soil
2. Heath land B	2000	30mm	Soil conditioner	
3. Heath land C	2000	40mm	Soil conditioner	
4. Heath land D	2000	40mm	40:60	
Heath Control	2000	Control	Control	Control

*\*40:60 blend refers to 40% composted soil conditioner: 60% mulch mixed product.*

Soil amendments were applied from July to August in 2008 followed by seeding late July and early August 2008.

Composted soil conditioner and mulch were applied using a rear discharge manure spreader. Soil conditioner was incorporated into the heath lands plots using a rotary hoe attached behind the manure spreader.

## Compost – measuring the impact

### Plants

Plant establishment and growth was monitored over a two-year period. In both the dry land and heath land plots, all rates and blends of composted products resulted in significantly greater native plant cover than those without compost. The best results were seen with the 30mm rate of mulch in the dry land plots and 20mm rate of composted soil conditioner in the heath plots.

Observations four years after compost application show there is still a marked difference in the areas where composted products were applied. Native vegetation has established successfully and formed a densely vegetated community. Plants in both the dry land and heath land plots are now reproducing and seed of some native species, like Smokebush, that are particularly difficult to propagate has been distributed by fauna. These observations indicate that the wetland is becoming self sustaining, which is important for minimising the impact of weed invasion and feeding on seeds and saplings by fauna.



### Soil

Soil samples were taken before and after application of composted soil conditioner. Soil sampling, at the 40mm rate, indicated some improvements in soil pH, structure and nutrient levels. No results exceed ecological investigation levels or health investigation levels for recreational open spaces prescribed in the 'Assessment Levels for Soil, Sediment and Water' in the Contaminated Sites Management Series.

### Water

Water quality was monitored in two bores, with water samples taken before and after application of composted products. No significant impacts on water salinity, pH or nutrient levels were observed.

### Addressing compost use in sensitive ecosystems

The project partners, with the help of consultants and soil scientists wanted to address a number of potential risks of using compost when creating the wetland. Strategies were developed to mitigate potential risks, such as nutrient toxicity and leaching. Composted products provide a slow-release of nutrients which is beneficial for plant growth, but composted products that could be particularly high in nutrient concentrations or derived from household organic sources were not used in the trials. Composted products were trialled away from the seasonally-inundated wet basins to reduce the risk of nutrients leaching from organic matter and impacting on ground and surface water quality. Finally, some species of native plants are susceptible to increased levels of phosphorus, therefore low phosphorous soil conditioner was selected. All NATA accredited laboratory analysis of soil conditioner was received and reviewed prior to application.

## Costs

A total of 945m<sup>3</sup> of composted soil conditioner and 300m<sup>3</sup> of mulch was used in the trials, at a cost of \$51,120. Spreading and incorporation cost \$24,400. The cost of each soil amendment, not including site works, seeding costs and maintenance, was originally estimated at \$36.63 per m<sup>3</sup> for the composted soil conditioner (delivered) and \$5.50 for one type of mulch (delivered). Soil incorporation was \$17.60 per m<sup>3</sup> (\$1.232 per m<sup>2</sup>).



## Compost – making a difference

Composted soil conditioner and mulch helped to create a favourable soil environment for seed germination and plant establishment. Compost added organic matter to the sandy soils, which improved the soil's structure, stability and created a habitat for beneficial soil microbes. Water infiltration rates decreased and soil water holding capacity increased – seedlings were able to make better use of the limited water resources on site.

Composted products were also a source of slow release nutrients – soils were more fertile which improved seedling germination and plant establishment. Improvements in soil structure and plant establishment made the site more resilient to wind and rain erosion.

Despite the many challenges of the site, composted products have helped establish a healthy and vibrant wetland system. Almost 30 species of birds now inhabit the wetland which also provides habitat for a range of fauna including the bobtail lizard, bandicoots and snakes as well as a diverse array of invertebrates.

The collaborative partnership between the Waste Authority, DEC, Main Roads and the compost industry has demonstrated the benefits of composted products in establishing and sustaining native vegetation. The costs of erosion control and maintenance have been reduced and many of the concerns surrounding the use of compost in wetland creation and rehabilitation have also been addressed. In fact, composted products have provided a source of slow release nutrients beneficial to plant growth.

Main Roads have also made a significant change in their practices – the organic materials that were once considered waste are now recognised as a valuable resource for improving road infrastructure landscaping outcomes, and the health and resilience of Western Australian soils.



## More information and acknowledgments

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Department of Environment and Conservation Western Australia (2012), Report for a comparison of compost types and plant establishment techniques – Anstey Wetlands, available at the Waste Authority's website.

Grose, P. (2011), Composted soil conditioner and mulch promote native plant establishment from seed in a constructed seasonal wetland complex, Ecological Management and Restoration, Vol. 12(2), 151-154

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