

Shoalhaven's circular plastics precinct

"It's time to stop talking and do things.... we want to develop end-to-end solutions that support a circular economy."

Peter Windley, Waste Operations Coordinator, Shoalhaven City Council

Shoalhaven City Council ('Council') has an ambitious target to divert 90% of its waste from landfill. To support this target Shoalhaven is transforming its waste depot in Nowra from a waste sorting and disposal facility to an integrated circular economy precinct.

Co-located with the council-owned landfill is a Community Recycling Centre (CRC) where locals can drop off a range of products. Other activities being undertaken to process materials onsite include harvesting copper from electric cable, granulating plastics, shredding hygienic wipes and hospital gowns to create green ceramic tiles, and grinding glass into a range of sand products and concrete aggregate.

These developments have required significant investments by the Council, supplemented by NSW Government grants. The business case for Council included the environmental benefits of increased recycling, reducing costs by extending the life of the landfill, and the creation of new jobs in the region.

This case study draws on two site visits by members and friends of Circular Plastic Illawarra in 2023. We are grateful for the time taken by Peter Windley, Waste Operations Coordinator at the Council, and Andrew Douglas, Founder and Director of Kandui Technologies, for taking the time to share their knowledge with us.

Community Recycling Centres

Locals can drop off a wide range of household goods and materials at this CRC as well as an additional nine resource recovery facilities in the local government area (LGA), which are supported by NSW EPA. Items can be deposited at clearly sign-posted drop-off points for packaging, plastics, paints, gas bottles and other problematic materials.

Other waste dropped at the transfer station is sorted by staff to remove any recyclable materials such as plastic pipe, tyres, mattresses, and electrical cable, for recovery in their processing facilities.



The drop-off station in the for packaging in the Community Recycling Centre

Expanded polystyrene (EPS) recycling

EPS packaging is not recyclable through the kerbside collection system because it is difficult to sort in a Materials Recovery Facility (MRF) and has limited end markets. EPS is processed using equipment at the Nowra depot by shredding and then melting it into a solid material. This is then exported to make new polystyrene products.



Steps in the EPS processing (L-R): the drop-off point, bags of unprocessed EPS, the granulator, and the product sold into export markets.

Plastic pipes

Any plastic pipe dropped off at the transfer station is separated from other waste and granulated onsite. This material (HDPE or MDPE) is sold to plastic manufacturers.

Electrical cable

Around 22 tonnes of electrical cable are collected each year from the 10 resource recovery sites in the LGA. This is granulated to separate the copper wire from the PVC sheath. The copper is then ground into a powder and sold, while the plastic is used as a raw material in the MICROFactorie.



Electrical cable ready for processing

The MICROFactorie

Council is establishing the first commercial-scale MICROFactorie in partnership with academic researchers at UNSW SMaRT Centre and commercial partner Kandui Technologies. The factory manufactures green ceramic tiles and tabletops from textiles and recycled crushed glass produced next door at the glass processing plant.

While still being commissioned, the MICROFactorie has demonstrated its capacity to produce high quality products from recycled raw materials including packaging, synthetic textiles, and mattresses. Products include:

- tiles for the Sydney Olympic Aquatic Centre using uniforms and banners from the 2000 Olympics
- tiles for NSW Health from out-of-date disinfectant wipes
- 3D printing filament from used medical face shields and other plastics, which have been used to make tile spacers



Andrew Douglas, Founder and Director of Kandui Technologies, in front of the MICROFactorie



Example of a tile made from recycled glass and used medical gowns



Samples made from recycled glass and textiles

Glass processing plant

Several years ago, Shoalhaven City Council, like many other councils and recyclers, had accumulated a stockpile of mixed and broken glass. There were limited markets for this material at the time as it didn't meet quality specifications for glass packaging and had to be downcycled into products such as road base.

To solve this problem Council built a glass crushing and washing plant at the West Nowra facility. This plant produces multiple grades of product, ranging from a fine powder which is sold to a local adhesive manufacturer, through to larger granules suitable for asphalt, road base or pipe bedding. When the factory was built there were no agreed specifications for recycled glass in road construction, so Council worked with Transport NSW and Austroads to develop them. Since then, crushed glass has been used in local projects such as the Albion Park bypass and the Nowra bridge project.

Council is also working with RMIT University and the University of Western Sydney (UWS) to develop new, higher value end products. Very fine glass (<50 micron) has similar properties to cement, and UWS researchers have developed a composite concrete product with 93% glass.

Having almost processed their 18,000-tonne stockpile, Council is now planning to process material from other sources.



Peter Windley showing the granulated glass



Prototype of a construction product developed in partnership with the University of Western Sydney from 90% glass

Mixed residual waste

Small quantities of residual (unrecyclable) glass and plastics are recovered in a Process Engineered Fuel (PEF) plant located on the site. This produces a solid fuel that replaces gas and coal required in cement kilns.

Landfill

The last option for non-recyclable waste is to dispose of it in landfill. Gas that is generated as organic material breaks down in landfill (comprising ~50% methane) is recovered to generate 6 MW of power. Leachate is treated to remove

PFAS, with plans in place to reuse the water after treatment in the glass washing plant.

Next steps

A new MRF is currently (2023-24) being built. This modern and advanced facility will use advanced technology and innovation including Optical Sorting and Artificial Intelligence (AI) to maximise recovery rates and purity of outputs from not only traditional kerbside comingled recycling, but multiple other sources and waste streams. The new MRF will allow Council to incorporate existing recycling operations to further recover and recycle problematic packaging and other problematic waste streams (non-kerbside comingled) currently recovered onsite.

Council is interested in adding soft plastics to their kerbside collection system as soon as end markets are available. The aim is to process this material in a plastic granulating, washing and pelletising plant that they plan to build at the back end of the MRF. The waste team is working with UNSW SMaRT Centre to explore potential end products for the sorted materials.

The Shoalhaven Rubber Crumb Plant is currently being constructed. This will utilise tyres and other waste rubber materials that are currently destined for landfill. The plant will create a valuable crumbed rubber and powder commodity ready for use in local Shoalhaven civil infrastructure projects, in particular, as a commercial polymer replacement in asphalts and bitumen.

Council also plans to establish an Alternate Waste Treatment (AWT) facility that will be amongst Australia's first advanced recycling treatment plants capable of diverting over 90% of mixed waste from landfill. The process uses autoclaves that sterilise and dry the waste, eliminating odours and allowing the dry material to be sorted through a series of processes to separate all recyclable components.

Conclusion

This case study shows what can be achieved by a relatively small local government in a regional area. The keys to their success include:

- the passion and determination of the waste team members
- strong support from management
- partnerships with research organisations and companies that share their vision.

Council's approach is to look beyond business-as-usual for opportunities to convert 'wastes' into valuable materials, with the twin aims of improving circularity while generating social and economic benefits for the region.