Sunshine Coast Council has taken a nation leading position in the field of waste management by unveiling Australia’s first ‘three fraction’ underground Automatic Waste Collection System (AWCS).

A two-year research and development phase followed by a public tender process, culminated in Envac Australia Pty Ltd being awarded a contract to design, supply, construct, operate and maintain an AWCS in the new Maroochydore City Centre.

Envac Australia’s parent company, Envac AB Sweden were the pioneers of underground waste vacuum systems and whilst new to Australia, the systems are founded on proven technology first used in the 1960’s. Since then, systems have been installed in more than 700 municipal locations around the globe including Barcelona, Paris, London, Beijing, Dubai, Singapore and Seoul.

As an alternative to standard kerbside bin collection services, general waste, food waste and commingled recyclables produced within the new Maroochydore city centre will be transported from commercial buildings and apartments at up to 70kmh through a 6.5km system of underground vacuum pipes to a collection station located in the outskirts of the CBD.

The new CBD is being constructed on the site of a former golf course located in the heart of Maroochydore that presented a unique “greenfield” opportunity for Council to develop a central business district in one of Australia’s fastest growing regions. The 53-hectare site is owned by Council, has been declared a Priority Development Area (PDA) and is destined to become the new cultural, business and government regional centre for the Sunshine Coast.

Like every other city and town across Australia, Council’s ‘business as usual’ waste collection system requires a fleet of side-lift, rear-lift and front-lift trucks to provide a bin collection service that is a constant source of noise, traffic congestion and diesel fumes. Traditional waste management practices also require allocation of space within buildings to store waste bins and the daily or weekly presentation of bins on kerbsides awaiting collection which impacts on the visual amenity of the streetscape.

The city centre will deliver 2,000 residential dwellings and 240,000 m² of commercial & retail floor space. Modelling of predicted waste generation rates for the new CBD indicated that conventional waste collection would require daily servicing of approximately 300 bulk bins and 200 public place wheelie bins. Anyone who has lived or worked in a CBD will be acutely aware of the nuisance factor servicing these bins creates.
The innovation of underground waste collection means that city workers and residents will never have to walk past rows of ‘fragrant’ bins, overflowing public place bins or be woken early by noisy garbage trucks in the Maroochydore City Centre.

**How the System Works**
The system uses air as a transport medium, moving waste from source to a central collection point that can be up to 2.5 km away and consists of four basic components, Disposal Points, Pipe Network, Collection Station and Electronic Monitoring & Control.

**Disposal Points**
Disposal points are controlled inlets that sit above ground either in public streets, parks, courtyards or internally in buildings.

To encourage landfill diversion and maximise waste recycling, each building in the Maroochydore CBD will be required, as a minimum, to incorporate a single ‘three fraction’ inlet disposal point either in the building basement or ground floor. The three fractions being:
- Organic (food waste);
- Commingled recyclables; and
- General waste.

Developers have discretion to install multiple three fraction inlets throughout respective buildings, for example as a chute system to service each floor, and/or in various locations throughout the footprint of the site dependant on its proposed use.

To minimise the risk of organic fraction contamination, public place bins in the new CBD will comprise of two fraction inlets:
- Commingled recyclables; and
- General waste

Waste dropped into each disposal point inlet will be stored in a sealed compartment until the flow of air is activated by the central control system. The vacuum system will then consecutively collect each waste fraction according to the system’s scheduled operation. Sensors within each inlet storage compartment will also alert the control system if the storage compartment reaches critical holding capacity earlier than scheduled and an additional collection event will be automatically activated.

For retail and commercial buildings, larger inlets can be incorporated to accommodate disposal of greater volumes of waste. Internal inlet doors can be key or swipe card controlled so that only registered users are able to access the system. This option if selected, will provide information to building managers regarding waste volumes deposited by different users.

**Pipe Network**
Infrastructure Agreements specifying land sale conditions applicable to the PDA, classify the AWCS pipe network as a utility...
service, similar to water supply and sewerage. The AWCS pipe network when installed will form a tree like layout through the CBD where the collection station is the root and waste inlets located along the network of branches fork out from the main trunk line.

Council is responsible for provision and installation of the main trunk and branch line network, including delivery of an AWCS utility stub to the boundary of each Lot. As the system and most associated components are proprietary products, Developers of each Lot will acquire and connect the majority of their internal AWCS pipeline, disposal inlets and related infrastructure through Envac.

The steel pipe network incorporates an anti-corrosive external protective coating and the pipes range in diameter from 400mm to 450mm with pipe wall thickness varying between 6.35mm and 21.4mm depending on location. High wear and tear areas such as bends are thicker due to the abrasive nature of some waste components, particularly glass fines in the commingled recyclables fraction.

To minimize cost and augment civil works productivity, the pipe network, including a series of inspection pits for maintenance access, will be simultaneously installed in underground service corridors with other utility services (water, sewerage, fibre-optic network, electricity etc).

The ‘engine room’ of the system is the collection station which will be located on the outskirts of the CBD. The collection station has been designed to a style and architecture that complements the expected format and standard of surrounding commercial and residential developments. Due to its proximity to sensitive receivers, a major consideration of the collection station design process included mitigation measures to prevent odour & dust emissions and techniques to maximise noise attenuation.

The collection station houses most of the system equipment including a series of centrifugal fans (exhausters) powered by 110kW 3 phase motors for creation of vacuum, waste cyclones for separation of waste and conveying air, dust cyclones with filter elements for cleaning the conveying air before it is released to the receiving environment, compactors to maximize bin load weights, a series of 30m³ container bins for bulk waste transport, gantry cranes for lifting and moving the bins, air pipes, valves, silencers, and other auxiliary equipment.

A visitor viewing area has also been incorporated in the building to cater for technical tours and waste education purposes, and to ensure seamless continuity of service delivery, back-up generators will be located on-site for use in the event of power black-outs.

From disposal inlets located throughout the CBD to the collection station bin storage area, the entire system is airtight. Material from each waste fraction is sequentially extracted from disposal inlets, transported through the pipe network and...
Outdoor waste inlet installation - underground parts.

Pipeline inspection pit

North Eastern Perspective

deposited into a series of sealed 30m³ container bins located within the ground floor of the collection station. Six container bins are on site at any one time. Three ‘active’ bins are connected to respective waste fraction compactors and three spares are stored ready for swap over when active bins are disconnected for transit to and from disposal facilities.

When a container bin is at capacity, the automated gantry crane transfers the bin to an internal bay for loading onto a standard hook-lift haulage truck for transport to Council’s respective recycling facilities or landfill. Haulage trucks will access and egress the site from a bypass road adjacent to the city centre, thereby avoiding any travel through the CBD.

Electronic Monitoring and Control
The collection station is also home to the electronic monitoring and control system which identifies and draws stored waste from respective inlets on a priority demand process.

The AWCS uses a programmable logic controller (PLC) and a supervisory control and data acquisition (SCADA) system developed by Envac, known as the Envac Automation Platform (EAP).

The EAP will be continually updated with statistical data relating to waste disposal behaviour across the entire system through a series of sensors installed in individual waste disposal points which constantly monitor the system and provide real time intelligence regarding user activity and inlet status including available storage capacity.
Using this data, adaptive algorithms ensure that the self-learning system continually fine-tunes the frequency and sequencing of disposal point emptying and adjusts the scheduling of container bin retrieval from the collection station to ensure a balanced operation that optimizes automation, reduces energy consumption and minimizes operational costs.

Notably, management and oversight of the EAP can be undertaken on site or remotely.

**System Commissioning**
The underground pipe network is currently being installed and collection station construction is due to begin September 2017. System commissioning is planned to commence mid-2018 in readiness for tenancy of first buildings which is anticipated later that year.

In the meantime, Council is experiencing considerable interest in the AWCS from numerous municipalities across Australia and when operational we look forward to opening our doors to a broad range of visitors for technical tours, school education programs and other interested community groups.

**In Summary**
Automatic underground “Smart Waste” collection is an integral component of Council’s ‘Smart City Framework’ and will provide significant contribution towards Council’s aim of balancing improvements to quality of life with economic growth and environmental sustainability in the Maroochydore CBD.