



Collection costs vanish for Brent Council as Wembley City's waste goes underground

Imagine a waste and recycling collection system that requires few vehicle movements, no containers, boxes, bins or sacks and no physical contact with waste after it has been deposited. A system that is accessible to residents 24-hours-a-day, 365-days-a-year and is completely automated, requiring virtually no input from collection staff. Can you imagine a Streetscene that remains free of litter, recycling boxes, unsightly bins and obstructions?

You may be surprised to hear that this is not the stuff of local authority waste and recycling officers' dreams, but is very much a reality, and is already in successful operation in one of London's most recent large scale residential and commercial developments – Wembley City. Read on to find out more about:-

- An efficient vacuum technology that sucks waste away, underground, at speeds of up to 70mph
- A system that removes the need for traditional collection systems, containers, vehicles and crews
- Vastly reduced vehicle movements and carbon emissions - saving an estimated 400 tonnes CO2 / year at Wembley City
- Improved Streetscene as waste and recycling 'disappears' as soon as it is deposited
- Local authority collection costs per household reduced by one third

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Background

Brent Council includes a largely urban area, situated in the North West of London. Across the borough, a compulsory recycling policy is in operation for the green box service which collects co-mingled recyclables (including glass). Residual waste collections are made weekly and the borough also offers a garden waste sack collection to all residents.

The Wembley City Development offered a unique opportunity to adopt an alternative approach to waste

During the early design and planning stages of this huge Wembley City development, installation of an underground route for waste disposal was proposed by developers Quintain simply as an additional utility or service which could be placed alongside other required infrastructure such as sewerage, water, gas and electricity. The pipes used have a design life of around sixty years – this is in line with most infrastructure and new development.

Quintain own the Wembley City site in its entirety which comprises 85 acres, 4, 200 homes and a vibrant mix of leisure, retail, hotels and office space including the planned Civic Offices for Brent Council. The fact that the developers owned the site and all of the infrastructure, including roads, was a key factor when considering whether an underground system of waste disposal was a feasible option. This outright ownership meant less multi party consultation and fewer constraints when it came to planning and designing the underground system

Brent Council was consulted on the innovative idea from the outset and endorsed the proposal after giving it full consideration.

Chris Whyte, Head of Environmental Management at Brent Council said:

“The developers made it clear to the council that Envac was their preferred method of waste disposal and asked that Brent accommodate it within the development. We were satisfied with the proposal and happy to endorse it.”

A vacuum technology that moves waste at 70mph underground – how does it work?



Photo 1: Inlet Chutes at Wembley City

Residents deposit their source separated wastes into one of three colour coded, above ground inlet chutes which are conveniently located near to the entrance to each block or building. (See photo 1)

The inlet chutes accept waste as follows:-

Green chute – Organic recyclables (all food waste, garden & compostable waste)

Orange chute – Dry recyclables (paper, card, glass, cans, plastic bottles)

Black chute – Residual waste

The separated waste is stored temporarily in an underground chamber until enough waste (chamber capacity is around 2 tonnes) has accumulated for transport to the collection terminal. At regular intervals (usually twice per day, but this can be adjusted), an automated valve opens and the waste is vacuumed away through a series of pipes to a waste terminal situated nearby.

Waste is automatically compacted and later on, collected by Brent Council's specially adapted hook lift collection vehicles for disposal or reprocessing. For a more detailed technical description of this process, including diagrams, please see [Appendix 1](#).

Design and installation of an underground waste system cost in the region of £7Million for the Wembley City site - who paid and who is responsible for what?



Photo 2: Envac pipes being laid at Wembley City

Although the developers initiated some early discussions around a possible contribution from Brent Council towards the cost of capital outlay, design and installation, Brent made it clear to the developers that they were not in a position to contribute financially. Therefore the financial viability of this type of collection system has been largely dependent on the developers wishing to pursue the use of this technology.

One factor that has significantly contributed to the financial viability of the technology for the developers in this situation was the high cost of land per metre². In total the installation of the Envac system saved an estimated 1865m² for residential properties (the equivalent of 22 flats, with an estimated value of £5 million); provided an additional 62 car parking spaces (with an estimated value of £1.8 million) and a further 1106m² for commercial use.

It made clear financial sense for the developers to free up as much space as possible. There was no need for the traditional bin stores and access routes associated with multiple occupancy blocks and therefore the developers were able to make significant savings. Considerable future savings for Quintain were also predicted when taking into account future revenue from provision of waste management contracts to commercial premises.

The operation of the Envac system is entirely independent of the Waste collection Authority Brent Council, with the exception that the waste is removed from the collection station. The configuration of the Envac system at the Wembley City site supports the waste strategy implemented by Brent Council, but Quintain have essentially become waste management contractors for the homes and business within Wembley City. Waste management is written into both the

residential and commercial leasing /buying agreements of the development and Quintain manage these waste contracts. Table 1 summarises who is responsible for which costs associated with the design, build and maintenance of the underground system in the case of Wembley City.

Expenditure	Responsible
Capital Expenditure (Design, supply and fix all pipe, inlet, collection station)	Developer
Operational Expenditure (Service & maintenance of Envac system, Power to run fans, compactors etc)	Developer
Collection costs (removal of waste & recycling from waste terminal)	Local authority
Communications to residents	Local authority & Envac

Table 1: Summary of arrangements at Wembley City

For a more detailed cost comparison of the Envac system versus traditional collection methods see [Appendix 2](#).

Collection costs per household reduced by one third for the waste collection authority

Whilst all operations on site are dealt with by the developers, the waste collection costs for residential parts of the development remain the responsibility of the local authority, Brent Council. If developers had adopted a more traditional approach to waste management opting for communal bin stores and 1100 litre Euro bins, Brent estimate that they would have been required to purchase two new refuse collection vehicles along with collection crews, visiting each bin store two to three times per week.

The costs and implications for Brent Council would have been significant. With the underground system in place, Brent Council's financial and resource input is greatly reduced. Ongoing annual costs such as staff salaries, fuel and vehicle maintenance are also much lower. Total collection costs per household in the rest of Brent are at around £90 per annum. For properties in the Wembley City development, this figure is £60 per annum.

One investment Brent Council did make was the purchase of a hook lift vehicle, required to collect compacted waste from the terminal. Brent Council pay a collection fee of around £100 per lift. The cost of running the dedicated hook lift RCV is around £100k per year.

Other implications for the collection authority

The use of the Envac technology at Wembley City is largely seen as positive and development of the system was welcomed and promoted by Brent Council from the outset. Brent report that there are seldom any problems or negative aspects to the way the system operates.

Communications to residents are a joint effort between Brent Council and Envac. The main focus of communication is to remind residents which materials to put into which chute and to avoid contamination etc.

Chris Whyte, Head of Environmental Management at Brent Council commented:

“Operationally, there are no issues and contamination has not been a concern – it is a very clean process”.

Benefits of going underground

Aside from the financial savings for the collection authority, there are many real benefits of adopting an underground system for developer, collection authority, residents and the environment. Key points are outlined below.

For residents and the local Streetscene environment...

Accessibility and convenience is a key advantage - the system is available 24 hours a day, 365 days a year. Residents can dispose of recycling and residual waste little and often without the need to store waste for extended periods in often space limited homes.

Local environment is improved, waste becomes invisible. No unsightly, odorous bin stores, noise of collections, litter, pests or vermin.

Traffic movements are reduced, less noise and congestion. Estimated 72% reduction in km travelled by waste collection vehicles and 95% reduction in time vehicles would need to spend on site.*

Vehicle related CO2 emissions reduced and local pollution from traffic is lessened

General greenhouse gas emissions lower using Envac system.*

For the local authority

No contingency planning required for bank holidays, missed collections. Minimal disruption due to severe weather conditions, vehicle breakdown etc.

Significant cash savings as costs associated with traditional collections such as staff and vehicles disappear.

Minimal health & safety / manual handling risks as all physical contact with the waste is removed.

Recycling rates are comparable to the rest of the borough – currently at around 35%

Contamination via the Envac system is not an issue for Brent to date there have been no problems with rejected loads etc.

Food waste recycling rates improved when compared to similar properties in the area using traditional waste collection systems. Mainly due to storage and collection issues being removed as barriers to recycling.

For the developer...

Additional space is made available on street, in communal areas and in buildings. This equates to significant financial savings.

Improves cityscape, environment and appearance of development.

No on-going costs of bin maintenance, cleaning and employing an operative to move bins to point of collection.



Photo 3: Envac Infrastructure

In a wider environmental / social context...

Recycling increases – due to the communal nature of the recycling chutes, social controls become an effective monitor and motivator. Source separating is encouraged, contamination is reduced and environmental awareness increases.

Reduction in methane emissions due to a reduction of organic and food wastes going to landfill

* Data was taken from a report prepared for Quintain by SLR Consultancy in 2007. For further details please email win@southeastiep.gov.uk

Incentive schemes can be easily introduced - users can be supplied with a personal swipe card making it possible to record and measure each time they use the waste system. Weighing technology could also be added in theory, (although this could be quite costly). This would open up the possibility of monitoring waste composition, and recycling rates and operating reward based incentive schemes etc.

Future developments - environmental gains could be seen, for example, through the implementation of a district heating scheme and energy production through an AD facility – both of which are possible additions to the Envac system.

System limitations

There are some limitations to the Envac system such as not being able to accept bulky, clinical, hazardous, WEEE, liquid or construction wastes.

Also, the system cannot accommodate large quantities of glass as regular deposits of glass can cause harmful abrasion to the chutes and transfer pipe work and will ultimately accelerate wear and tear of the system. Co-mingled glass (up to 10%) is however, acceptable. Co-collection of glass with other recyclates could cause potential problems for re-processors.

Cost and capital expenditure for design and implementation is also an issue. Although the longer term cost analysis clearly demonstrates that this type of system can be cost effective.

Is the future underground?

Now that the system is tried and tested at the Wembley site, Brent Council report that they are keen to replicate the success of underground systems in other developments, however, for the most part, the initial costs for planning and infrastructure seem to be prohibitive for developers and no plans for further developments are underway at present.

A recent announcement in nearby Lewisham, however, reports that the Envac system has been chosen to handle the waste at Surrey Canal, a Sporting Village development in South East London. The £3m contract will see Envac handle 5,000 tonnes of waste from the site each year.

In a partnership with nearby power plant SELCHP, residual waste from the Envac system will be fed directly into the plant to generate energy for the whole of the village. A recycling rate of more than 40% is expected to be achieved.

Points for Planners

Consideration for how waste will be stored, managed collected and transported should form an integral part of the plans for any new residential or commercial development. Local authorities have an important role

in encouraging and promoting good practice through their planning departments and one way in which waste managers could assist in this process would be to provide clear and concise guidance to their planning colleagues. A guidance document relevant to the local authority which can in turn be passed onto developers could contain information such as:-

- Waste Strategy for the district / county
- Local waste service specification including details of types of waste collected and recycled, frequency of collection, size of collection containers, capacity requirements for households.
- Guidelines for designing waste storage facilities including information on how to screen and disguise bin stores and how to avoid vandalism and contamination.
- Guidelines on the storage of waste and recycling within the building, for example in-built storage areas adequate to house containers used by the local authority.
- Good practice guidelines for designing access routes and turning space required for RCVs
- Health & safety information including clearance required for access, manual handling, risks of fire, noise, smells, visual intrusion.
- Consideration and preference for innovative collection infrastructure such as underground stores or vacuum collection systems.

For more information see these documents:-

[Code for Sustainable Homes](#)

[Making Space for Waste - ADEPT, June 2010 - Designing Waste Management in New Developments A Practical Guide for Developers and Local Authorities](#)

Sources, Links & Contacts

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020 8937 5342
[Brent Council's waste & recycling web pages](#)

[Envac website](#)
[A History of the Envac System](#)
[FAQs for Envac system](#)

Appendix 1: How the technology works

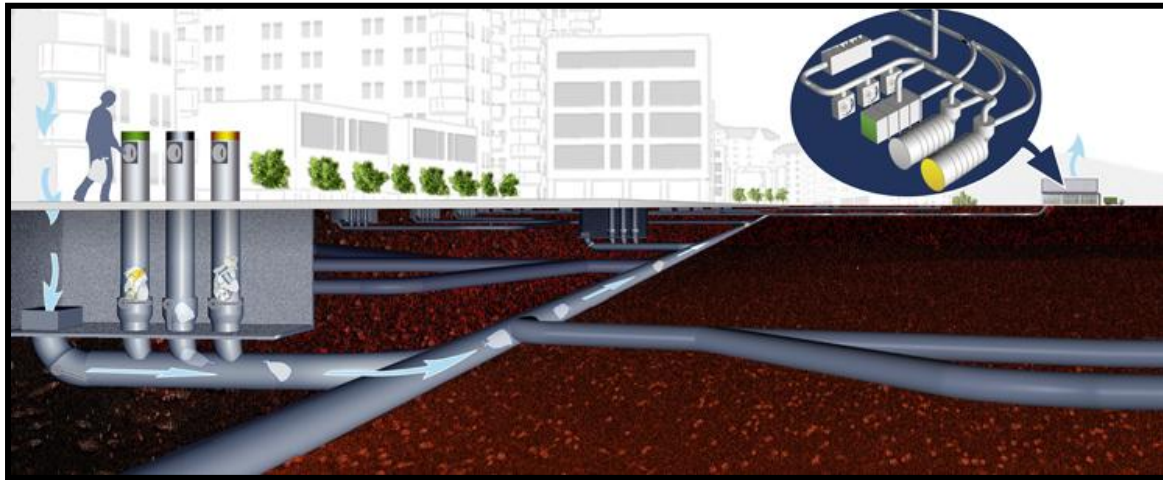


Diagram of a stationary vacuum system

Stage One – Service user deposits waste into Inlet

Residents throw their waste into ordinary, readily accessible ‘inlets’ which can be located either indoors or out. At Wembley City, residents are provided with an outdoor communal area each with three chutes, accepting waste as follows:-

- Green chute – Organic recyclables (all food waste, garden & compostable waste)
- Orange chute – Dry recyclables (paper, card, glass, cans, plastic bottles)
- Black chute – Residual waste

Once waste has been deposited into one of the chutes, material is stored temporarily above a closed storage valve. All full inlets are then emptied at regular intervals. Automatic emptying is governed by a control system in a collection station building on the periphery of the area which is linked to the inlets via a system of underground pipes.

Stage Two – Emptying

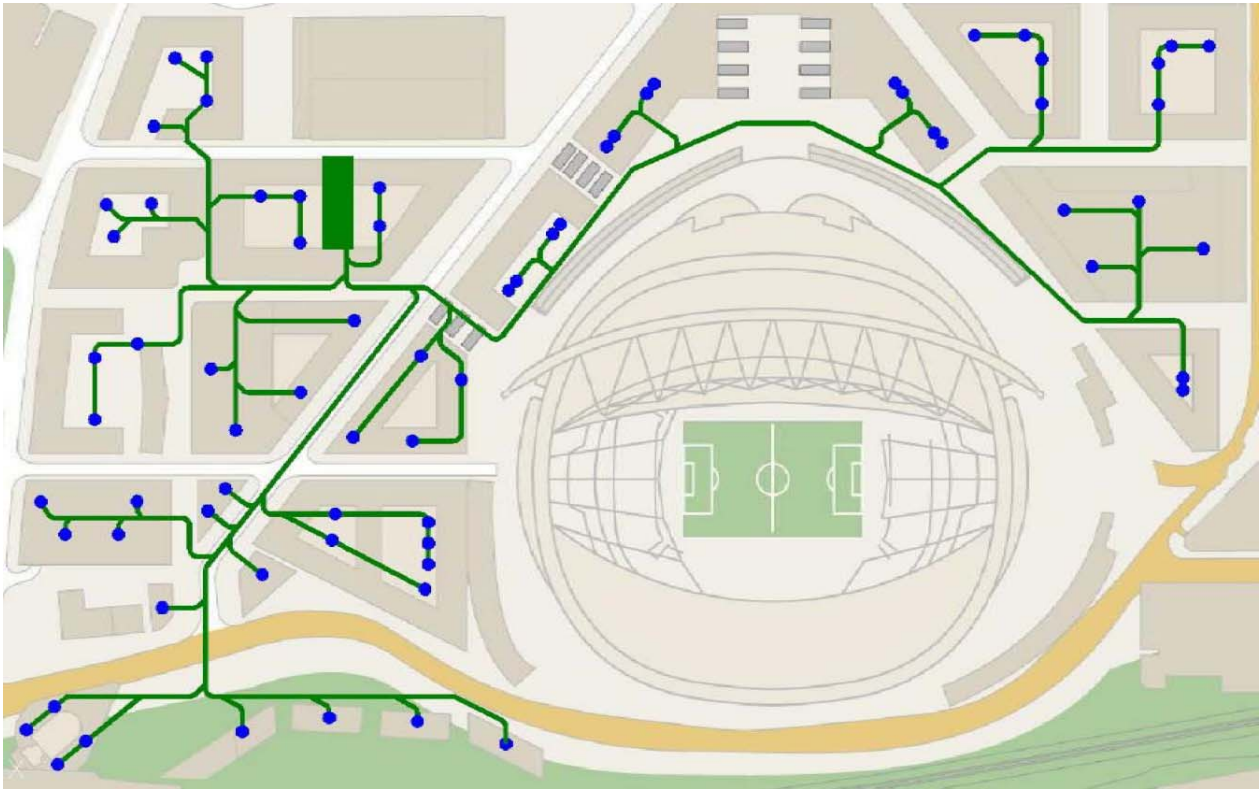
The control system senses when it is time to empty the inlets, a number of fans are started which build up a vacuum in the pipe system. First, a supply air valve is opened in order to allow transport air to enter the pipe system. Then the storage valves beneath the inlets are opened one by one. The waste bags fall down into the horizontal pipe system and are sucked away to the terminal. Each waste type is emptied individually into the horizontal system to ensure waste types stay separated. At Wembley City, the inlets are emptied automatically twice per day but they can be set to open more or less frequently when required.

Stage Three – Collection station

Waste at the collection station is sucked through a cyclone, where it is separated from the transport air. It then falls down into a compressor where it is compressed and then fed into the correct sealed container. The transport air is released via a flue after having passed through dust and cleaning filters and silencers. The collection station forms part of the Hilton Hotel service area. The main doors remain closed at all times, and only open to allow waste collection and maintenance vehicles access. When the vehicle has entered the station the doors are closed immediately to ensure minimum noise pollution.

Stage Four – Collection

When the containers are full, a collection vehicle enters the collection station, and the full container is loaded onto the vehicle. This is then taken away by the local authority for disposal or re-processing depending on the contents.



Envac pipe network at Wembley City

Further notes

- Residents tend to deposit little and often, as they are leaving the block.
- Stainless steel is used for organics chute to minimise corrosion to pipes.
- Blockages rarely occur but if they do it is normally due to an oversized object. In this case the system recognises the change in air pressure and automatically increases fan speeds until the blockage is cleared.
- Access points to the underground pipes are installed every 100 metres.
- To date, no manual blockage removals have been required at Wembley City.
- There is an approximate maximum distance of 2km between inlets and collection station, but this distance is also dependant on other factors such as gradient. The maximum distance achieved to date is 3.7km in Norway.
- A mobile version of the system is more suited to retrofit projects – this works without the need for the collection station. Instead, the waste is temporarily stored in closed underground screw tanks, located underneath the inlets and vacuum vehicles collect regularly from docking points situated on the periphery of the development.
- Instead of a collection station, waste could also be transported straight to a sorting, reprocessing or disposal route for example a Materials Recovery Facility or an Energy from Waste plant.
- The technology is flexible and can be customised and adapted to suit any number of settings including residential, hospital, airport and commercial / retail
- Surprisingly, this is by no means a new technology – the first underground waste transport systems developed by [Envac](#) were installed in the 1960's. The Envac system now has a global presence with major installations in cities such as Vitoria, Stockholm and Barcelona and in destinations such as Dubai and Disneyworld, Florida, where the system has been in place since 1971

Appendix 2

A comparison of Envac vs traditional collection methods using Eurobins for a development of 10, 000 flats. Comparison over 30 years. (Provided by Envac)

Capital Expenditure (CAPEX)	ENVAC	EUROBIN	COMMENTS
Eurobin cost	£0	£2,550,000	Total 1700 bins x £250/bin, replaced every 5 years
Envac capital cost	£11,000,000	£0	Design, supply and fix all pipe, inlet, collection station
Bin room housing cost	£500,000	£10,625,000	Eurobin, 1700 bins @ 2.5sq.m. per bin @ £2500/sq.m.
			Envac is for building to house collection station
Trenching cost	£1,100,000	£0	
Total Capex	£12,600,000	£13,175,000	
Capex per flat	£1,260	£1,317.50	
Capex per flat/year	£42	£43.92	
Operational Expenditure (OPEX) per year			
Envac full service	£98,000	£0	Service/maintain Envac system
Envac energy cost	£11,000	£0	Power to run fans, compactors etc.
Eurobins maintenance	£0	£17,000	4% per year to replace lids/castors/vehicle damage
Eurobin annual clean	£0	£13,600	£8 per bin per year
Eurobin portering costs	£0	£160,000	1700 bins will require 8 full time staff @ £20k p.a. to move bins to kerbside and back to bin store
Waste collection cost*	£100,000	£480,000	£10/flat/year with Envac - £48/flat/year without Envac
Total Opex/year	£209,000	£670,600	
Opex per flat/year	£20.90	£67.06	

*This cost is the local authority waste collection cost. The saving made in their collection cost which is achieved by the installation of the Envac system is partially required to fund the Envac full service Opex cost.

Summary – Envac is a cost effective waste collection method if space released by communal bin rooms is valued and a contribution towards running costs can be secured by the local authority.