

GETTING INTO GARBAGE BINS

SIMPLE SIGNAGE AND OVERALL BIN DESIGN CAN INCREASE RECYCLING AND REDUCE LITTER



PROJECT OVERVIEW

One issue with public litter bins in Toronto is that they are failing to deter the significant amounts of litter that end up on city streets and eventually enter surrounding environments, like [Toronto's Harbourfront](#). This leakage of litter can likely be attributed to two primary deficits of the bins: 1. they are not attracting sufficient attention and use by people to deter littering, and 2. when bins do fill up, maintenance issues lead to overflowing bins. The City of Toronto is aware that overflowing bins pose a problem and is considering new bin design.

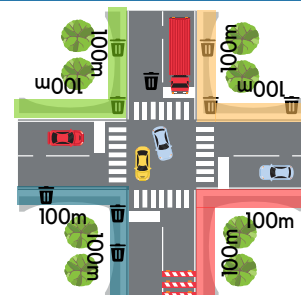
Another issue with public litter bins in Toronto is contamination (from improper sorting of waste between landfill and recycling). When the contamination is high (above 25%), the waste cannot be processed as recycling and the contents are instead sent to landfill. Thus, one barrier to high recycling rates is improper waste sorting.

Our research aims to inform how overall bin design, signage, and the abundance of bins affect the amount of litter and waste sorting. *Importantly, we found that overall bin design and bin signage matters most.* **We observed less litter for self-compacting bins with fill sensors and better waste sorting when clear and direct signage was added to bins.**

METHODS

1. BIN AVAILABILITY

A total of 156 litter transects were conducted at intersections across the City of Toronto. Intersections included a combination of ["Mixed Use"](#) and ["Neighbourhoods"](#) land use, and at least one of the intersecting roads was a major arterial corridor (e.g., Bloor). At each intersection, a 100m transect was set along each of the 8 stretches of sidewalk extending from the intersection and data was paired at each corner of the intersection for analysis (i.e., 4 analyzed corners per intersection). In each transect, all litter items were recorded and characterized, binned by size (larger or smaller than 4 in²). The number of bins within each transect was also recorded.



Example of transect areas and public litter bins along a Toronto intersection.

2. BIN SIGNAGE

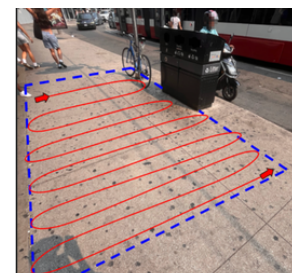
We manipulated the signage on three dual-stream (landfill and recycling) bins outside of Ripley's Aquarium in downtown Toronto. We carefully created signage that was aimed to be simple and clear - to improve waste sorting. This signage was installed for one week, directing users to dispose of a specific and simplified set of items – cans, paper, coffee cups & lids, glass items, plastic cups, and plastic bottles - into the recycling stream and to put all other items (including any food contaminated items) into the landfill stream. Waste audits were conducted on each bin before and after the new signs were deployed to determine whether sorting improved.



Ripley's Recycling bin with added signage.

3. BIN DESIGN

In summer of 2025, litter transects were conducted in Sankofa Square around two existing ASTRAL model public litter bins (WR4 and WR5) and two bins with new bin designs (Big Belly and CleanCUBE) which have a more prominent design, fill sensors, and an internal self-compacting press.



Litter transect area and walking pattern in front of an ASTRAL WR4 bin.

RESULTS

1. BIN AVAILABILITY

The number of bins present at each intersection corner did not affect the amount of litter we observed (fig 2.). The average amount of litter across all intersection corners was ~ 0.34 items/m². Cigarette butts were the most abundant litter item (~ 12 times greater than the second most abundant category of litter) (fig. 1).

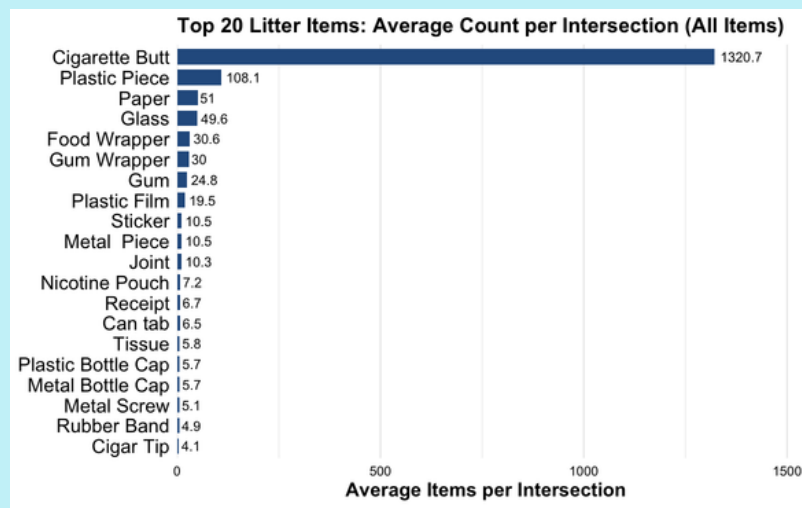


Fig 1. Average item count per intersection.

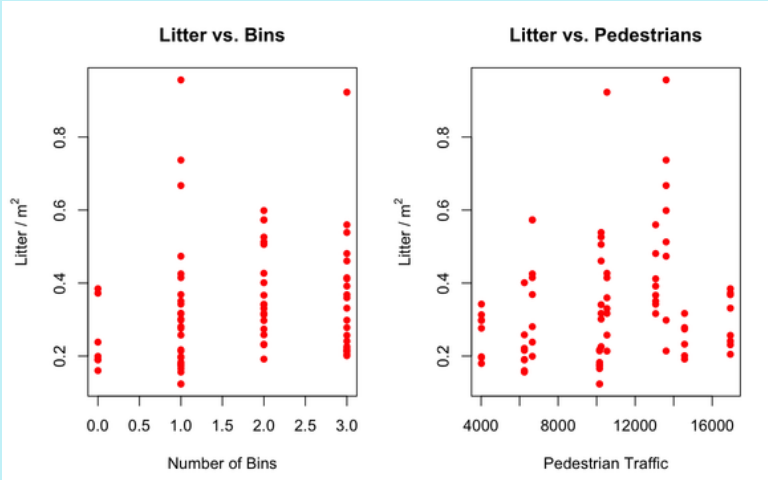


Fig 2. Insignificant relationships of litter with number of bins and pedestrian traffic.

2. BIN SIGNAGE

Simple signage improved waste sorting. The improvement in sorting appears to be driven by the sign instructing users not to add food-soiled items to the recycling bin (fig. 3). The results were split into three categories: **Correct items** (items were correct regardless of if they were soiled), **Unsoiled** (items were correct and appeared to be added unsoiled), **No Cross-Contamination** (items were correct, appeared to be added unsoiled, and were not soiled from another item). The last category, No Cross-Contamination, is relevant to the behaviour of others, as one soiled item can contaminate other items in the bin (i.e., one bad sorter can negate other’s correct sorting).

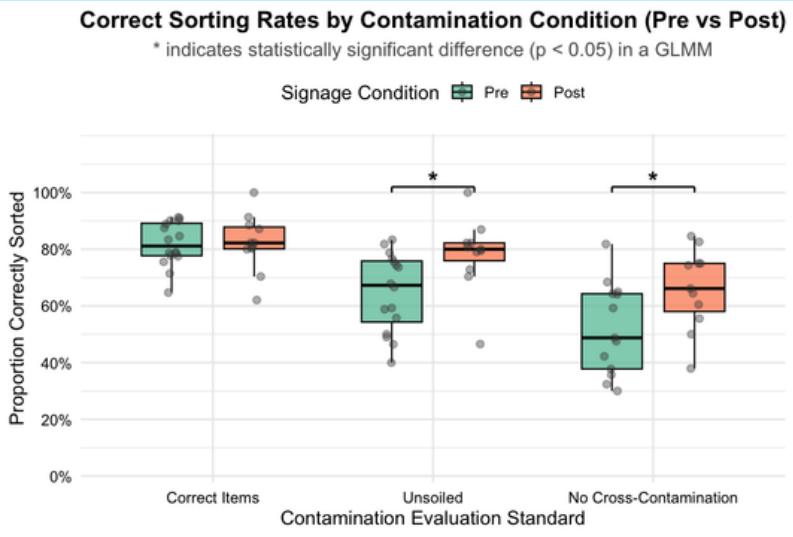


Fig 3. Comparison of the proportion of waste that was sorted correctly pre signage (green) and post signage (orange) installation.

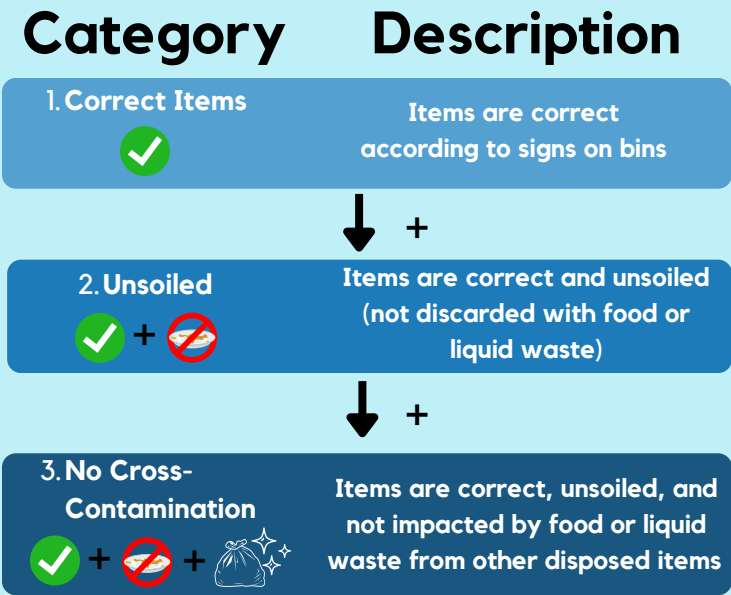


Fig 4. Definitions of the three categories used to determine if waste was sorted correctly.

3. BIN DESIGN

Bins that are designed with self-compacters, sensors to measure bin fullness, and some item-sorting signage had less litter around them than older models without these new features (fig.5).

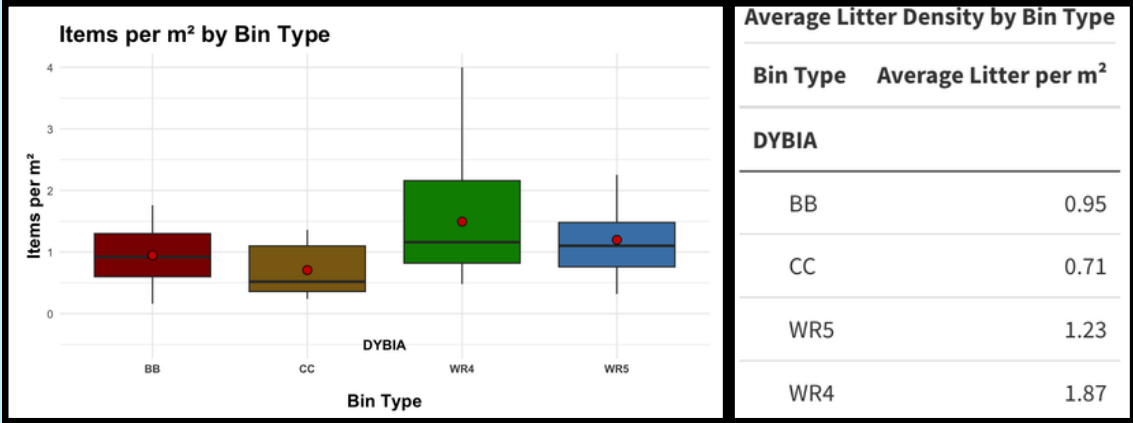


Fig. 5. Differences in litter density (litter/m²) found in transects around each bin type in the Downtown Yonge Business Improvement Area.



ASTRAL WR4



CleanCUBE

Fig. 6. Photos of an old and widely used ASTRAL WR4 litter bin in Toronto and a newly piloted self-compacting bin called the CleanCUBE.

PRIMARY FINDINGS

BIN AVAILABILITY

- No significant trends were observed between levels of litter and number of bins (both cigarette and other non-cigarette litter) (fig. 1). This data suggests that any approach by the City of Toronto focussing predominantly on increasing bin availability may have a minimal impact on deterring littering.
- Cigarette butts were a significant proportion (73.5%) of all littered items found during transects, suggesting current bins are not being used to dispose of cigarette butts (despite the slot for them).

BIN SIGNAGE

- The proportion of correctly sorted items, which were either unsoiled or unsoiled and not cross-contaminated by other items, increased significantly after signage was installed (from 54% to 71% for the unsoiled and not cross-contaminated category).
- Most of the gains from signage were relevant to disposing of less food and liquid waste, which can contaminate theirs and other recyclable items (fig. 3).
- Cross-contamination from improperly sorted waste-covered items (i.e., the negative impact of "bad sorters"), alone, led to an additional average decline (after accounting for unsoiled items) in recyclable bin contents by 12.6% across the full length of the study (fig. 3).

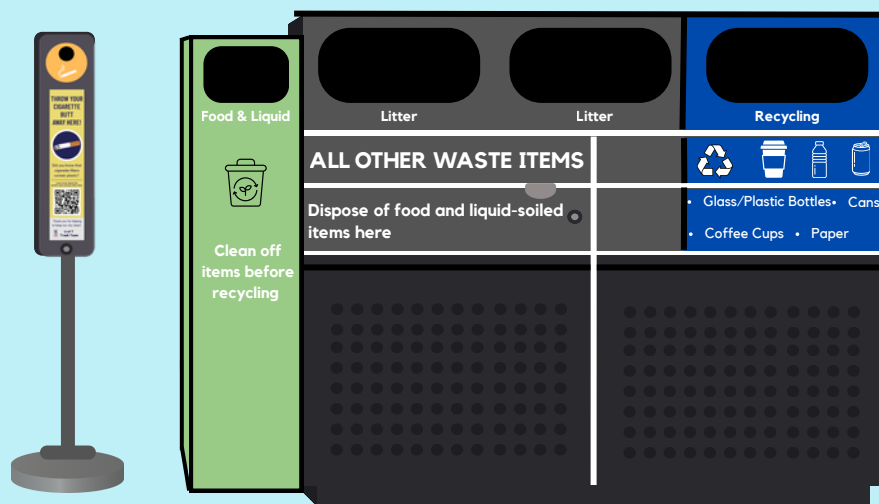
BIN DESIGN

- Our 2025 study in the DYBIA found that solar-powered and self-compacting bins (fig. 6. CleanCUBE) had lower levels of litter around them (0.71 and 0.95 pieces of litter/m²) than the existing ASTRAL model public litter bins found throughout the City of Toronto (1.23 and 1.87 pieces of litter/m²) (fig. 5).

QUALITY OVER QUANTITY

The abundance of public bins accounted for very little of the variation in litter at major intersections. However, better bin design decreased the amount of litter on the ground and clear signage improved waste sorting and reduced contamination. Furthermore, although these bins all have disposal holes for cigarette filters, cigarette butts continue to be the most common litter item observed which suggests the public litter bins alone will not reduce cigarette litter.

- 1. DEVELOP CLEAR SIGNAGE ON BINS:** Signage added to bins should be clear, simple, and consistent across bins. Selecting a smaller permitted list of recyclable items may help decrease contamination. Text about soiled items should be present and clear. This may increase recycling rates.
- 2. PROVIDE RECEPTACLES FOR FOOD AND LIQUID DISPOSAL:** To help reduce the cross-contamination of recyclable materials with excessive amounts of liquid and food, a separate stream or collection slot could be dedicated to liquids and food.
- 3. LEVERAGE NEW BIN DESIGNS:** Consider the addition of self-compacting bin models with sensors that alert the City of when they are nearing full. This can help reduce bin overflow, and thus reduce litter.
- 4. ADD NEW CIGARETTE ABATEMENT STRATEGIES:** The lack of a statistically significant impact of litter bins on cigarette litter suggests that the built-in receptacles in these bins are not fulfilling their intended role. Although these receptacles have been present on city bins for many years, they are ignored by many smokers. New standalone cigarette receptacles paired with clear signage has been shown to reduce cigarette butt litter, and should be installed across the City.



Concept design of a public litter bin (modified from an ASTRAL model design) which differentiates landfill, recycling, and has an organics/liquids bin. This model would also include a fill sensor and self-compactor to improve bin servicing and avoid overflow. The bin is paired with a nearby and standalone cigarette receptacle.

Citations

City of Toronto. (2026, June 19). Official plan maps. City of Toronto. <https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/official-plan/official-plan-maps-copy/#location=&lat=&lng=&zoom=>

Trapping trash in the Toronto Harbour: 2025 data summary project overview. U of T Trash Team. (n.d.). <https://www.porttoronto.com/wp-content/uploads/2025Floatables-PolicyBrief.pdf>



U of T
Trash Team



DOWNTOWN



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