# FOCUS ISSUES

## FOCUS ON RESIDENTIAL PLASTICS

One of the most misunderstood facets of the current curbside recycling program is plastics. As one resident recently put it, "plastic is plastic is plastic, right?" Unfortunately, no. The seven Society for Plastics Industries (SPI) plastic resin identification codes that are applied to many, though not all, rigid plastic containers tell only part of a long, complicated story that underlies this useful but difficult-to-manage material.

### Plastic Bottles and Jugs

**# 1 and # 2 Bottles are…**

**95% of all plastic bottles**
**52% of all plastic containers**
**15% of all plastics**
**2% of all waste**

**that New York Residents discard**

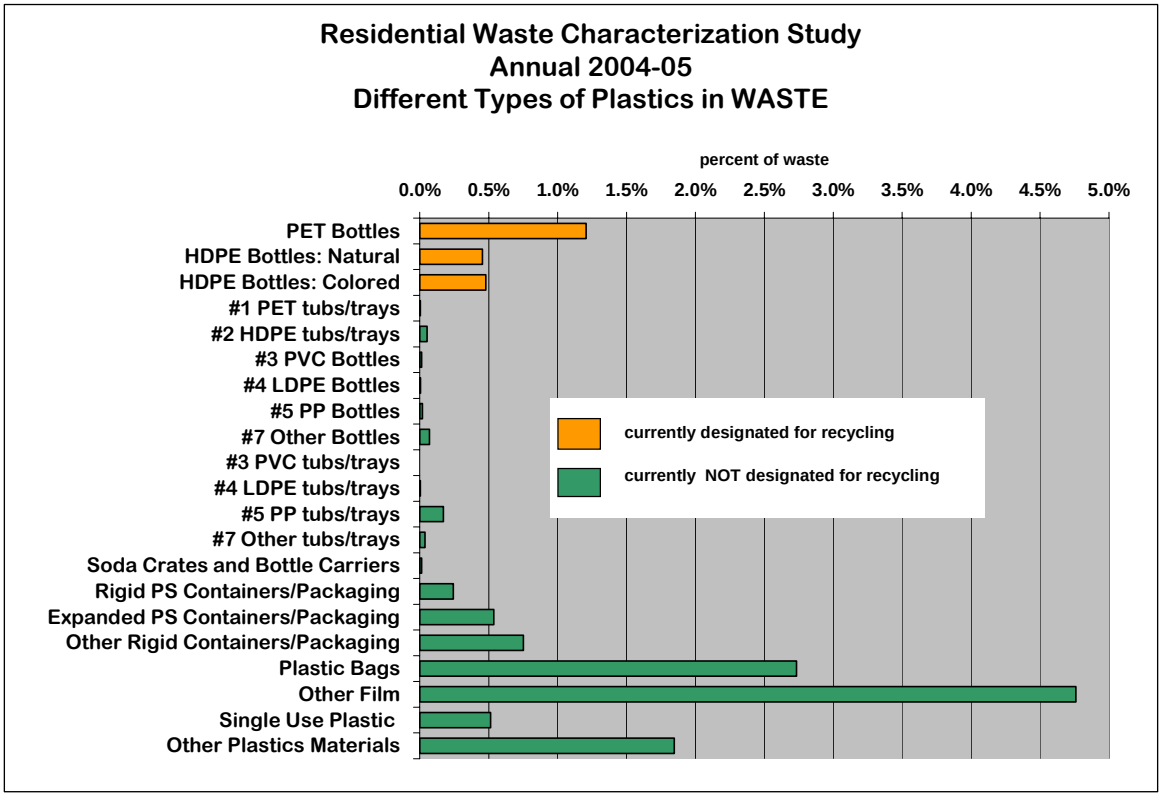
At present, DSNY generally asks residents to recycle "plastic bottles and jugs" in its curbside recycling public education materials. At the recycling plant, however, only #1 and #2 bottles and jugs, which constitute the vast majority of all plastic bottles and jugs, are actually recycled. The reason for this is that these particular commodities meet the two crucial criteria for successful recycling. First, #1 and #2 bottles are present in significant enough quantities in the waste stream to make economies of scale in collection and processing work. Second, the confluence of technological capabilities, product specifications, and global economic forces creates reliable markets for bottles and jugs of these two resins. Other types of plastics may satisfy one or the other criteria, but not both.

Plastics with codes three through seven are NOT currently recyclable in NYC, nor are they in most municipal programs. Like many other municipalities, DSNY has, over the history of the program, found it simpler for residents to recycle all bottles rather than focus on the resin codes. An exception to this approach occurred in 2004, when objections from the New York City Recycling Advisory Board, which contested the 95% statistic based on anecdotal observations in local supermarkets, led to a change in wording in 2004 when the full recycling program was reinstated. In response to CRAB pressure, DSNY's public education materials specified #1 and #2 plastic bottles and jugs as recyclable. This distinction, which was wholly unnecessary due to the extremely small fraction of bottles and jugs that are not #1 and #2, caused confusion, and was reversed in all subsequent public education materials.

### Tubs and Trays

In New York City, as in most communities, bottles and jugs are the only plastic containers collected for recycling. Plastic containers without necks, such as tubs and trays, are not recyclable, even if they are marked with a #1 or #2 resin code. This is because plastic bottles are "blow-molded," while plastic tubs are "injection-molded." There are different additives used in each manufacturing process. Thus, while #1 bottles and jugs and #1 tubs and trays are made of the same resin (PET), they cannot be mixed in the recycling process. The same holds for #2 bottles and jugs vs. #2 tubs and trays.

The WCS sorted containers, bags, and durable plastic items into 22 separate categories, with results shown below.




This aspect of the WCS highlights the wide varieties of plastics, as well as the incompleteness of the plastics coding scheme that was voluntarily adopted by the SPI in the late 1980's.

## Misleading Resin Codes

Almost all plastic products are imprinted with a resin code — a small number enclosed by the "chasing arrows" symbol. Contrary to popular opinion, this code is not intended to indicate that the plastic is recyclable. Rather, the resin code is used by the plastics industry to indicate the general type of chemical compound used to make the product. The resin codes were adopted by the SPI in 1988 to provide an industry-wide standard that would make it easier to identify and sort recyclable plastic. As the SPI points out on its website, "The code was not intended to be — nor was it ever promoted as — a guarantee to consumers that a given item bearing the code will be accepted for recycling in their community." [1]

## Sorting Plastic: Thousands of Variations

Although there are only seven resin codes, there are actually thousands of different types of plastic. Different combinations of dyes and additives can be added to the basic resin to produce a desired color, shape and texture in the final product. These variations in the manufacturing process lead to

[1] http://www.plasticsindustry.org/outreach/recycling/2124.htm

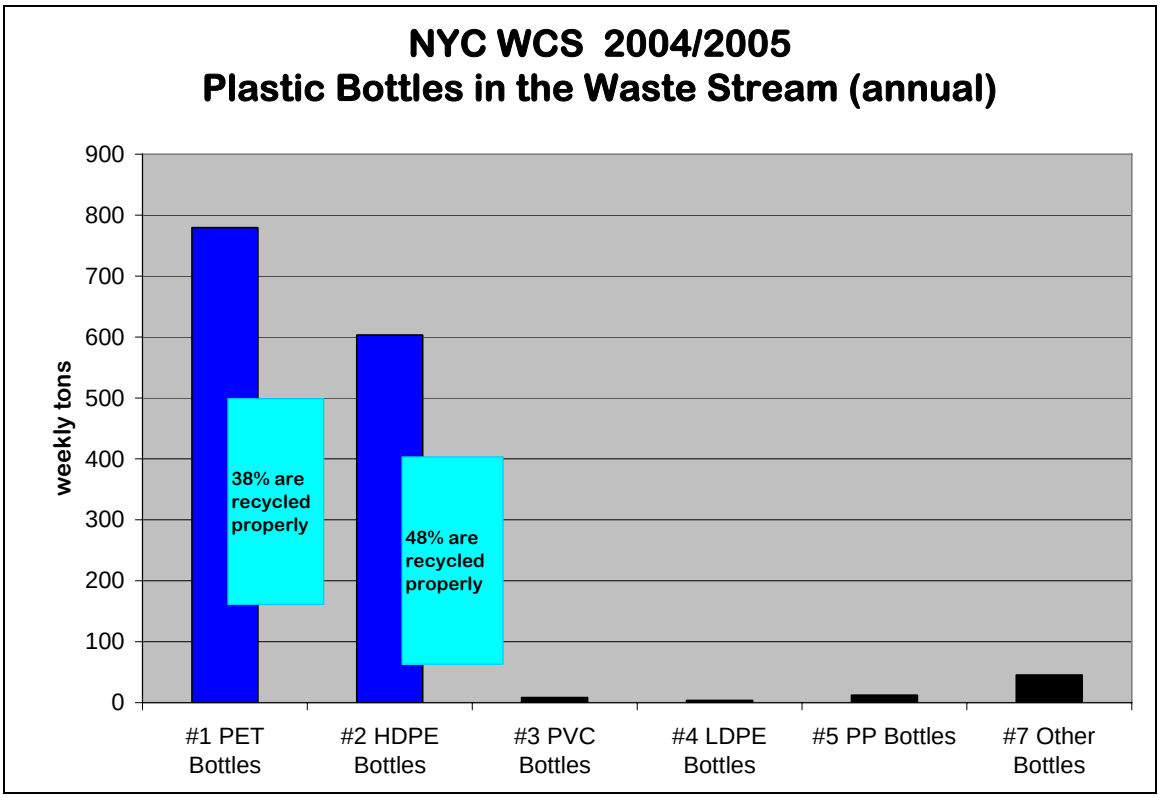
*The information herein has been compiled, analyzed, and reported by the DSNY Bureau of Waste Prevention, Reuse and Recycling, using data collected by its consultant R.W. Beck. These highlights do not substitute for a thorough review of R.W. Beck's Final Report, which contains more detailed data. Some percentages may not total exactly due to rounding.*

different melting points and other properties within the same resin code. To be made into another product, plastic must be carefully sorted by type. Combining different types of plastic renders it useless for manufacturing. As the California Integrated Waste Management Board (CIWMB) observes:

> Product and container manufacturers are sensitive to problems associated with mixed resin types. Different resins have different molecular structures and hence dissimilar physical properties, such as melting point, impact resistance, elasticity, and strength. Thus, it is critical that PCRs [post-consumption recyclables] be as homogeneous as possible to minimize the problems associated with packaging quality. If resin types become mixed during reprocessing, manufacturing equipment can become damaged and the recycled plastic is not usable for new products.[1]

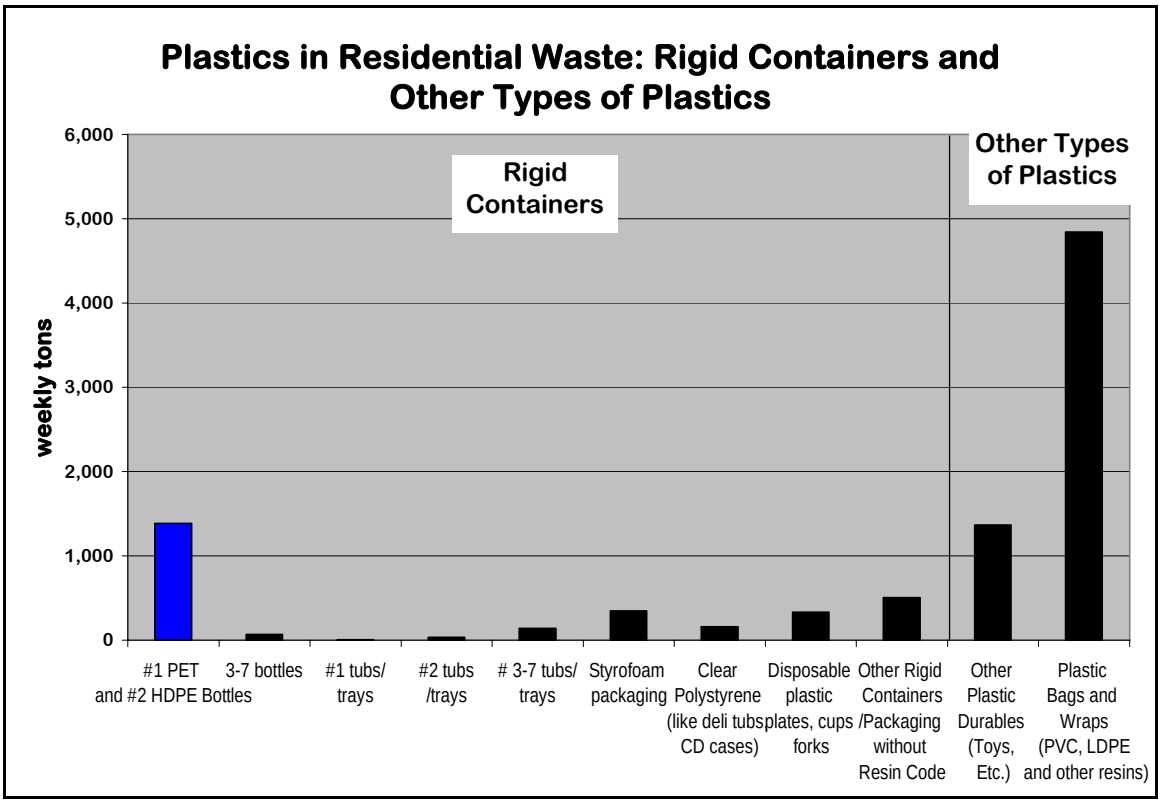
The technology exists to recycle most kinds of plastics if carefully sorted by type. However, a lack of infrastructure prevents all but the most widespread kinds of plastic from being recycled in practice. For recycling to work, communities must be able to cost-effectively collect and sort plastic, and businesses must be willing to accept the material for processing. Collection is expensive because plastic bottles are light yet bulky, making it hard to efficiently gather significant amounts of matching plastic. Only a few kinds of plastic have the combination of a steady and uncontaminated source and the necessary market conditions to make recycling that type of plastic container feasible.

The two charts on the pages that follow put the presence of different numbered containers in context.




[1] www.ciwmb.ca.gov, accessed 10/3/2006

*The information herein has been compiled, analyzed, and reported by the DSNY Bureau of Waste Prevention, Reuse and Recycling, using data collected by its consultant R.W. Beck. These highlights do not substitute for a thorough review of R.W. Beck's Final Report, which contains more detailed data. Some percentages may not total exactly due to rounding.*




## Low Expectations for #'s 3 – 7 in 2007

| | Percent of Waste Stream |
|---|---|
| **#1 HDPE Bottles** | **0.93%** |
| **# 2 PET Bottles** | **1.21%** |
| **# 1 and #2 tubs and trays** | **0.27%** |
| **#3 -- #7 Bottles** | **0.11%** |
| **already designated** | **2.14%** |
| **to be designated under new legislation** | **0.38%** |

Legislation has been proposed in NYC to formally add #3 – #7 containers (including bottles, jugs and trays), plus #1 and #2 tubs and trays, to the recycling program. As well-intentioned as this effort is, the effect of such an initiative on the diversion rate will be minimal, even under the most wildly optimistic scenarios, and will add to already existing confusion caused by resin codes that are inadequate to the task of informing residents what to recycle. The reason becomes clear when we look at the relative fractions of each set of materials in the waste stream:

Under an impossible to achieve scenario where everyone recycled every scrap of #3 – 7 bottles and #1 and #2 tubs and trays, the diversion rate would only increase by 0.38%. If we use realistic capture rates, the effect is even more marginal. The present capture rate for #1 and #2 HDPE and PET bottles is 43%. If we assume a similar capture rate for #1 and #2 tubs and trays, and #3 – #7 bottles, this would translate into an increase in the diversion rate of 0.16%. If we more optimistically assume that

*The information herein has been compiled, analyzed, and reported by the DSNY Bureau of Waste Prevention, Reuse and Recycling, using data collected by its consultant R.W. Beck. These highlights do not substitute for a thorough review of R.W. Beck's Final Report, which contains more detailed data. Some percentages may not total exactly due to rounding.*

the capture rate for all #1 through #7 plastics, including #1 and #2 bottles currently designated, would rise to 60%, the diversion rate would only rise one half of one percent overall.

But what about all the other fractions of plastics? The table below lists the 22 categories that were assessed in the WCS, none of which can be recycled together. The problems with most of these groups are similar to those for #1 / #2 tubs and trays and #3 – #7 plastics in general — they must be separated and kept free of contaminants to recycle, and taken by themselves, constitute a very small fraction of the waste stream. This means that markets are weak or nonexistent, infrastructure is lacking, and in effect, recycling these materials in a residential curbside program is not practical.

| material subgroup | material category | annual percent in the waste stream | | | |
|---|---|---|---|---|---|
| | | Refuse | MGP | Paper recycling | WASTE |
| #1 PET Bottles | PET Bottles | 0.90% | 6.46% | 0.07% | 1.21% |
| # 2 HDPE Bottles | HDPE Bottles: Natural | 0.28% | 3.15% | 0.01% | 0.46% |
| | HDPE Bottles: Colored | 0.30% | 3.27% | 0.01% | 0.48% |
| #1-#2 Tubs/Trays/Other Containers | #1 PET tubs/trays | 0.00% | 0.02% | 0.00% | 0.01% |
| | #2 HDPE tubs/trays | 0.05% | 0.21% | 0.00% | 0.05% |
| #3-#7 Bottles | #3 PVC Bottles | 0.01% | 0.04% | 0.00% | 0.01% |
| | #4 LDPE Bottles | 0.01% | 0.01% | 0.00% | 0.01% |
| | #5 PP Bottles | 0.01% | 0.10% | 0.00% | 0.02% |
| | #7 Other Bottles | 0.07% | 0.20% | 0.00% | 0.07% |
| #3-7 Tubs/Trays/Other Containers | #3 PVC tubs/trays | 0.00% | 0.01% | 0.00% | 0.00% |
| | #4 LDPE tubs/trays | 0.01% | 0.01% | 0.00% | 0.00% |
| | #5 PP tubs/trays | 0.17% | 0.42% | 0.00% | 0.17% |
| | #7 Other tubs/trays | 0.04% | 0.06% | 0.00% | 0.04% |
| Other Rigid Containers/Packaging | Soda Crates and Bottle Carriers | 0.01% | 0.07% | 0.00% | 0.01% |
| | Rigid PS Containers/Packaging | 0.27% | 0.28% | 0.01% | 0.24% |
| | Expanded PS Containers/Packaging | 0.64% | 0.10% | 0.04% | 0.54% |
| | Other Rigid Containers/Packaging | 0.79% | 1.34% | 0.04% | 0.75% |
| Film | Plastic Bags | 3.22% | 0.94% | 0.23% | 2.73% |
| | Other Film | 5.44% | 3.09% | 0.71% | 4.76% |
| Other Plastic Products | Single Use Plastic | 0.60% | 0.22% | 0.02% | 0.51% |
| | Other Plastics Materials | 1.92% | 3.54% | 0.20% | 1.85% |
| | Other PVC | 0.02% | 0.04% | 0.00% | 0.02% |
| TOTAL PLASTICS IN 22 CATEGORIES | | 14.74% | 23.54% | 1.35% | 13.92% |

*The information herein has been compiled, analyzed, and reported by the DSNY Bureau of Waste Prevention, Reuse and Recycling, using data collected by its consultant R.W. Beck. These highlights do not substitute for a thorough review of R.W. Beck's Final Report, which contains more detailed data. Some percentages may not total exactly due to rounding.*

## Plastic bags

The only large fraction of plastics that remains outside current recycling designation is plastic bags and other plastic film.[1] This fraction is not homogeneous — it consists of LDPE, PVC, and other resins, and moreover usually is not marked with a resin code, so sorting by resin is not possible. As the Canadian Plastics Industry Association (CPI) writes:

> The recycling of plastic film in the residential waste stream faces formidable technical, economic and other practical barriers. Municipal waste analyses confirm that film is a large component…however, only about 40% could be classified as "potentially recyclable."

The "potentially recyclable" category includes clean polyethylene bags and film from sources such as grocery carry-out sacks, dry cleaning bags, bread bags, and the over-wrap on articles such as diapers and paper towels. In general, the non-recyclable films are highly contaminated (such as garbage bags, meat and poultry wrappings, and household stretch or cling films). There is currently no manual or mechanical sorting technology capable of sorting this mixture or a foreseeable opportunity to reprocess it. To maximize the benefits of recycling, the management plan/policy must reduce the environmental impacts associated with collection, transport, sorting, cleaning and re-processing. For film plastic, this is a difficult task.

The economics of recycling must also make sense. Markets are only available for recycled plastics that can compete on price and quality with alternate materials. The importance of stable, viable end markets for recycled materials cannot be over-emphasized; except under extraordinary circumstances, the prices paid for recycled plastics are usually lower than those for virgin resin…Unfortunately, most of the potentially recyclable post-consumer polyethylene film from residential sources has generally proven to be too highly contaminated to meet the stringent quality standards for reuse as film. [2]

Because plastic bags are used as refuse and recycling conveyances, residential film plastics are much more heterogeneous (many different types of film plastic) and contaminated with organic matter than film plastics from commercial or industrial streams. Approaching municipal collection based on commercial or industrial examples of "success" are not always applicable, and residential alternatives, such encouraging residents to bring used shopping bags to grocery stores, are not successful at diverting enough of the waste stream to be viable.

In short, there are no easy answers when it comes to plastic bag diversion. As much as we might like to see all of that ubiquitous film plastic go into our MGP curbside recycling containers, with no discernible increase in diversion rate to be gained, and no mechanism for providing clean, sorted feedstock to a potential supplier, the barriers to capturing film plastic from NYC's residential waste stream via curbside recycling are, at this point in time, extremely high.

[1] Plastic film refers to bags and wraps, not camera film.
[2] http://www.cpia.ca/film/news.php?ID=332