



# Using Orlando's Recycling Quality Index to Determine Changes in Recycling Behavior

City of Orlando

# Recycling Quality Index (RQI)

**RQI** : is a numerical value that is inversely related to the quantity of categories of contaminants that the residents have in their recycling cart and is directly related to their recycling quality

# categories of contaminants	0	1	2	3	4	5	6	7	8	9	10
<b>RQI</b>	10	9	8	7	6	5	4	3	2	1	0
Recycling quality											
	Good <span style="float: right;">Bad</span>										

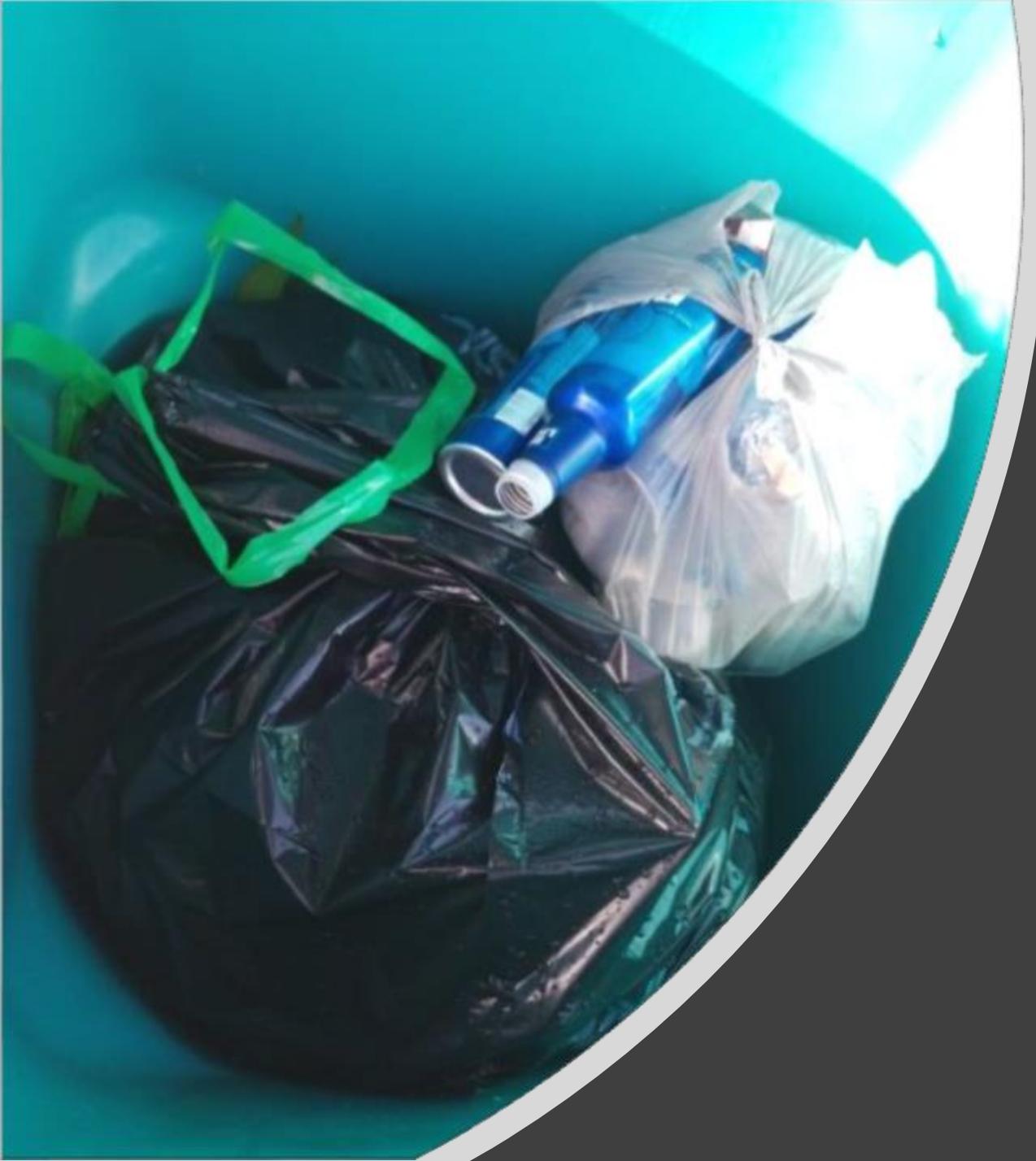
**Application:** Measure the change after any type of intervention is applied within a neighborhood

**Communication Strategies** included labeling (bilingual), door to door education, promo activity, mail and email distribution, and cart tagging.

**Operational Changes** included adjusting collection frequency, removing cart for a probationary period, adjusting container size, and providing alternative equipment

# Contamination categories

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Bagged  
recycling (BR)



Plastic bags-thin (PB-THIN) |



Plastic bags-thick (PB-THICK)



Flexible plastic items (FPI)

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Food waste (FW)





Paper products (PP)

# Cardboard (CB)



# Styrofoam (SF)



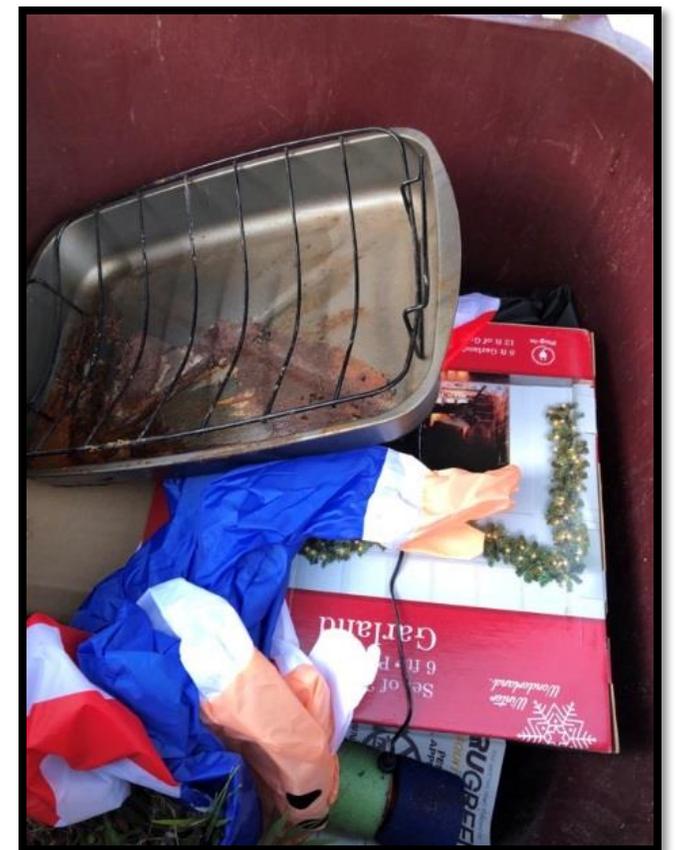
Yard waste (YW)





Textile (TE)

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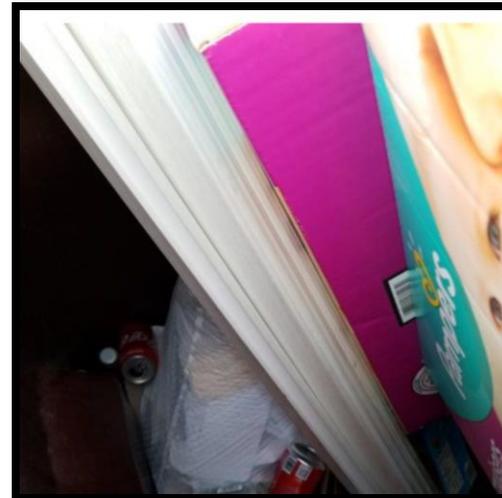
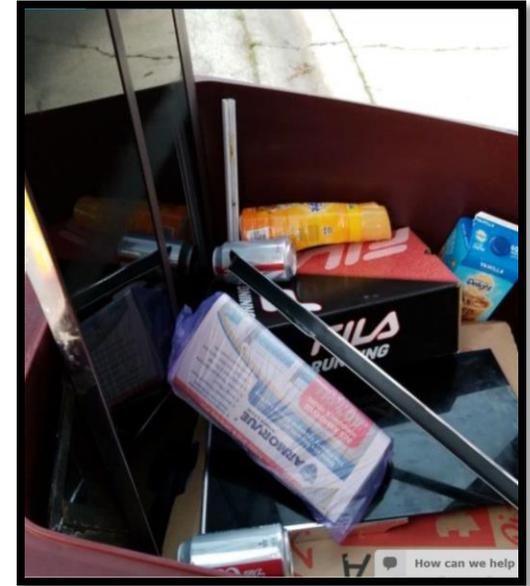
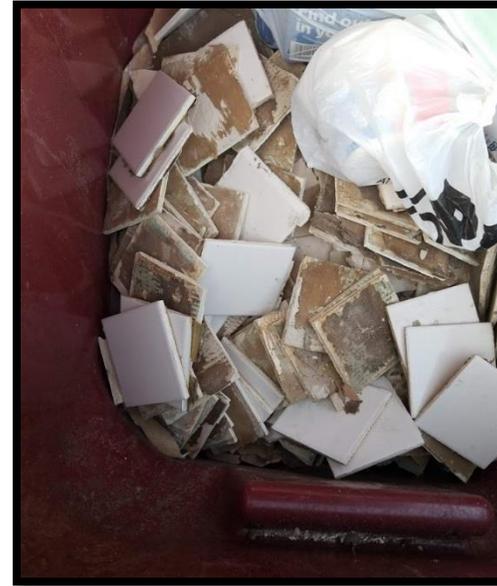
Metal items that are not a can (ME)



Tanglers (TA)

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# Construction debris (CD)





Household garbage (HG)

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Engelwood Recycling Stu...

Address

Residence number not visible

Location

Capture Location

Barcode

Capture Barcode

Cart ID

New Photo

Capture Photo

50%

Next



Lake Nona Recyclin...

Contamination

- None
- BR-Bagged Recycling
- PB-THIN-Thin plastic bags
- PB-THICK-Thick plastic bags
- FPI-Flexible plastic items
- FW-Food waste
- PP-Paper products
- SF-Styrofoam
- YW-Yard Waste
- TE-Textile
- ME-Metals that are not a can

50%

Next

Data capture

# RQI calculations

Single family Recycling  
Contamination Study

# Study case: Engelwood Neighborhood Contamination Study

Our objective is to determine if education is an effective communication tool to improve the quality of recycling. In addition, we want to compare different types of communication strategies to identify which is more effective at addressing contamination – including personal communication and door hangers. Finally, we want to test if RQI is an effective tool to determine changes in recycling behavior after an intervention.

## Methods

- Data entry to establish baseline Pre-education Inspection
- Recycling carts labeling
- Pre education RQI
- Recycling Education(door hangers and flyers)
- Post-education inspections
- Post education RQI

# KNOW BEFORE YOU THROW!

## ¡ASEGÚRESE ANTES DE BOTAR!

Include only these items in your recycle cart:

Solo recicle:



### PLASTIC

Bottles and containers labeled #1 - #5

Caps stay on

Envases y botellas #1 - #5, con tapa



### GLASS

Bottles and jars  
Remove lids

Botellas y jarras, sin tapa



### METAL

Tin, aluminum, steel and empty aerosol cans

Lata, aluminio, acero y latas vacías de aerosol



### CARDBOARD

Flattened boxes

Cajas desarmadas



### PAPER

Newspapers, paper bags, junk mail, sheets of paper and drink cartons

Periódicos, bolsas y hojas de papel, correo basura y cajas de jugo

**DO NOT** place these items in your recycle cart:

NO coloque en su recipiente para reciclar:



Don't bag your recyclables.  
Leave items loose.  
Bolsas, ponga sus artículos sueltos



No plastic bags or film plastic  
Plástico para envolver



No styrofoam (packing materials, egg cartons, to-go containers)  
Poliestireno (material para empacar, envases para llevar comida, cartones de huevos)



No household garbage  
Basura

IL-0000 348 APR19

## RECYCLE RIGHT, ORLANDO!

### ¡ORLANDO RECICLA BIEN!

Learn more recycling tips at [orlando.gov/recycling](http://orlando.gov/recycling).  
Más consejos para reciclar en [orlando.gov/recycling](http://orlando.gov/recycling).



Cart labeling

# Door to door education

**KNOW BEFORE YOU THROW!**  
¡ASEGÚRESE ANTES DE BOTAR!

Include only these items in your recycle cart:  
Solo recicle:

 <b>PLASTIC</b> Bottles and containers labeled #1 - #5 Cajas de leche azúca	 <b>GLASS</b> Bottles and jars Botellas y jarras, vidrio	 <b>METAL</b> Tin, aluminum, steel and empty aerosol cans Lata aluminio, acero y otros metales en aerosol	 <b>CARDBOARD</b> Flattened boxes Cajas desmenuadas	 <b>PAPER</b> Newspapers, paper bags, junk mail, sheets of paper and china cartons Papeles, bolsas y hojas de papel, cartones de comida
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DO NOT place these items in your recycle cart:  
NO coloque en su recipiente para reciclar:

 Don't bag your recyclables Llévelos limpios	 No plastic bags or film plastic Bolsas de plástico	 No styrofoam (packing materials, egg cartons, etc.) Espuma para empaques, materiales para huevos, etc.	 No household garbage Basura
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Learn more recycling tips at [orlando.gov/recycling](http://orlando.gov/recycling).  
CITY OF ORLANDO

**PLASTIC BAGS AND SHEETS OF PLASTIC DO NOT BELONG IN YOUR RECYCLING CART.**

Plastic bags and other flexible plastics get tangled in recycling sorting equipment and shut down operations. Instead, take plastic bags to your local grocery retailer.

		
Grocery bags	Bagged items	Food storage bags

		
Newspaper bags	Air pockets from shipping	Plastic case wrap

When these items are put in your cart, they tangle the machines.

CITY OF ORLANDO  
Learn more recycling tips at [orlando.gov/recycling](http://orlando.gov/recycling).

**NO COLOQUE BOLSAS DE PLÁSTICO O PLÁSTICO FLEXIBLE EN SU RECIPiente PARA RECICLAR.**

Se enredan en las máquinas y paralizan las operaciones. Lleve sus bolsas y plástico flexible (limpio) a su almacén de viveres local.

		
Bolsas para mercado	Bolsas con basura	Bolsas para almacenar alimentos

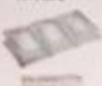
		
Bolsas para diarios	Bolsas con aire para embalar	Plástico para embalar

Estos artículos atascan la maquinaria si los pone en su recipiente para reciclar.

CITY OF ORLANDO  
Vea más consejos para reciclar en [orlando.gov/recycling](http://orlando.gov/recycling).

**Plastic bags and sheets of plastic do not belong in your recycling cart.**

Plastic bags and other flexible plastics get tangled in recycling sorting equipment and shut down operations. Instead, take plastic bags to your local grocery retailer.

		
Grocery bags	Newspaper bags	Air pockets from shipping

		
Bagged items	Food storage bags	Plastic case wrap

RECYCLE RIGHT, ORLANDO!  
CITY OF ORLANDO  
Learn more recycling tips at [orlando.gov/recycling](http://orlando.gov/recycling).

**No ponga bolsas de plástico o plástico flexible en su recipiente para reciclar.**

Se enredan en las máquinas y paralizan las operaciones. Lleve sus bolsas y plástico flexible (limpio) a su almacén de viveres local.

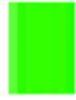
		
Bolsas para mercado	Bolsas para diarios	Bolsas para almacenar alimentos

		
Bolsas con basura	Bolsas con aire para embalar	Plástico para embalar

RECYCLA BIEN, ORLANDO!  
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Flyers distributed with surveys-active direct education

Door hangers-Active indirect education

# categories of contaminants	0	1	2	3	4	5	6	7	8	9	10
<b>RQI</b>	10	9	8	7	6	5	4	3	2	1	0
Recycling quality											
	Good										Bad

	Cat Pre Edu	Tot Cat Pre Edu	Pre Edu RQI		Δ RQI	Result
Week 1	PB, PC, HG	PB, PC, HG, TE, FW, SF	4		+3	Increase
Week 2	PB, TE, FW					
Week 3	PB, SF, PC					
	Cat Pos Edu	Tot Cat Pos Edu	Pos Edu RQI			
Week 1	PB	PB, PC, HG	7			
Week 2	PB, PC					
Week 3	HG					

# Calculations

House #1

# Results

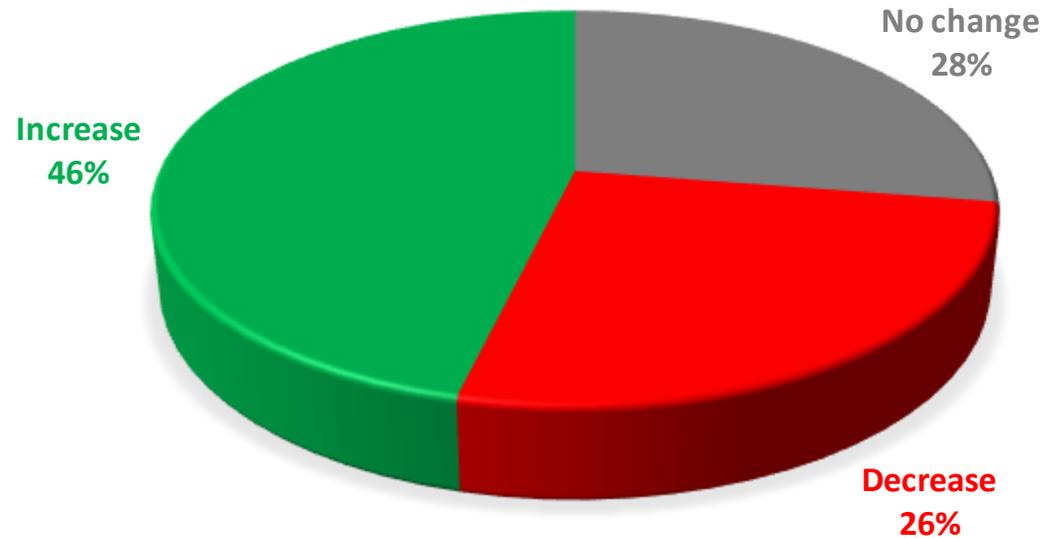
Door to door education		
Residences that increased their RQI (higher recycling quality post education)	Residences that decreased their RQI (lower recycling quality post education)	Residences that showed no changes
37	21	22

Door hangers		
Increase RQI (higher quality post education)	Decrease RQI (lower quality post education)	No change post education
21	11	11

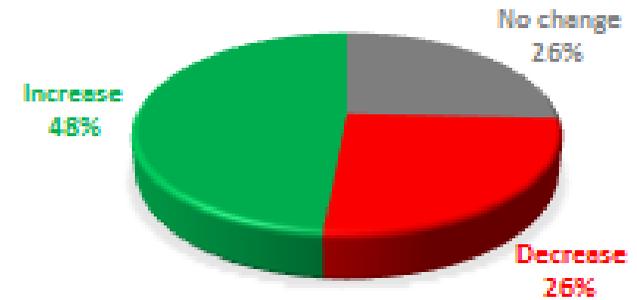
Personal Communication		
Increase RQI (higher quality post education)	Decrease RQI (lower quality post education)	No change post education
16	10	11

# Results

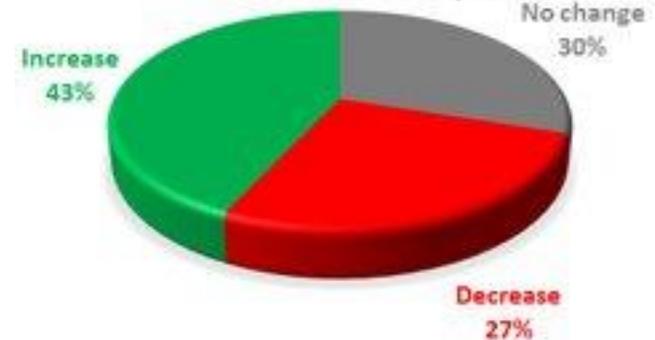
## POST EDUCATION CHANGE IN RQI (DOOR TO DOOR OR DOOR HANGERS)



## EFFECT OF EDUCATION STRATEGIES(DOOR HANGERS) IN RQI



## EFFECT OF EDUCATION STRATEGIES(PERSONAL COMMUNICATION) IN RQI



# RQI calculations

Multifamily recycling  
contamination study

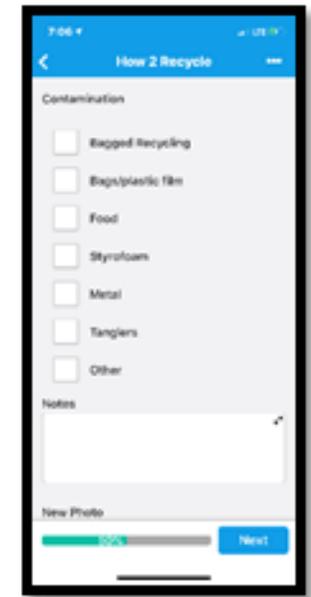
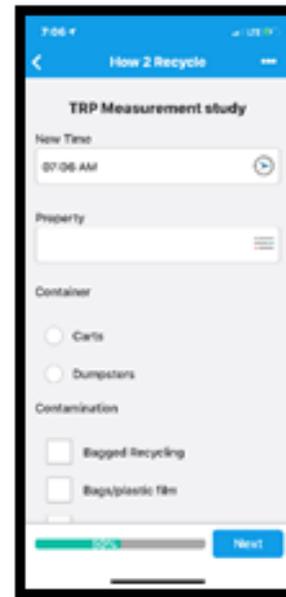


## Project Scope

- Focused on the successfulness of the How2Recycle label at reducing contamination when applied to a reusable tote bag with educational material.
- 13 properties and 2033 units
  - Mid-rise, High-rise, Garden-style
  - Apartment, condo
- Combination of different containers
  - Dumpsters, 95gal carts
- Minimum 3-week audit before and after tote distribution

# Methodology

- Conduct a baseline audit to determine extent of contamination
  - Data collection using GoCanvas
  - Pictures taken of each container
- Maintain uniformity between residential and multifamily
  - Used RQI and other indices.
    - CSI
- Distribute tote bags
  - Bilingual: English / Spanish
- Conduct a follow-up audit to determine change in contamination
  - Site visits take place on the day before collection
- Survey distribution
  - To include non-participating properties

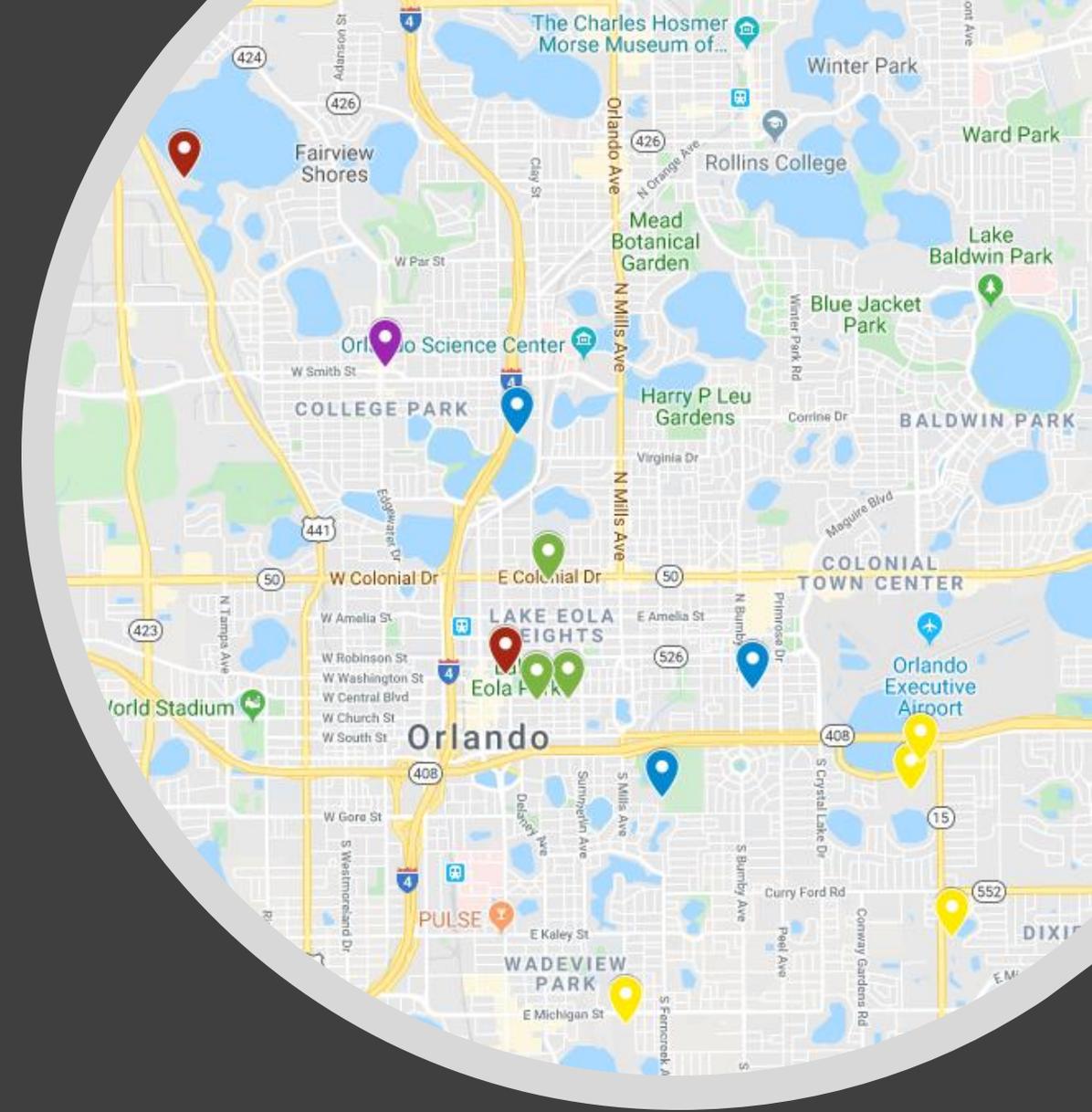


RQI Scale

# categories of contaminants	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
RQI	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Recycling quality															
	Good													Bad	

# Map of Participating properties in Orlando

- Garden Style
  - Dumpster
  - Cart
- High-Rise
  - Dumpster
  - Cart
- Mid-Rise
  - Cart



# Educational Material

## HOW TO USE THIS RECYCLING TOTE:

- 

**1.** Collect your accepted recycling materials in this tote
- 

**2.** Empty tote in recycling container
- 

**3.** Refill and repeat

Congratulations! Today you are receiving the tools you need to recycle successfully! This tote lists recyclables accepted locally and comes with a helpful magnet for your refrigerator. Know what to throw so you can waste less and recycle more.

 Find out more about what you can recycle at [orlando.gov/recycle](http://orlando.gov/recycle). Type the name of a waste item and we'll provide information on recycling or disposal. **Thank you for your recycling contribution!**



## LOOK FOR THE How2Recycle LABEL

Use this recycling tote to collect and carry to your collection bin

Recycle the following items:



**Cans**  
empty and rinse



**Glass**  
empty and rinse



**Paper**  
flatten cardboard boxes



**Plastic Bottles & Containers**  
empty bottles and containers and replace cap



**NO!**  
Not in your recycling.



**No Food or Liquid**  
(empty all containers)



**No To-Go Containers**



**No bags, No trash.**  
(do not bag recyclables)



**No Batteries**

**Store drop-off only**



**Plastic Bags and Wrap**  
cannot go in curbside recycling  
- take to store drop-offs

# RECYCLE

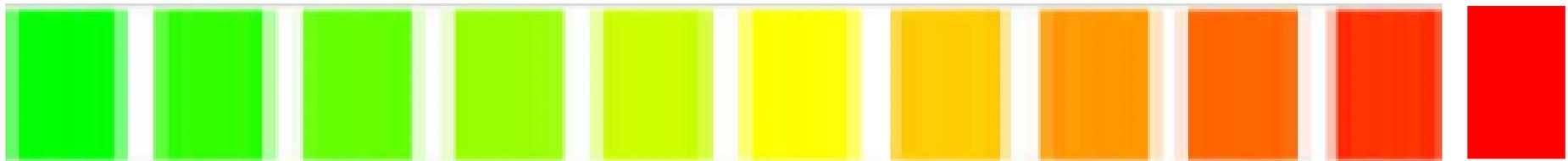


Learn more at [orlando.gov/recycling](http://orlando.gov/recycling)



# Flexibility of the RQI

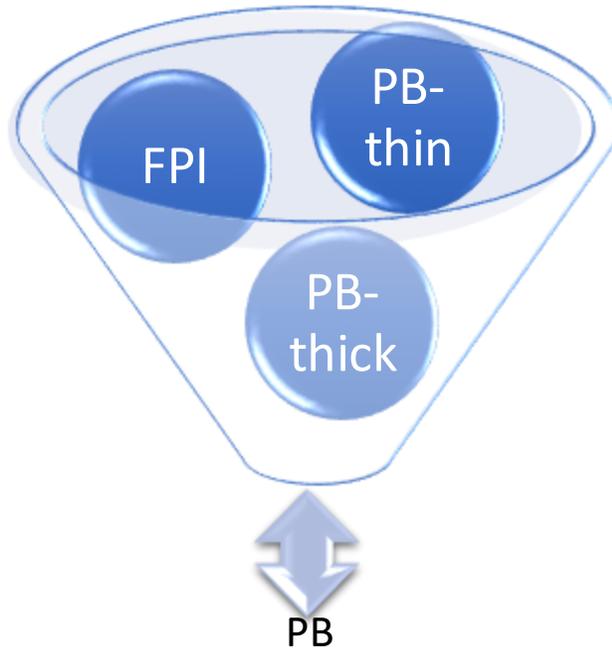
RQI Scale

# categories of contaminants	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
RQI	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Recycling quality															
	Good											Bad			

# Flexibility of the RQI categories

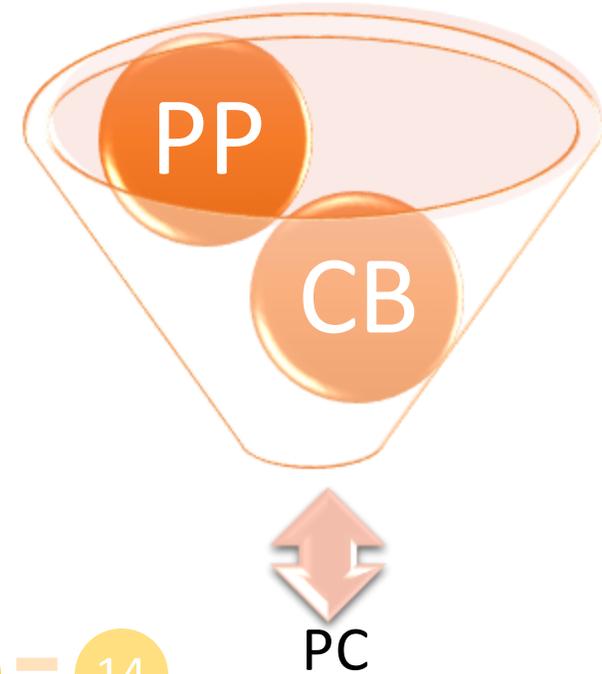
## 10 categories

- NC
- PB
- SF
- FW
- YW
- TE
- PC
- HG
- ME
- CD



## 14 categories

- NC
- PB-THIN
- PB-THICK
- FPI
- SF
- FW
- YW
- TE
- PP
- CB
- HG
- ME
- CD
- TA

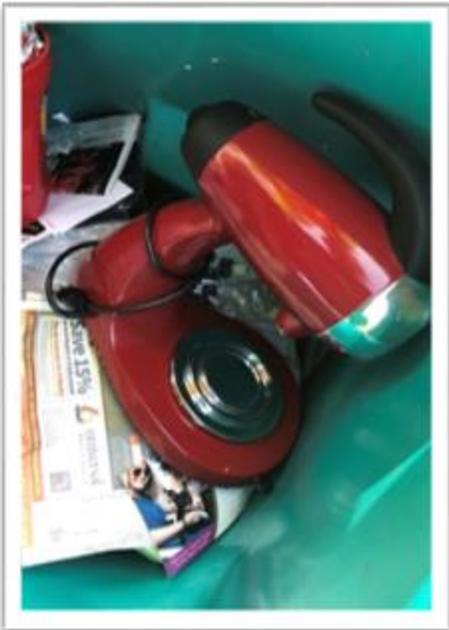


$$13 + TA = 14$$

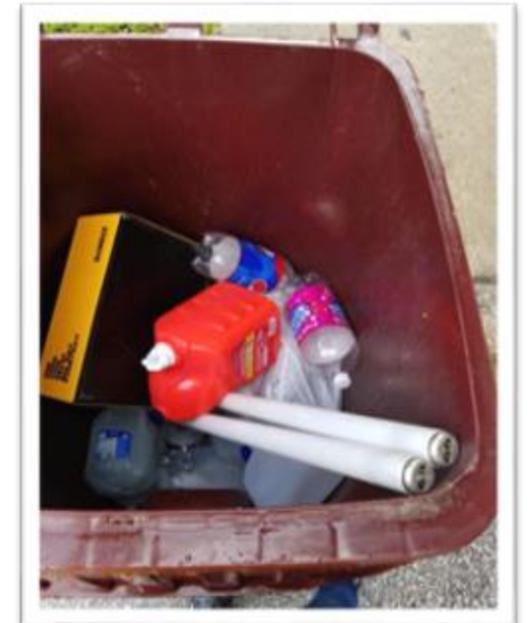
# Additional contamination categories

## Split Household garbage category

- Electric items
- Non-electric items

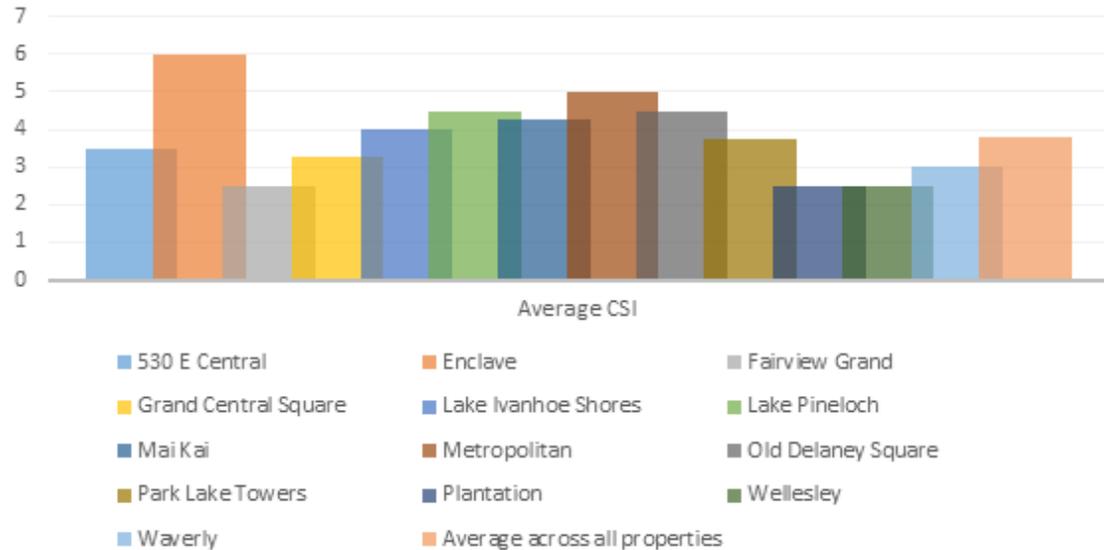


## Hazardous household wastes

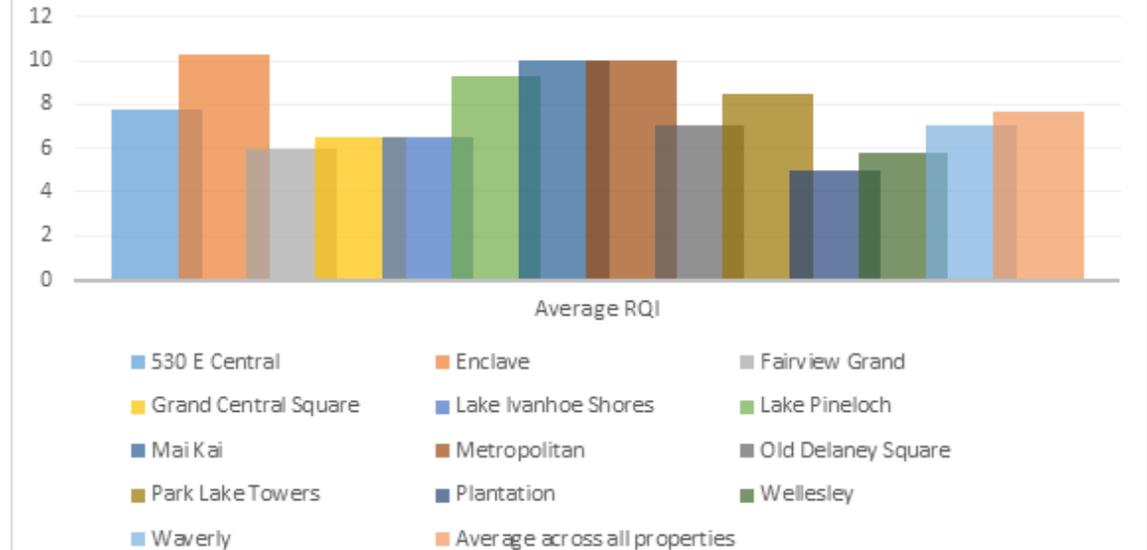


# RQI provides legitimacy to other indices

CSI Pre-tote Average



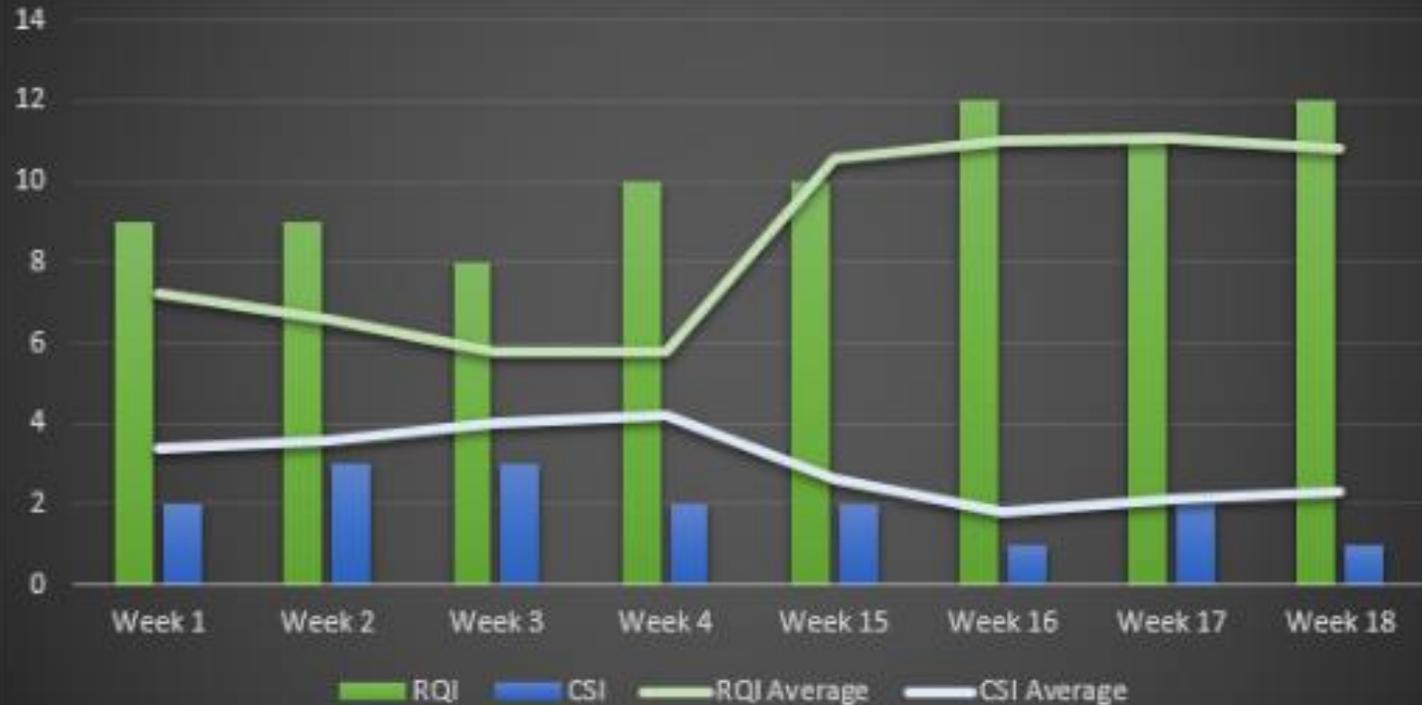
RQI Pre-tote Average



# Data interpretation and Results

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## Plantation Gardens [Diachronic]



This represents 1 of 13 properties and shows the change in recycling behavior from PHASE 1 (weeks 1-4) to PHASE 2 (weeks 15-18). The shift in the graph represents tote bag distribution and usage by multi-family residents. It is important to use a long-term measurement (diachronic) as remedial strategies will fade over time in a multifamily setting.

In this instance, the property overperformed when compared to project averages – meaning they recycled better.

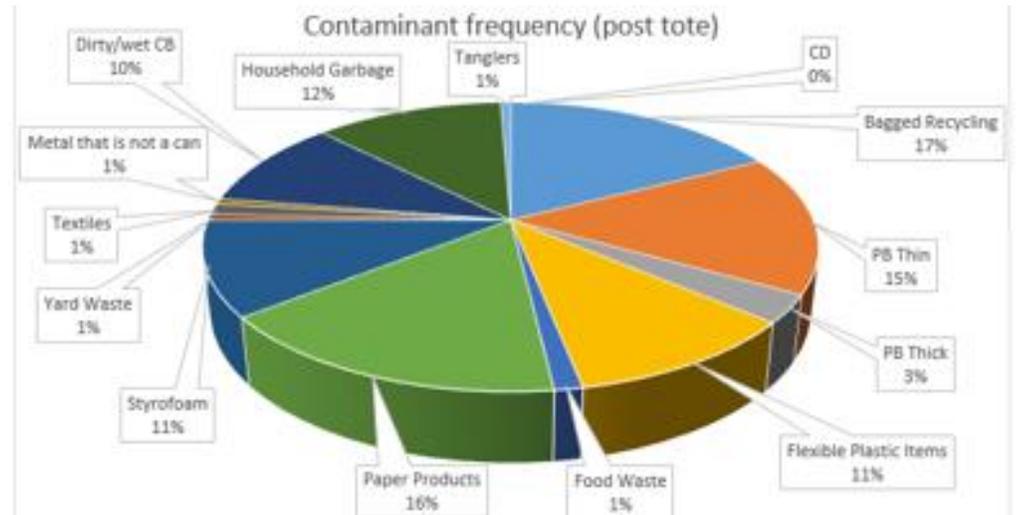
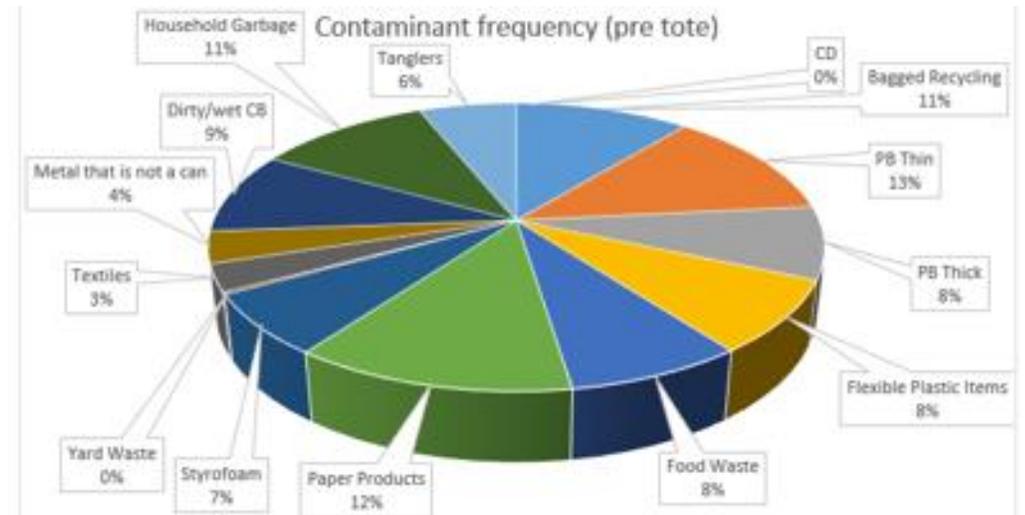
# Comparison of auditing phases

# Changes in contamination makeup

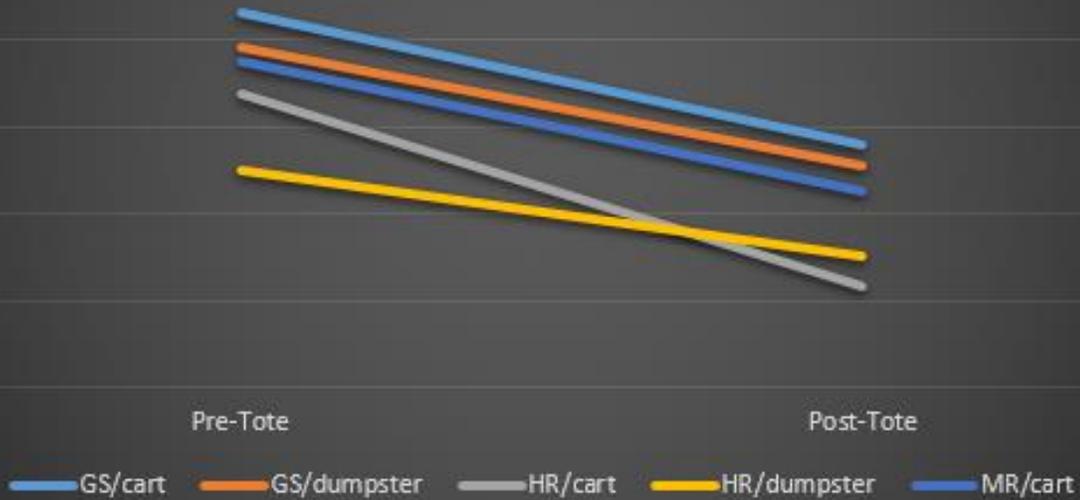
These charts show the change in contamination makeup based on the number of times documented from one phase to the next.

The contaminant most reduced due to the education intervention was tangles.

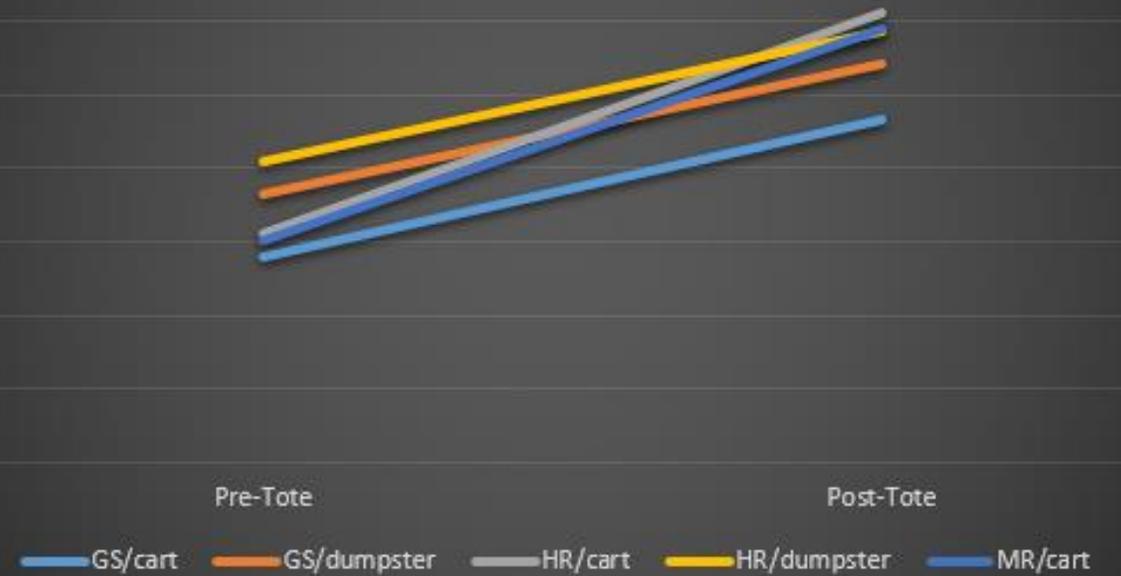
Note: it does not represent the total number of each contaminant, but rather how many times it was documented per audit. For example if one recycling cart was documented as having bagged recycling, it does not differentiate between having one instance of bagged recycling or twenty instances of bagged recycling.



### Contamination Saturation Shift by Property Type



### Recycling Quality Shift by Property Type



## Index shifts

High-Rise properties with carts (grey) exhibited the highest success rate with the How2Recycle label. Every property improved after the recycling education intervention.

# What the RQI does NOT show

- The “depth” of contamination
- The frequency of single contaminants
- Capture rate comparisons

# Things to Keep in Mind

## Transient residency

- 50% of Orlando residents live in multifamily housing
- 40%-50% of apartment leases are NOT renewed annually.
  - Remedial strategies (including use of RQI) must be long-term.

## Point source ambiguity

- Unable to determine where contamination comes from
- Centralized location of recycling containers
- Containers available 24/7

## Insufficient yardage

- .5yd/ single family household
- 6yd for multifamily property of 250+ units
  - This disparity leads to greater and more diverse contamination



RQI measures the change in recycling behavior

RQI allows for targeted educational campaigns

RQI can be adapted to multiple scenarios

Supplementing RQI with volume measurements (such as CSI) is strongly recommended in a multifamily setting

Recap

# Contact Information

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