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LESSON PLAN Investigating Your School

OBJECTIVE

In *Waste Deep 3* – Investigating Your School students will:

- ✓ Conduct school-based waste-related research at the hyperlocal level
- ✓ Investigate and collect data regarding student, teacher, and custodial knowledge, attitudes and behaviors
- ✓ Learn about and collect data regarding the waste systems and infrastructure in the school
- ✓ Analyze student-captured data and share with school community

INQUIRY/CRITICAL THINKING QUESTIONS

- How close is our school to achieving Zero Waste?
- Is there sufficient school infrastructure in place to handle all our waste?
- What are the biggest barriers to recycling behavior change – knowledge, attitudes, policies, infrastructure, etc.?
- How can data be collected in a way that could be used to measure change over time?
- How can data capture and data analysis inform how we take action to affect change?

TIME NEEDED

Three 45-minute periods

MATERIALS NEEDED

Data Capture Tools Overview

Data Capture Tools

- 1) Waste Journal
- 2) Student Survey
- 3) Adult Interview
- 4) Collecting Cafeteria Data
- 5) Recycling Inspection Rating Chart
- 6) Classroom Waste Investigation
- 7) Bin Tally Sheet

PROCEDURE

Waste Deep 3 is an introduction to activities that students and teachers can use to capture waste-related data of the school. Students work in small groups to choose a data capture tool, learn how to use the tool, collect data, analyze their findings, and share findings with classmates.

- I. Waste Deep 2 Brainstorm Recap: (5 minutes)** review project ideas. Explain that before any meaningful project starts, it's important to conduct research and collect data – to inform project development and to track efficacy of project.
- II. Review NYC Data, Systems, and Recycling 101 Slides (WD2): (5 minutes)** review and discuss most relevant information and statistics from WD2 Slides.
- III. Overview of Data Capture Tools: (10 minutes)** review the various opportunities to collect data: Share data capture tools with students.
- IV. Data Capture Tool Selection & Preparation (25 minutes)** students select tool, learn how to use it, do an example, and plan for data capture
- V. Capture Data (45 minutes)** students use data capture tools in school
- VI. Analyze Data (20 minutes)** students analyze the data captured
- VII. Share Data (25 minutes)** student groups present their research findings to classmates

Continue the journey in *Waste Deep 4: Taking Creative Action!*



INVESTIGATING YOUR SCHOOL Research Tools

1. WASTE JOURNAL

A look at personal recycling behavior

A Waste Journal allows students to hold a mirror up to themselves and take an inventory of their recycling behaviors over time.

Students look at the number of materials they used, how long they had them, and how they disposed of them.

Use Waste Journal to capture data.

2. STUDENT SURVEY

A look at student recycling knowledge, attitudes, and behaviors

Surveys are an efficient way to collect information from a large number of people in a short amount of time. Students create and conduct a 5-10 question survey to understand more deeply the recycling knowledge, attitudes, and behaviors of their peers.

Use Student Survey Template to create additional survey questions and to capture data.

3. ADULT INTERVIEW

A look at adult recycling attitudes and behaviors

Interviews allow you to gain valuable information from people that have the most influence on and/or are most affected by a

problem or situation. Students decide who they want to interview (e.g. Principal, Custodial Engineer, Cleaner, Sustainability Coordinator, Teacher) and then develop a list of questions that are most relevant to the person they are interviewing. Make questions targeted and specific.

Create your own Adult Interview Tool and capture data.

4. COLLECTING CAFETERIA DATA

A look at student recycling attitudes and behaviors in the cafeteria

The reasons students don't recycle correctly and consistently are varied. Students capture this data to better understand the barriers to successful student recycling in the cafeteria.

See Collecting Cafeteria Data Instructions for more details and the Activity Sheets to capture data.

5. RECYCLING INSPECTION RATING CHART

A look at classroom recycling behaviors

Also known as classroom monitoring, recycling inspections allow students to rate and assign recycling grades based on contamination levels in classroom bins.

Use Recycling Inspection Rating Chart to capture data.

6. CLASSROOM WASTE INVESTIGATION

An in-depth look at the physical composition of your school's waste

Ever wonder what's in the school's classroom waste? A waste investigation is a structured process used to quantify the amount and types of waste being generated in a defined building space. Information from waste audits help identify current recycling practices and how they can be improved.

Use Classroom Waste Investigation Guide, Data Capture Sheet, and Data Analysis Sheet.

7. BIN TALLY SHEET

A look at school recycling infrastructure

Design, infrastructure, and signage impacts behavior. Use the Bin Tally Sheet to take an inventory of recycling bins in the school. This will help assess if you need additional bins or more signage. It's also an opportunity to see if all bins are being kept in one location near the door and/or if classroom bin lids are present.

Use Bin Tally Sheet to capture data.

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ACTIVITY Waste Journal

Name: _____ Start Date: _____ End Date: _____

Item thrown out	Location of Disposal (School/Home/Street)	Which bin did you put it in? (Blue/Green/Brown/Black)	How long did you have this item before throwing it out? (Hours/days/weeks/longer)

Name: _____ Start Date: _____ End Date: _____

Item thrown out	Location of Disposal (School/Home/Street)	Which bin did you put it in? (Blue/Green/Brown/Black)	How long did you have this item before throwing it out? (Hours/days/weeks/longer)



ACTIVITY Waste Journal

Name: _____

Start Date: _____

End Date: _____

Item thrown out	Location of Disposal (School/Home/Street)	Which bin did you put it in? (Blue/Green/Brown/Black)	How long did you have this item before throwing it out? (Hours/days/weeks/longer)

Name: _____

Start Date: _____

End Date: _____

Item thrown out	Location of Disposal (School/Home/Street)	Which bin did you put it in? (Blue/Green/Brown/Black)	How long did you have this item before throwing it out? (Hours/days/weeks/longer)

For more resources and downloadable Green Team materials, check out the Recycling Champions website www.grownyc.org/RCP

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ACTIVITY Student Survey

Student Survey Template

1. The last time you threw something away did you think about what bin to put it in?	Yes	No		
2. Did you think about where that item might go after you threw it away or who/what it might affect?	Yes	No		
3. Did you know that your school is a Zero Waste School?	Yes	No		
4. Do you view recycling/waste reduction as important?	<i>Very Important</i>	<i>Important</i>	<i>No opinion</i>	<i>Not important</i>
5. Why?	<i>Explain:</i>			
6. How often do you recycle?	<i>Always</i>	<i>Sometimes</i>	<i>Rarely</i>	<i>Never</i>
7. What's the reason you don't recycle "always"?	<i>Explain:</i>			
8.				
9.				
10.				



ACTIVITY Adult Survey

Adult Survey Template

1. The last time you threw something away did you think about what bin to put it in?	Yes	No		
2. Did you think about where that item might go after you threw it away or who/what it might affect?	Yes	No		
3. Did you know that our school is a Zero Waste School?	Yes	No		
4. Do you view recycling/waste reduction as important?	<i>Very Important</i>	<i>Important</i>	<i>No opinion</i>	<i>Not important</i>
5. Why?	<i>Explain:</i>			
6. How often do you recycle?	<i>Always</i>	<i>Sometimes</i>	<i>Rarely</i>	<i>Never</i>
7. What's the reason you don't recycle "always"?	<i>Explain:</i>			
8. How close is our school to achieving Zero Waste?				
9. What are the biggest barriers to changing recycling behaviors at our school?				
10. How can students and adults work together to achieve zero waste?				



ACTIVITY Collecting Cafeteria Data

The reasons students don't recycle correctly and consistently are varied. Have students do this data collection exercise before the Recycling Monitor training so they can better understand the barriers to successful student recycling in the cafeteria.

Use this activity as:

- An opportunity for students to learn more about their school's recycling culture and gain more confidence as they transition into their roles as Recycling Monitors.
- Pre- and post-test tools to measure the effectiveness of your student Recycling Monitors.
- Part of a larger project-based learning exercise woven into core subject area curriculum.

ACTIVITY 1 Collecting Quantitative Cafeteria Data

Step 1: Students should use the *Collecting Quantitative Data* form while observing a full period in the cafeteria and categorize student recycling behavior based on categories:

"Zero Wasters": Successfully stop, contemplate and sort their cafeteria waste into the appropriate recycling bins.

"Contemplators": Take a moment to consider which bin to put their cafeteria waste but are not always successful.

"Dump & Runners": Place all their cafeteria waste in one bin, regardless of the contents.

"Deserters": Leave their cafeteria waste at the table when they leave.

Step 2: Make only one tally mark for each person they observe.

Step 3: Take notes about their observations in the "What are you noticing?" box.

Step 4: Calculate "Total #" and "% of Total" at the end of each observation period.

1	I	6	IIII I
2	II	7	IIII II
3	III	8	IIII III
4	IIII	9	IIII IIII
5	IIII	10	IIII IIII

Optional: Break up observation and data collection into 10-minute intervals. Do sorting behaviors change according to the amount of time remaining in the lunch period? If so, how could you help affect behavior change?

ACTIVITY 2 Collecting Qualitative Cafeteria Data

Step 1: Students should use the *Collecting Qualitative Data* form to ask a random sample of students from each category above about their recycling behaviors.

Step 2: Analyze your data. What reoccurring trends or themes did you notice? What did students say would motivate them to recycle? Could changes in recycling station location, signage, announcements or education help encourage more successful sorting?

Step 3: Display results on a bulletin board or share in a newsletter.

Step 4: After 2-3 months conduct the exercise again and compare your results.

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ACTIVITY Collecting Quantitative Cafeteria Data

Name _____ Date _____ Period _____ School _____
 Menu Items _____

There are 4 stages of sorters. Designate and make only one tally for each person you observe. Make notes about your observations.

“Zero Wasters” : Successfully stop, contemplate and sort their cafeteria waste into the appropriate bins :)		
Make tally marks for number of Zero Wasters in the space below.	What are you noticing?	<i>Total #</i> <i>% of Total</i>
“Contemplators” : Take a moment to consider which bin to put their cafeteria waste, but aren’t always successful :/		
Make tally marks for number of Contemplators in the space below.	What are you noticing?	<i>Total #</i> <i>% of Total</i>
“Dump & Runners” : Place all their cafeteria waste in one bin, regardless of the contents :(
Make tally marks for number of Dump & Runners in the space below.	What are you noticing?	<i>Total #</i> <i>% of Total</i>
“Deserters” : Leave their cafeteria waste at the table when they leave :o		
Make tally marks for number of Deserters in the space below.	What are you noticing?	<i>Total #</i> <i>% of Total</i>
NOTE: Total # of “Deserters” / Total # of Students Observed X 100 = % of Total		TOTAL # of Students Observed: 100%



ACTIVITY Collecting Qualitative Cafeteria Data

Ask a random sample of students from each stage about their sorting behavior and fill in answers below.

“Zero Wasters” : Successfully stop, contemplate and sort their cafeteria waste into the appropriate bins :)

Questions: *Why did you take the time and effort to sort your waste? What would motivate you to continue to do so?*

Answers:

Total # of students interviewed

“Contemplators” : Take a moment to consider which bin to put their cafeteria waste in, but are not always successful :/

Questions: *Why didn't you take more time to accurately sort all of your waste? What would motivate you to do so?*

Answers:

Total # of students interviewed

“Dump & Runners” : Place all their cafeteria waste in one bin, regardless of the contents :(

Questions: *Why did you put all of your materials in one bin? What would motivate you to sort your waste?*

Answers:

Total # of students interviewed

“Deserters” : Leave their cafeteria waste at the table when they leave :o

Questions: *Why did you leave your waste at the table? What would motivate you to take it to a recycling station?*

Answers:

Total # of students interviewed

TOTAL #:



GUIDE Classroom Waste Investigation

What is a Classroom Waste Investigation?

Ever wonder how well your school is recycling? A waste investigation, also known as a waste audit, is a structured process used to quantify the amount and types of waste being generated in a defined building space. Information from waste audits help identify current recycling practices and how they can be improved. In schools, they serve as a tool to:

- Educate students about the importance of recycling.
- Measure effectiveness of existing waste management systems.
- Incorporate experiential learning into classroom subjects.
- Engage students in the science of data collection, data analysis and data presentation.
- Identify ways of reducing consumption and reusing classroom materials.

Believe it or not, waste audits are a fun activity for students to engage in. If you think about it, how often do you get to explore what's in your waste and why? Let the waste investigation begin!

Planning

- Form a group of 10-15 students.
- Obtain permission from your Principal to conduct the waste audit in the cafeteria, gym or an open outdoor space.
- Identify which classrooms' bins you'll be investigating. Depending on the number of students involved, choose how many classrooms you'll be collecting from. Inform teachers.
- Inform your custodial staff when and where you'll be conducting the waste audit so that they do not empty classroom bins prior to your activity. Determine with your custodial staff where to put materials following the completion of your audit.
- It would be helpful to borrow an empty dual-bin dolly from your custodian and label bags clearly.
- **SAFETY CONSIDERATIONS:** Do NOT sort waste from bathrooms or health-related areas. Remind students to wear closed shoes on the day of the audit.



TIP: Before waste audit day, meet with the student group to review instructions and data collection sheet. You may even conduct a smaller, sample audit from one classroom! Let students know that it may get messy.

Time Required: 1.5 hours approximately

Materials Needed: email schoolrecycling@grownyc.org to rent a Waste Audit kit for free.

3 data sheets	3 scales for weighing	3 large clear plastic trash bags
Plastic tarp(s)	3 clipboards	3 sets of waste category signs
Rubber gloves	Hand sanitizer	NYC's Recycling Signs for all 3 waste streams

Preparation

- Review NYC's recycling rules, so that students can sort items into proper categories.
- Review Data Collection procedure and Data Sheet.
- Divide participants into 3 teams (Green/Blue/Trash). All teams should designate members to set up, collect, sort, weigh, and record data.
- Inform students which classrooms the materials will be collected from. Note: If a classroom has more than 3 bins, assume unlabeled or extra bins are Trash.
- Ensure dual bin dolly is empty and the bags are correctly labeled.
- Distribute **Bin Team Directions** to each group.
- Hand out materials and protective gear to students and repeat safety considerations.

Data Collection

Collect Bin Materials

- Designate one member from each group to go and collect bin materials. Ensure that materials are going into the corresponding bag in the dual-bin dolly. **Collect materials as found from bins.**
Note: Green Bin Team member will collect items from green bins in each classroom, Blue Bin Team member will collect items from blue bins in each classroom, and Trash Bin Team member will collect items from trash bins in each classroom.
- The remaining members should lay down tarps, designate 3 separate areas for sorting, and read **Bin Team Directions**.
- Once all materials are collected, team members will bring the materials to their designated tarp area.



TIP: To minimize the mess, leave trash items in the bag and pick out recyclables to sort and weigh separately.

Collect and Analyze Data

Use **DATA SHEET Classroom Waste Investigation** form to collect and record data.

- Record all measurements in pounds (lbs.) to 1 decimal place (e.g. 2.1 lbs.)
- MGPC = Metal, Glass, Hard Plastic, Cartons

Use **DIRECTIONS Data Analysis** document to assist in analyzing the data.

Clean-up

- Put sorted recyclables and trash into 3 separate clear bags.
- Take bags to your schools waste storage or setout area designated by your custodial staff.
- Clean up any spillage on tarps and put away all tools safely.

Evaluation

A waste audit can be a very eye-opening experience. Use the momentum to share the results with the rest of your school and create a plan to reduce waste based on your findings.

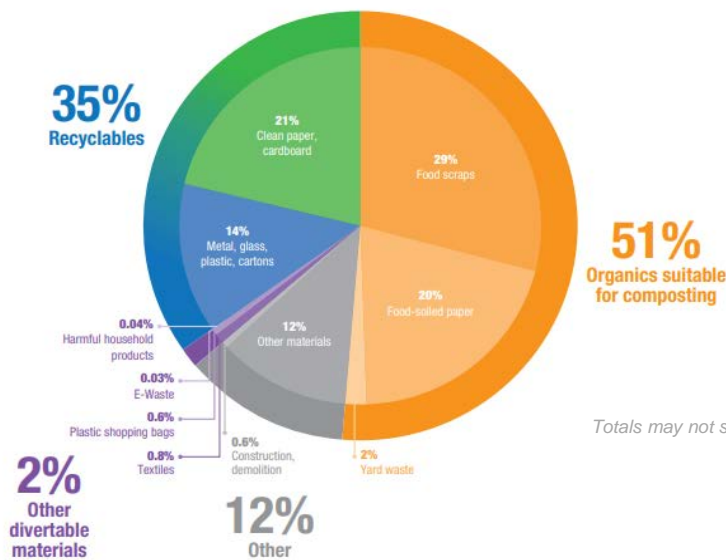
Inquiry and Critical Thinking Questions:

- What were the main components of our school's waste?
- What were the most commonly missorted items?
- Are there any things we found that we found that didn't belong in any of the 3 piles? Why?
- What were some of the items that could have been reused instead of thrown away?
- Would the results be different if the audit was done at a different time in the school year?
- Based on our findings, what could students do today to reduce waste going to landfills?
- How can we help raise awareness and affect change through announcements, monitors, signage or education?

Opportunities:

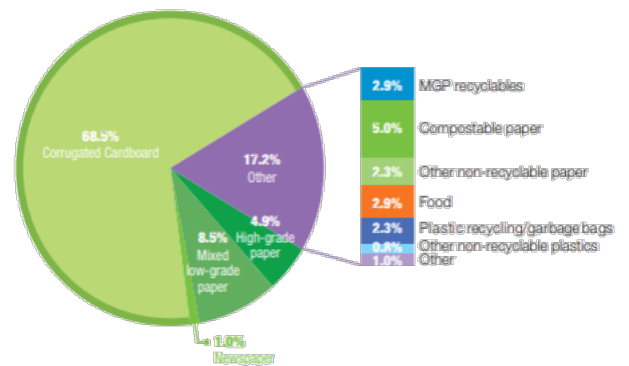
- Compare your *actual* waste diversion rates to your *potential* waste diversion rates and identify opportunities for change.
- Create your own bar graphs or pie charts to display in your school community.
- Use DSNY's Schools Composition pie charts below as examples.
- Repeat Waste Audit again throughout the year to chart progress.

2017 Composition of Schools Aggregate Discards



Note: The term "Aggregate Discards" is used to mean overall waste, or the sum total of all material streams.

2017 Composition of School Paper Recycling



Totals may not sum exactly due to rounding

For more resources and downloadable Green Team materials, check out the Recycling Champions website www.grownyc.org/RCP

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DIRECTIONS Bin Teams

Cut along line and give to each team.

Green Bin Team

Note: All of the data your team collects will be filled into Row 1

1. Sort all materials found in the Green Bins. Put Paper & Cardboard in one pile, MGPC in another pile and Trash in another pile.
 2. Weigh Paper & Cardboard. Record total in Row 1, Column 1.
 3. Weigh MGPC. Record total in Row 1, Column 2.
 4. Weigh Trash. Record total in Row 1, Column 3.
 5. Across Row 1, add Column 1, Column 2 and Column 3 together. Record in Row 1, Column 4 as “**Bin Total**”.
-

Blue Bin Team

Note: All of the data your team collects will be filled into Row 2

1. Sort all materials found in the Blue Bins. Put Paper & Cardboard in one pile, MGPC in another pile and Trash in another pile.
 2. Weigh Paper & Cardboard. Record total in Row 2, Column 1.
 3. Weigh MGPC. Record total in Row 2, Column 2.
 4. Weigh Trash. Record total in Row 2, Column 3.
 5. Across Row 2, add Column 1, Column 2 and Column 3. Record in Row 2, Column 4 as “**Bin Total**”.
-

Trash Bin Team

Note: All of the data your team collects will be filled into Row 3

1. Sort all materials found in the Trash Bins. Put Paper & Cardboard in one pile, MGPC in another pile and Trash in another pile.
2. Weigh Paper & Cardboard. Record total in Row 3, Column 1.
3. Weigh MGPC. Record total in Row 3, Column 2.
4. Weigh Trash. Record total in Row 3, Column 3.

Across Row 3, add Column 1, Column 2 and Column 3. Record in Row 3, in Column 4 as “**Bin Total**”.

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DIRECTIONS Data Analysis

Data Analysis

After all 3 teams have measured their materials, it's time to make sense of all these numbers!

Share & Add Data

- Teacher may ask each team member to say their three data points out loud so rest of the class can fill in the entire table.
- Add all measurements in Column 1 to find the “**Stream Total**” for Paper & Cardboard. Record total in Row 4, Column 1. Repeat for Column 2 and Column 3 to measure Stream totals for MGPC and Trash.
- Add all measurements in Row 1 to find the “**Bin Total**” for all items found in all the Green Bins. Record total in Row 1, Column 4. Repeat for Row 2 and Row 3 to find bin totals for Blue Bins and Trash Bins
- Adding all Stream totals and all Bin Totals should indicate a grand total.

Analyze Data

The 4 primary data points to analyze during a waste audit are Capture Rates, Contamination Rates, Actual Diversion Rates and Potential Diversion Rates.

A. Capture Rate: the percentage of materials that are properly sorted (placed in the correct bin). The goal is high Capture Rates.

B. Contamination Rate: the percentage of waste materials that are improperly sorted (placed in the wrong bin). The goal is low Contamination Rates.

C. Actual Diversion Rate: the percentage of all waste materials measured (Grand Total) that are actually sorted correctly, recycled and diverted from (not sent to) landfills. All Trash and incorrectly sorted materials are sent to landfills. The goal is high Diversion Rates.

D. Potential Diversion Rate: the percentage of all waste materials measured (Grand Total) that could be recycled and diverted from (not sent to) landfills. This data will highlight the room for improvement.

A. CAPTURE RATES

Paper & Cardboard

$$\text{Paper \& Cardboard Capture Rate (\%)} = \left(\frac{\text{Paper \& Cardboard found in Green Bins}}{\text{Paper \& Cardboard Stream Total}} \right) \times 100$$

Take the measurement in Row 1, Column 1 (the amount of Paper & Cardboard properly sorted and placed in Green Bins) and divide by the measurement in Row 4, Column 1 ("Stream Total"). Multiply by 100 to get percentage.

MGPC

$$\text{MGPC Capture Rate (\%)} = \left(\frac{\text{MGPC found in Blue Bins}}{\text{MGPC Stream Total}} \right) \times 100$$

Take the measurement in Row 2, Column 2 (the amount of MGPC properly sorted and placed in Blue Bins) and divide by the measurement in Row 4, Column 2 ("Stream Total"). Multiply by 100 to get percentage.

Trash

$$\text{Trash Capture Rate (\%)} = \left(\frac{\text{Trash found in Black Bins}}{\text{Trash Stream Total}} \right) \times 100$$

Take the measurement in Row 3, Column 3 (the amount of Trash properly sorted and placed in Trash Bins) and divide by the measurement in Row 4, Column 3 ("Stream Total"). Multiply by 100 to get percentage.

B. CONTAMINATION RATES

Green Bin

$$\text{Green Bin Contamination Rate (\%)} = \left(\frac{\text{MGPC + Trash found in Green Bins}}{\text{Green Bin Total Weight}} \right) \times 100$$

Add the measurements in Row 1, Column 2 + Row 1, Column 3 (the amount of MGPC and Trash in Green Bins). Take total and divide by the measurement in Row 1, Column 4 ("Bin Total"). Multiply by 100 to get percentage.

Blue Bin

$$\text{Blue Bin Contamination Rate (\%)} = \left(\frac{\text{Paper \& Cardboard + Trash found in Blue Bins}}{\text{Blue Bin Total Weight}} \right) \times 100$$

Add the measurements in Row 2, Column 1 + Row 2, Column 3 (the amount of Paper & Cardboard and Trash in Blue Bins). Take total and divide by the measurement in Row 2, Column 4 ("Bin Total"). Multiply by 100 to get percentage.

Trash Bin

$$\text{Trash Bin Contamination Rate (\%)} = \left(\frac{\text{Paper \& Cardboard + MGPC found in Trash Bins}}{\text{Trash Bin Total Weight}} \right) \times 100$$

Add the measurements in Row 3, Column 1 + Row 3, Column 2 (the amount of Paper & Cardboard and MGPC in Trash Bins) Take total and divide by the measurement in Row 3, Column 4 ("Bin Total"). Multiply by 100 to get percentage.

C. ACTUAL DIVERSION RATE

$$\text{Actual Diversion Rate (\%)} = \left(\frac{\text{Paper \& Cardboard found in Green Bins} + \text{MGPC found in Blue Bins}}{\text{Grand Total of Weight Measured}} \right) \times 100$$

Add the measurements in Row 1, Column 1 (the amount of Paper & Cardboard in Green Bins) and Row 2, Column 2 (the amount of MGPC in Blue Bins). Take total and divide by the measurement in Row 4, Column 4 (Grand Total). Multiply by 100 to get percentage.

D. POTENTIAL DIVERSION RATE

$$\text{Potential Diversion Rate (\%)} = \left(\frac{\text{Paper \& Cardboard Stream Total} + \text{MGPC Stream Total}}{\text{Grand Total of Weight Measured}} \right) \times 100$$

Add the measurements in Row 4, Column 1 (the amount of Paper & Cardboard in all Bins) and Row 4, Column 2 (the amount of MGPC in all Bins). Take total and divide by the measurement in Row 4, Column 4 (Grand Total). Multiply by 100 to get percentage.

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