GREEN SOLUTIONS

ENVIRONMENTAL CONSULTING

METHODOLOGY FOR RESIDUALS CHARACTERIZATION TESTS

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METHODOLOGY FOR RESIDUALS CHARACTERIZATION TESTS

INTRODUCTION

This document is intended to serve as a "how-to" manual for determining the composition of recycling processing residuals in Clark County, Washington. The instructions provided in this manual are directed primarily at the processing residuals that result from the annual allocation study performed by Waste Connections at the West Van Material Recovery Facility ("West Van"). With the appropriate adjustments, these instructions could also be used for sampling and testing of similar materials, such as for testing other types of residuals or incoming mixed recyclables, but are not intended to apply to significantly different materials, such as testing the composition of solid wastes.

For the allocation study, materials from geographically-specific residential sources are processed separately from other sources to determine the breakdown of the recyclables and the amount of contaminants (residuals) collected from those sources. In theory, the processing residuals are the same as the incoming contaminants, but in reality the processing residuals are actually a mix of contaminants removed from the incoming recyclables and acceptable recyclable materials that did not get recovered in the processing system. The clear point here is that the system is not perfect (no system is perfect), and so some "good" recyclables are not getting recovered. The less obvious but equally important point is that the processing system is also not perfect in removing contaminants, and so part of the contaminants are being shipped out with the bales of recycled materials. This point should be kept in mind when evaluating the results and the purpose of this type of test. In other words, one of the important points is that the quantity and composition of the residuals may or may not be an accurate reflection of the amounts and types of contaminants in the incoming recyclables.

Terms Used in this Document

The processing residuals addressed in this manual are generally divided into two categories:

End-of-Belt, or EOB: These are the residuals that fall off the end of the processing line after recyclable materials have been removed in the processing system. These may also be referred to as "end of the line" residuals (or by other terms) by Waste Connections staff. In previous years, this stream in particular has typically included significant amounts of recyclable materials that were not recovered in the processing system (sometimes called "lost recyclables").

Other: "Other Residuals" is the term used in this document for the mixture of residuals removed at various other points in the processing system, including the materials pulled off at the beginning of the line (such as bags of garbage, bulky items, and plastic bags and film), broken glass and other fines screened out in the process, and contaminants manually pulled off the line partway through the processing system. This stream of residuals is generally called "garbage" by Waste Connection staff. Stringy materials cut off of the screens ("screen cuttings") may be included in this category or this material has sometimes been kept separate for testing purposes (although the amount of the screen cuttings is very small relative to the other residuals).

Overview of the Sampling and Sorting Process

Testing the composition of the processing residuals involves three major steps:

- Taking samples
- Sorting the samples
- Analyzing and reporting the results

Each of these steps is described below and must be done correctly in order to yield accurate results.

TAKING SAMPLES OF PROCESSING RESIDUALS

The Big Picture

The goal of any sampling process is to yield accurate information on the material being sampled. If a large amount of material could somehow be reduced to a small amount and still be 100% representative of the larger amount, for instance in this case reducing 10,000 pounds of residuals to one sample that is 100 or 200 pounds in size, then a single sample could be tested and those results taken as the true values. Unfortunately, this is not possible. Alternatively one could also take the entire amount of material (10,000 pounds or more) as the "sample" and it would automatically qualify as being representative. This approach is impractical for a variety of reasons. Hence, one needs to rely on the results for several small samples to determine the composition of the material being tested. Those samples must be as representative and unbiased as possible to yield accurate results. Fortunately for this and the many other types of sampling procedures that are used in other fields, statistical analysis can be applied to the sample results to get a sense of the accuracy of the results.

Taking representative samples of the source material, in this case a pile of residuals placed on the tipping floor or other surface, requires careful consideration of the variations that may exist within the pile. In the case of the EOB Residuals, there may be no observable variations within the pile but it must be assumed that there are potentially some such variations and the sampling process must be designed accordingly. For instance, a common issue for loose materials such as the EOB Residuals is that light/bouncy/round objects have a tendency to roll or bounce to the outside edges of the pile, both while the roll-off container is being filled and again when it is emptied. Heavy and/or small objects have a tendency to migrate to the bottom of the material when the roll-off is being moved or emptied. Similar issues exist for the mixture of Other Residuals, but in this case the concerns about variation within the pile are compounded by the fact that these residuals are a mixture of different materials (with different "particle sizes" and different densities) from different points in the processing system, and that these materials are not mixed together (not that mixing is a great idea, see sidebar) and may or may not be placed in the roll-off container in amounts that are representative of the overall amounts of each. The solution to the above issues is the same for both types of residuals, which is that the preferred sampling approach is to take a slice of the material that starts at the outer edge of the pile and extends into the center and bottom of the pile of material.

Sidebar: Pre-Mixing Residuals

Various studies have attempted to mix waste or recyclables prior to sampling to create a more homogenous material for sampling purposes, but this effort has generally resulted in poor results and so is not recommended. The process in some cases has resulted in materials that are dirtier or degraded in some way and thus harder to identify, or the mixing process potentially aggravates the tendency for heavy objects and fines to fall to the bottom of the pile and then be under-sampled (or over-sampled).

An important point to keep in mind is that the ability to accurately characterize the residuals is highly dependent on the assumption that the residuals set aside for this test by Waste Connections staff are representative of the residuals generated by the allocation study. The single roll-off container set aside for either of the EOB and Other Residuals is only 20% to 50% of the total amount of those residuals generated. The process for placing residuals into the roll-off container should be reviewed with Waste Connections staff in order to ensure that no problems are being created at that point. This is especially a concern for the Other Residuals, since those residuals are a mixture of very different types of residuals (bags of garbage and bulky items, broken glass and other fines, contaminants manually pulled off the line and possibly screen cuttings). The certainty of the results would be greatly improved if these different residuals were kept separate and then separately tested, although this would also increase the number of samples that needed to be sorted for this test because each of these residuals streams would need a minimum of three samples.

How to Actually Take a Sample

Taking a slice of a pile may sound simple, but it requires a bit of skill and experience. As a slice of the pile is removed, there will be a tendency for adjacent materials to fall into the void created by removing the sampled materials. This would potentially bias the sample because one would never reach the center and bottom of the pile. To avoid this, it will be necessary to push aside the adjacent materials as the sampled materials are removed. If one starts at the outer edge of the pile, the undesirable materials can also be pushed behind the sampler. The width of the sampled slice should be kept somewhat narrow, otherwise the target sample weight (generally 100 pounds) will be achieved long before the center and bottom of the slice is reached. As a practical measure, the width should be at least the same as the trash can used for sampling purposes. Taking the sample is then as simple as placing the trash can at an angle to the pile and shoveling (with hands or a tool) the materials into the trash can until full. A scoop shovel (see Figure 1) can be used for the loose materials at the bottom edge of the pile, but a shovel quickly becomes useless for the pile itself because the materials are so intertwined.

Figure 1: Scoop Shovel

Type of scoop shovel carried by Home Depot. Shovel is about 15" wide and has a handle 31" long.

As the sample is being taken, large or long items will sometimes be encountered. The general rule of thumb in these cases is to include these in the sample if they lie more than 50% within the target sample area. In a rare case, a long item such as a garden hose could be cut so as to include part of it in the sample. This might be a desirable practice in part because the hose would be difficult to push out of the way and would instead interfere with the sampling process if it was not removed somehow.

Sample Size

The target sample size of 100 pounds has been used for processing residuals and seems to work well for this. It generally takes at least five 32-gallon trash cans to get to this sample size, but can take ten or more cans for the EOB Residuals because of the low density of that material. Note that this sample size differs from waste sorting projects where the target sample size is 200 pounds. A larger sample size is used for garbage because of the greater inherent variability of it and due to the desire to capture accurate data on materials that are present in smaller quantities in garbage.

Number of Samples to Take

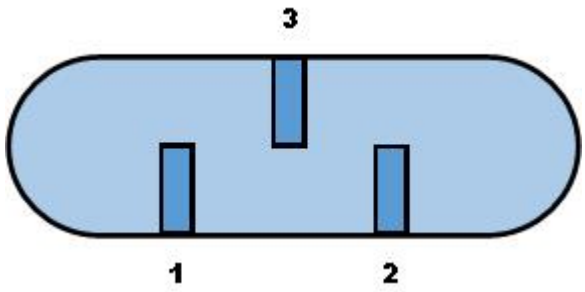
A minimum of three samples need to be taken in order to allow statistical analysis of the sample results. Three samples should also be considered a minimum for the purposes of sampling different parts of the residuals pile and calculating a reliable average of the results. More samples are a good idea for materials that are less homogenous (such as for the Other Residuals). Past studies of the residuals have taken three samples of the EOB Residuals and four samples of the Other Residuals. This approach appears to have worked well and these should be considered the minimum number of samples for this test. If anything, a few more samples would be prudent for both types of residuals, but there is also the practical consideration that this total number of samples (seven) provides a reasonable daily workload for a sorting crew.

It might be tempting to increase sample numbers to improve the statistical meaningfulness of the results, but such improvements require an order of magnitude increase in the sample numbers. In other words, to make the results "twice as good" statistically would not require a doubling of the sample numbers from 3 to 6 samples, but instead would require an increase from 3 to 30 samples. Obviously this quickly becomes impractical.

Where to Take the Samples

The decision about where to sample a pile of residuals should be made before the pile is examined too closely to avoid sampling biases. Although many waste sampling projects rely on random selection of loads for sampling (if done properly, random selection helps avoid sampling biases), the situation here is different because multiple samples are being taken from a single pile of material and the goal is to accurately characterize that pile. Thus, the sampling strategy changes from random selection to evenly distributing the sampling points throughout the pile. For a situation where three samples are being taken, a typical strategy could be to take two samples on one side, about one-third of the distance from each end, and one sample from the other side at about the midpoint (see Figure 2).

Figure 2: Sampling Points for Three-Sample Scenario

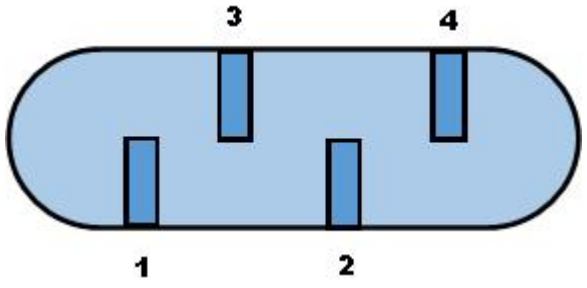


Darker-shaded areas represent slices of sampled material.

This strategy allows for both sides of the pile to be sampled in case there are differences from side to side, while also avoiding sampling at the same points on both sides. The latter point is a good idea in case the sampling process on one side could potentially "disturb" the makeup of the materials on the other side, but more importantly this allows the sampling points to be spread out. This strategy also avoids sampling from the ends. Avoiding either end of the pile is generally a good idea because there may be an atypical mix of materials at the ends, due to the way in which the roll-off was loaded and/or due to the tendency for bouncy/round objects to roll to the sides or ends. Of course, the opposite could also be argued, that avoiding the ends leads to under-sampling the bouncy/rolling objects. A sample could be taken at one end if this is a concern, but generally this should be avoided because with only three samples, those samples should be directed at the bulk of the pile and not "wasted" in a marginal area.

For a strategy using four samples from a pile, the samples could be taken from both sides but offset from each other so that again the sample are not taken from the points that are directly opposite another sample (see Figure 3). In this case, a sample (either sample 1 or 4 in Figure 3) could also be shifted closer to the end and then angled toward the center if there was an interest in capturing more of the materials at one end.

Figure 3: Sampling Points for Four-Sample Scenario



Darker-shaded areas represent slices of sampled material.

Summary of the Sampling Process

To recap the steps needed for sampling:

- Choose the number of samples and locations.
- Take each sample as a slice of the pile, checking sample size until the desired weight (100 pounds) is achieved, or take more if needed to sample a complete slice. Samples should be taken by starting from the outer bottom edge and working towards the center and bottom of the pile, placing materials into 32-gallon trash cans.
- Set aside each sample until it is ready for sorting.

SORTING SAMPLES OF PROCESSING RESIDUALS

Overview

A substantial amount of preparation is needed to ensure a successful waste sorting project, including:

- Making arrangements for the sorting crew, space at the facility (presumably at West Van), setting aside residuals to be tested, and confirming the schedule with all.
- Confirming the availability and condition of the sorting equipment and replenishing supplies.
- Updating the list of sorting categories and preparing the necessary definitions and forms, then printing an appropriate number of copies of those.

On the day of the sorting activities, one or two staff (preferably two) should arrive at West Van an hour before the other crew members to unload equipment and supplies, set up the sorting table and area, and arrange for the residuals to be placed in a spot close to where the sorting crew will be working. Ideally, there would be sufficient time for the first sample to be taken and some of this placed on the sorting table so that this is ready for the sorting crew. Some cleaning of the sorting area may be needed to avoid tripping hazards and to make the area cleaner for the crew's sake (hence the broom and rake shown in the equipment list).

Sorting Equipment

A list of the equipment and supplies needed for this type of project is shown in Attachment A and this section describes some of those items in greater detail.

- **Sorting Box**: a box of plywood construction (approximately 6 ft. x 3 ft. x 1 ft. deep). See Attachment B for more details on this box, including instructions on how to build one.
- **Sawhorses**: portable (folding) sawhorses can be purchased at a hardware store and these can be used to hold the box at an appropriate height. The height of these sawhorses can typically be adjusted, although in most cases these would be used at the lowest height in order to accommodate the shortest member(s) of the sorting crew.
- **Large Trash Cans**: 32-gallon trash cans work well for this because these are widely available and inexpensive. There is no need to use the sturdier versions of these, as those typically do not stack as well and the heavier weight cannot be justified by the small amount of use. The most important thing is that the trash cans should be a "matched set" as far as the weight of cans is concerned. Having all of the cans weigh exactly the same allows the tare weight to be set on the scale and the weight of the contents can then be more directly determined. Creating a matched set is typically accomplished by purchasing all of the cans at the same time from the same source, although the weights for a new set of cans should be checked to confirm that they match. If the cans are not a matched set, then the weight of the cans must be written on the side of the can, noted during the weighing process and then subtracted later. While this may sound simple enough, additional complications such as this should be aggressively avoided because every additional task adds to an already full workload and provides another opportunity for serious errors. A minimum of 12 trash cans should be used around the sorting table, with additional cans available for sampling purposes.
- **Small Cans or Buckets**: smaller containers such as five-gallon buckets can also be used around the sorting table. The use of smaller cans is a space-saving measure during the actual sorting and also makes it easier to transport the equipment to the site and move containers around for sorting and weighing activities. Furthermore, the smaller containers can be used for materials present in smaller quantities (not every sorting category requires a 32-gallon can) and can lead to more accurate weights later (if a scale is used for the smaller containers that has more precision at the lower weights, although today's scale technology has all but eliminated this

factor). The use of smaller containers does, however, require that two scales be used, so that the tare weights for the two sizes of containers can be set on two different scales. These smaller containers also need to be a "matched set" so that the tare weights are identical. Note that experience has shown that the five-gallon buckets sold by large hardware stores may not have identical tare weights, and these buckets also do not come apart easily after being stacked (nested).

- **Two Scales**: two scales should be used to accommodate the two sizes of containers. The scale for the five-gallon buckets should have a lower range (or capacity), for example a maximum capacity of 20 to 50 pounds, and may have greater precision at the lower weights. The scale for the larger containers should have a larger capacity, up to 300 pounds, and provide weights in increments of 0.05 pounds or less. Both scales will need to be battery-operated. The larger scale should be a floor model, with the weighing pan only a few inches high, so that the larger cans can be placed easily on it. The smaller scale could be a bench scale, although this will necessitate placing it on something to raise it up to more easily operate it and view the weights. This issue can be resolved by placing the scale on top of a plastic bin or other container, and that plastic bin can also be used to hold the scale when in storage. Photo 1 shows the scales and containers used for the 2019 residuals study.

Photo 1: Scales used in 2019 Residuals Test

Photo taken July 24, 2019. Photo shows scales, buckets and cans used for 2019 residuals study.

- **Safety Supplies**: safety supplies for the sorting crew include gloves, hard hats, visibility vests, and safety glasses. Atlas-style gloves (with rubber coating on the palm side and cloth on the back side) have worked well for similar projects, but it should be kept in mind that these do offer much puncture resistance. Leather or other gloves could be used instead. Ear plugs and

dust masks should be available but likely will not be needed unless the work is being conducted while the facility or nearby areas are actively in use by others. A first aid kit and fire extinguisher should also be available, and ideally an eye wash station would be available in the area as well.

- **Photo Supplies**: some of the items on the equipment list are for the purpose of taking pictures of the sorted materials (although general pictures of the residuals and crew are also a good idea), including a large tarp, camera, and labels. The labels would be pre-printed with the name of the category (such as "Recyclable Paper") or the name of the source (such as "Single Family EOB Residuals"). For the latter, it is a good idea to include the date (which can be pre-printed on the label) and sample number (which will then require multiple copies of these labels). Examples of the two types of labels are shown in Attachment C, and digital copies were provided with this manual.
- **Data Collection Forms**: two data collection forms were used for this project in 2019; the Sample Data Form and the Bag Tally Form. These forms are shown in Attachment D and digital copies of these were provided with this manual.
- **Training Materials**: a training session should be conducted for the crew of sorters (see next section for more details) and this session should provide an overview of the sorting methods, categories, definitions, and health and safety procedures. At a minimum, the materials needed to support this effort include a list of the sorting categories and definitions, a recycling flyer or copy of recycling rules, and a health and safety checklist (see Attachment E for examples of these materials).
- **Sorting Station Assignments**: the final item on the equipment list that bears explanation is the "station assignments." This item bears some explanation because it is a bit complicated to decide how to break up the list of sorting categories into individual assignments for five sorting crew members. An example of how this is done is shown in Attachment F, which shows station assignments that have been refined over the past few years of this study. This is not to say that these lists are "cast in stone" and in fact these should be revised as desired. Note that these lists are intended to be printed on heavier paper (such as 80 lb cardstock), then trimmed to remove excess paper (but leaving room for the duct tape) and then attached to the sides of the sorting box with duct tape along the top and bottom edges.

Crew Training

Training the crew before sorting activities are begun is an important step, although a balance must be struck between thoroughly covering the critical points without spending an overly long time on this part (because it delays the crew from actually doing the work). The crew training session should provide an overview of the sorting methods, a review of the categories and key aspects of the definitions used for those categories, and a review of the health and safety aspects of the work. Crewmembers should not be allowed to do any work until they are provided with health and safety training.

A guide and sample materials that can be used for the crew training session are shown in Attachment E. As noted in Attachment E, the first sample that is sorted should be considered as part of the crew training. There will of course be additional questions that come up throughout the sorting work, and crewmembers should be encouraged to ask questions about any materials that they are uncertain about. The sorted materials should also be checked periodically throughout the day and at the scale. Any discrepancies should be discussed to clarify the materials that should be included in each category. It should be kept in mind that no amount of prior preparation or training will avoid some questions and uncertainties, due in large part to the wide variety of materials present in the recycling and waste streams, and so some judgement calls will be required of the crew and crew leaders as to how to categorize specific items. "On-the-fly" changes or deviations from the definitions should be avoided if at all possible, however, and then any changes should be documented.

Sorting Activities

With the proper preparation and tools, the actual sorting is fairly straightforward: mixed materials to be sorted are placed on the sorting table and specific materials are removed and placed into cans and buckets (see Photo 2).

Photo 2: Sorting Crew and Setup for 2017 Residuals Characterization Test

Photo taken June 16, 2017. Photo shows sorting crew around table and placement of five-gallon buckets and 32-gallon trash cans.

To prepare for sorting, one or more people should go to West Van an hour before the rest of the sorting crew to set up equipment and make other preparations, including setting up the scales and setting the tare weights on the scales, setting up the sorting table, putting cans around the table and grabbing the first sample and putting some of that on the table. After the training session, the crew should be brought to the sorting table and the list of materials for each position around the table (see Attachment F) should be briefly reviewed, not only so that each person knows which materials they are responsible for but also so that they know who is handling the other materials. The sorting crew members should remove specific materials and place those into containers around the table according to the list of categories for their station.

As materials are sorted out of the residuals, additional cans of residuals should be placed onto the sorting table one can at a time until the last can for that sample is placed on the table. Sorting should continue until all that remains are small bits and pieces. At some point, sorting should be ceased and the small bits and pieces remaining on the table should be placed into a separate can or bucket and visually characterized. Visually characterizing the bits and pieces can be done by weighing this material and then allocating an appropriate portion of the weight to the three or four primary categories present in the mix. The two-inch screen in the bottom of the sorting table will allow the "fines" (materials less than two inches in size) to drop below the screen and these can be removed by tipping the box and allowing those to fall onto a tarp. The fines should be placed into an empty can or bucket and weighed

separately. At the end of a sample, all materials will need to be removed and weighed, and then the cans and buckets emptied and returned to the table. It should be noted that a key aspect of this part of the process is to develop a system of teamwork, where a few people are helping at the scales, a few people are emptying the fines from the sorting box and placing those in a can, one or two people are emptying cans and buckets after being weighed and then setting up the sorting area for the next sample, and others are counting plastic bags (if that is being done).

A few additional points about sorting activities include:

- If the classification of a specific item is unclear at the time of the sorting activities, it can be weighed separately and later added to the appropriate category.
- Another key aspect of efficient sorting is to take samples so that the next sample is available when the sorting crew is ready for it. Samples should be taken and set aside in such a manner that they will not be confused with other samples or sorted materials.
- The ideal location for the sorting area would provide easy access to the piles of residuals for sampling, but will be out of the way of traffic and with the least impact (interference) on normal facility operations. Space requirements are about 20' by 20' for the sorting area, plus additional room for temporary storage of samples and the piles of residuals.
- A sorting test can be an excellent opportunity to collect additional data, such as the number of plastic bags or a more detailed breakdown of one of the categories (such as how much wet-strength paper is in the non-recyclable paper), but caution should be exercised to avoid adding too many tasks to what is already a fairly complicated project. If additional tasks are conducted, it would be best to find a "champion" on the sorting crew to conduct the additional tasks rather than to add those to the already lengthy list of responsibilities for the crew leader(s).

Weighing the Sorted Materials

After a sample is finished being sorted, all cans and buckets with any materials in them should be brought to the scales. The smaller containers should be lined up or clustered around the scale being used for them (i.e., the scale with the tare weight set for an empty container of that type) and likewise with the larger containers and the scale being used for those. One person should be reading the scale and recording the weights, while one or two people remove weighed containers and set new ones on the scale. As previously mentioned, this is when a system of teamwork is especially important to operating efficiently and also to avoid mistakes such as containers being dumped before being weighed.

The weights can be entered into a laptop or other electronic device, but recording weights on paper is the recommended approach. Field conditions can be rough on electronic devices, and it would be extremely unfortunate to lose data due to damage to a laptop or other problem. Recording weights on paper is a more failsafe approach and allows an easier review of the recorded weights (see the next paragraph). With a reasonable amount of care, the loss of paper copies is a low risk, but if there is a concern about this then a photo can be taken of the completed data sheet to provide a second (backup) copy.

After all of the containers have been weighed, the data sheet should be reviewed to ensure that weights are shown for all materials that were found in the sample (in other words, no containers were overlooked or dumped prematurely and weights were recorded in the correct row).

Taking Photos

Photographs of the residuals and sorted materials are a good way to document the results of the fieldwork. The exact manner in which photographs are taken is not critical, but it is recommended that labels be included in the photos for easy identification later (see Photo 3). Examples of labels that can be used for this are shown in Attachment C and a digital copy of the labels was provided with this manual. It is also recommended that sorted materials be placed on a tarp to provide a clearer picture of

the materials. A label could be placed on the tarp identifying the source (such as "Multi-Family Residuals"), sample number and date, and then separate labels placed next to piles of sorted materials to identify that material (such as "Non-Recyclable Paper"). One approach is to take a picture of the entire tarp, including the label showing the sample identification (as shown in Photo 3), and then close-ups can be taken of the individual materials. This approach makes it easy to later identify the source of the materials photographed.

Photo 3: Example of Photograph of Sorted Materials

Photo taken May 19, 2019.

Visual Estimates

In a rare case, it might be desirable or necessary to visually estimate the composition of a type of residual, such as the stringy material cut off the screens ("screen cuttings"). The process of visual estimation is tricky and imprecise, and so this method should be reserved for materials with very simple composition or where there are no practical alternatives. In an ideal world, staff conducting the visual estimates would be trained in this work by repeatedly conducting visual estimates and then sorting the material to test their estimate, but of course this is hardly practical or cost-effective for an annual test of residuals. For a visual estimate, perhaps the main pitfall to be avoided is simply to bear in mind that the estimate is usually intended to yield percent by weight figures, and so the natural tendency to over-estimate light, high-volume materials should be avoided. Another suggestion is to have two or three people conduct a visual estimate and average the results. Finally, in the case of the materials left in the sorting box at the end of sorting, the best approach is to minimize these to the extent practical (thus limiting any damage from a potentially inaccurate estimate) or to create a special category for these materials (such as "miscellaneous") which will essentially remove them from the analysis.

Number of Bags
Additional data collected during the residuals sorting could include recording the number of bags containing shredded paper, batteries, recyclables, garbage, and bags of plastic bags. In addition, the number of loose plastic bags (plastic grocery/retail bags and other types of loose plastic bags) could be counted. A form was developed for this for the 2019 residuals test (see the Bag Counts form in Attachment D). This or another form could be used to keep track of the number of bags found during sorting (for items such as bags of recyclables) or some of these items could be counted after sorting is completed (either at the scale or by having a few people conduct a special count).

Summary of the Sorting Process
To recap the steps needed for sorting:

- Arrive before the sorting crew to set up equipment, work with Waste Connections staff to dump residuals, and pull the first sample.
- Conduct training session.
- Sort each sample and record data, take photos and collect additional data as desired.
- Pack up equipment, notify Waste Connections staff that you are done and leave site.

ANALYZING AND REPORTING THE RESULTS

The data collected in the field can be entered into a spreadsheet to calculate averages and the statistical meaningfulness of the results. The spreadsheet used for the 2019 residuals test was provided with this manual. This spreadsheet will need to be revised for any future changes in the sorting categories. The spreadsheet is based on three samples for the EOB residuals and four samples for the Other Residuals, and revisions will also be necessary if the number of samples for either is changed. The spreadsheet provided has highlighting where data should be entered, and a few comments were inserted to provide further direction. The spreadsheet is set up to calculate a weighted average of the two types of residuals for each source, and weight data will be needed from Waste Connections for the allocation study to calculate the weighted average and other results. Cells where data from Waste Connections will need to be added are highlighted on the Results tab of the spreadsheet provided (see Cells O5, O6, O10, R5, R6 and R10). Note that the data for cells O5, O6, R5, and R6 needs to be the total weight of each type of residual, and not just the weights for roll-offs tested. For Cells O10 and R10, the data needed is the total amount of each type of recyclable that was processed in the allocation study.

After the sample data is entered into the spreadsheet, it should be double-checked for accuracy. One way to do that is to print out the page of data and compare that to the sample data forms.

After the data has been verified, the results can be reported in various ways. The primary results will be the composition of each type of residual (in a percentages by weight), as well as the weighted average of both types of residuals for each source tested (single-family, multi-family, etc.), and also bag counts if these are recorded. The statistical meaningfulness of the composition results can also be reported, and other results can be reported depending on the data collected. The spreadsheet is set up to calculate statistical meaningfulness in terms of lower and upper confidence limits using the t-distribution approach (the t-distribution approach is used due to the relatively small sample size of only three to four samples per residual). This approach generally leads to slightly wider confidence intervals than other, more straightforward calculations of confidence intervals.

ATTACHMENT A
List of Sorting Equipment and Supplies

Sorting Equipment

Sorting Box
Sawhorses
Large Trash Cans, 12, plus 12 for sampling purposes
Small Cans, 12-16
Scales;
    1 large range for large trash cans
    1 small range for 5-gallon buckets
Extra Batteries for Scales
Canopy and Leg Weights for Canopy (if working outside)
Tarps, 1 large tarp for photos and one small one for fines
Hand Broom and Dust Pan for cleaning box (optional)
Shovel, scoop-type
Broom and Leaf Rake for cleanup
Safety Cones, 4 (optional, depends on sorting location and timing)
Pens and Clipboards, 2 each
Duct Tape
Camera
Cooler and Ice for Beverages
Treats for Crew; Bananas
Granola Bars
Doughnuts
Pop, water
Coffee, cocoa (optional), cups and creamer
Jerky
Cookies
Napkins, Plates, Cups

Safety Equipment (for up to 8 crewmembers)

Gloves, Atlas-Type
Hard Hats
Visibility Vests
Safety Glasses
Ear Plugs and Dust Masks (optional)
First Aid Kit
Fire Extinguisher

Forms

Sample Data Forms, 7 copies plus extra in case some get dirty or ripped
Bag Tally Forms
Training Materials (list of materials and recycling flyer)
Health and Safety Checklists
Sorting Station Assignments (list of materials for each spot, to be affixed to sorting box)
Labels for Photos (for each material and for type of sample)
Markers and Paper (for additional signs or labels if needed)
Project Files and Contact Info

ATTACHMENT B
How to Construct a Sorting Box

Introduction

The following instructions can be used to create a sorting box identical to the box used for the 2019 residuals tests (see Figure 1). This box is designed with a 2" by 2" screen in the bottom to allow separation of fines and small items during the sorting process. Including the screen in the box requires several other elements in addition to the screen itself, including the use of 2 by 4's attached to the base (otherwise 2 by 2's could be used), extending those 2 by 4's beyond the box on one end to keep the box off the floor when the fines are being dumped out, an opening on one end of the box for removing the fines that have passed through the screen (see Figure 2), an additional 2 by 4 down the center of the box to support the screen (see Figure 3), and a box that is deeper (by about three to four inches) than it otherwise needs to be. The use of the screen is recommended because it mimics the screening step that occurs during processing and because it removes fines that can't really be characterized anyway and would just interfere with the sorting process. However, if the decision is made at some point that the screen is unnecessary, than a simpler and lighter box could be made. In this case, a small tarp could be used inside the box to facilitate removal of the little bits and pieces that remain at the end of sorting a sample. A tarp could also be used in a box that has a screen if for some reason there is no desire to use the screen for a particular test.

Materials Needed to Construct a Box

Part ID	# of Pieces	Size	Notes
2" by 4" boards			
A	2	2" x 4" x 72"	Can round one of the ends of each board
B	1	2" x 4" x 66"	
C	2	2" x 4" x 17-¾"	
D	1	2" x 4" x 39-¾"	Could also use a piece of 1" by 4" or 1" by 6" of same length
5/8" plywood			
E	1	40" x 66"	
F	2	12" x 67-¼"	
G	1	40" x 12"	
H	1	40" x 7-7/8"	This piece should be cut with a "tab" that extends from the center of one long side, and the tab should be 1-½" x 4"
Other Supplies Needed			
I	2	Fencing, 44" x 74"	Galvanized welded wire fencing with rectangular holes that are 2" x 4"
J	70	Staples	Galvanized
K	50	Zipties	
L	60	Screws, 2"	A self-drilling screw, such as for decks, works well
M	4	Corner braces	Exterior grade recommended, such as Simpson L70 Angle
N	32	Screws, ¾" zinc (and washers if desired)	Such as a lath screws, for corner braces, if necessary adjust the number of screws for the number of holes in the braces
O	4	Handles	Best to avoid handles with sharp edges
P	8	Screws for handles	1-½" to 2" screws recommended, use a type of screw with a head that works for the handles
Q	1 gallon	Paint	Exterior grade, your choice of color (but best to avoid light colors)

Figure 1: Sorting Box used for 2019 Residuals Study

Figure 2: Opening on one end of Sorting Box

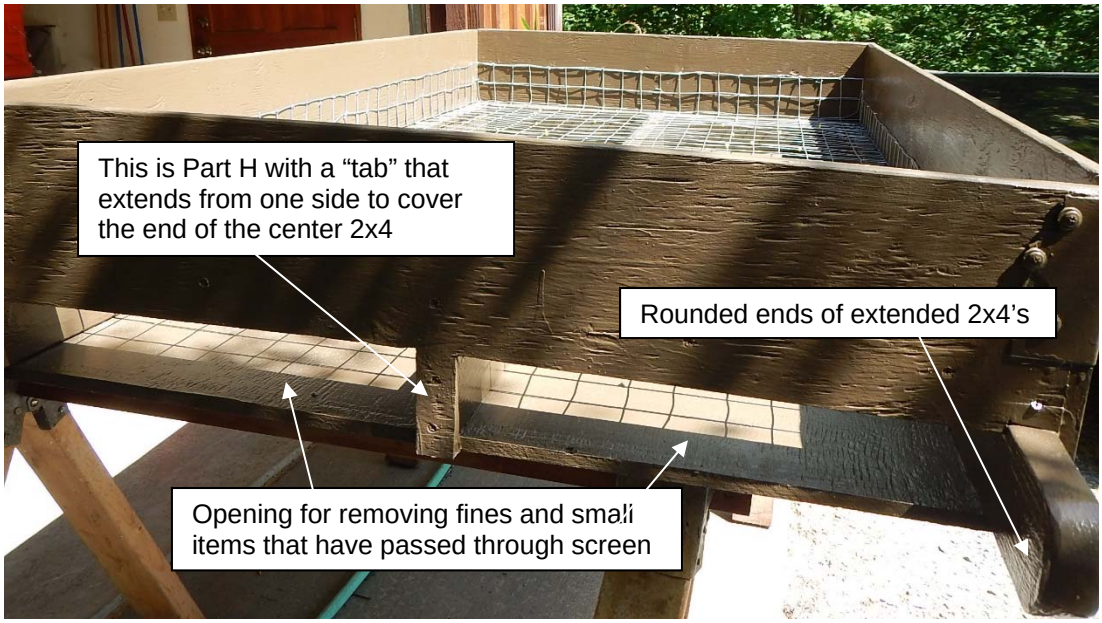
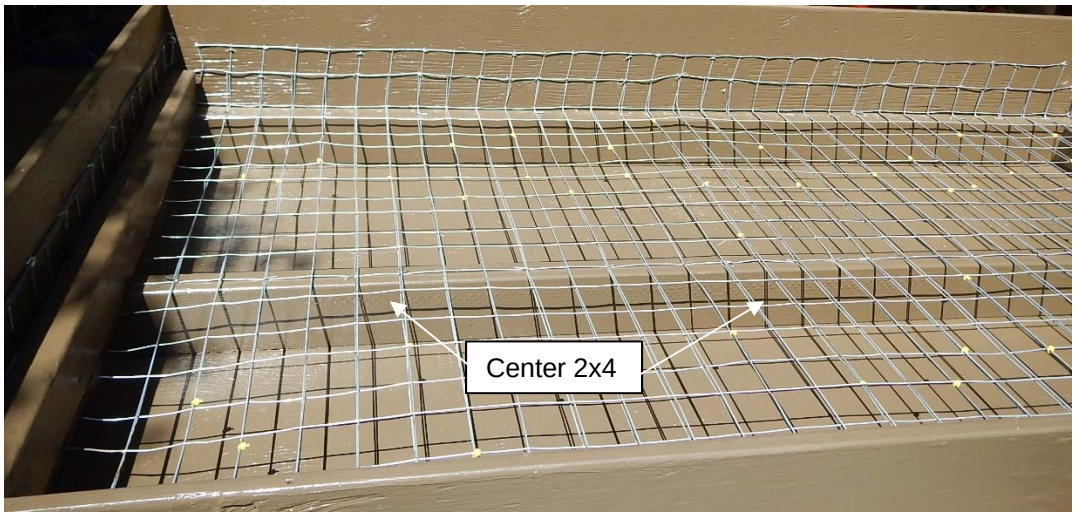


Figure 3: Center 2x4 for Screen Support



Process

To construct the box, assemble the pieces as described:

1. Attach the narrower side of each long 2x4 (Part A) to the long sides of the large piece of plywood (Part E), so that the boards are flush with the plywood edges on that side and also flush with one end of the plywood, and so that the rounded ends (or square ends if the ends weren't rounded) of the boards extend beyond the plywood on one side. The boards should be fastened with 2" screws (Part L) inserted through the plywood into the 2x4's about every 8" to 10". The heads of the screws should be flush with the surface of the plywood, and it might be necessary to pre-drill holes in order to countersink the screws in this way.

2. Attach the 66" 2x4 (Part B) in a similar fashion in the center of the plywood, so that the ends of this board are flush with the edges of the plywood.

3. Attach the two short 2x4's (Part C) to the short side of the plywood (on the side where the long 2x4's do not extend beyond the edge of the plywood), again using the 2" screws (Part L). These pieces should fit snugly into the space between the center 2x4 and the 2x4's on the edges. Any gaps between the boards will have a tendency to collect grit and small pieces of glass that will fall out later during transportation and storage, so it would be best to avoid gaps. If desired, two additional screws (2" or 2-½") can be screwed through the long 2x4 into the end of the short 2x4's on both sides for additional reinforcement, making sure again that the screw heads are flush with the 2x4 surface.

4. Attach the 40" by 12" piece of plywood (Part G) to the same side of the box where the two short pieces of 2x4's were installed in the previous step. The edges of this piece of plywood should be flush with the bottom of the large piece of plywood and with the outer edges of the 2x4's. Attach this piece of plywood with the 2" screws (Part L) by screwing through the plywood and into the 2x4's every 8-10", again making sure that the heads of the screws are flush with (do not protrude from) the plywood surface. Be sure to position the screws so that a screw goes into the ends of each of the three longest 2x4 boards.

5. Attach the two longer pieces of plywood (Part F) to each sides so that the bottom edges of these pieces are flush with the bottom side of the large piece of plywood and one of the short edges of these pieces are flush with the outside surface of the piece of plywood attached in the previous step (Part G). Again, attach with 2" screws (Part L) by screwing through the plywood and into the 2x4's every 8-10".

6. Attach the remaining piece of plywood (Part H) on the remaining side, so that the "tab" extending from one side covers the end of the center 2x4. This tab does not need to extend all the way to the bottom side of the plywood that forms the bottom of the box, because if it does then likely it will get caught on various surfaces as the box is being moved and pieces will be splintered off anyways. The bottom edge of this piece of plywood should rest on top of the two long 2x4's and the outer surface of the plywood should be flush with the ends of the plywood pieces installed in the previous step (Part F). Attach this piece of plywood to the end of the center 2x4 with two 2" screws (Part L).

7. Attach the corner braces (Part M) to each of the four corners so that the top of the braces are flush with the top edge of the plywood sides. Use lath screws (Part N) or other screws with low-profile heads, with or without washers, inserting screws into each available hole in the corner braces.

8. Paint (Part Q) all surfaces of the box. Also paint the remaining 2x4 (Part D) and set it aside for now.

9. Position the two pieces of fencing (Part I) in the box to create the screen. The corners of the fencing will need to be cut out in order to "fold" the fencing into box. Attach the fencing to the 2x4's and plywood sides with the staples (Part J), overlapping the two pieces of fencing to create

holes that are 2” by 2”. Be sure the staples are not so long that the points protrude on the outside of the box. Use the zipties (Part K) to hold the two pieces of fencing together, and then cut off the excess material from the zipties.

10. Attach the painted remaining 2x4 (Part D) to the inside of the box on the end with the opening so that the bottom of this board rests on top of the screen. Attach this board by screwing through the plywood and into the 2x4’s every 8-10” along the short side of the box, again making sure that the heads of the screws are flush with (do not protrude from) the plywood surfaces. Note that this piece is somewhat optional but helps to reinforce and protect the screen on that end, and as noted in the list of parts a piece of 1x4 or 1x6 could also be used here.

11. Attach handles (Part O) on each side of the box with appropriate screws (Part P), attaching these near the bottom of the box so that screws are attached where the 2x4’s are on the other side of the plywood (for greater strength). Use screws long enough to go into the 2x4’s by at least 1”. Handles should be about 12” from each end of the box, or about 30” apart.

ATTACHMENT C
Examples of Labels that can be used for Photos

Recyclable Paper

Single-Family
End-of-Belt Residuals

Date: _____
Sample #____

The above labels are reduced from the original size of 8.5" by 11". The original font used for these was Arial 72 points.

ATTACHMENT D
Data Collection Forms

Introduction

The following data collection forms were used for the 2019 residuals tests. The first form is a two-page form used to collect data on the weights of the sorted materials. This form is typically printed two-sided, so that the next page showing the definitions is on the back side of the data collection form and thus conveniently available if any questions come up about what should be included in each category. Obviously, this form will need to be revised for any future changes in the sorting categories or definitions.

The second form in this section is the bag tally form, which is useful for collecting data on the number of bags of various types found in each sample. This form was created in 2019 to allow this data to be recorded by a different person separately from the person recording the weights on the other form.

SAMPLE DATA FORM
CLARK COUNTY RESIDUALS CHARACTERIZATION STUDY

Sample #: _____ Residual: End-of-Belt Source: SF MF Other Residuals	Date: _____ Time: _____

TARGET RECYCLABLES	**WEIGHTS**	**COMMENTS**
Paper, Recyclable		
Paper, TetraPak		
Plastics, Recyclable		
Metals, Recyclable		
NON-TARGET MATERIALS		
Shredded Paper, in bags		# bags, paper:___ plastic:___
Shredded Paper, Unbagged		
Non-Recyclable Paper		Save for sub-sort
Cardboard, contaminated		
Plastic Packaging		
Plastic Bags, bagged		Count bags of bags:
Plast. Bags, loose grocery/retail		Count bags:
Plastic Bags, loose other		Count bags:
Plastic Film/Wrap		
Other Plastics		
Plastic, Styrofoam		
Plastic, Non-Recyclable Bottles		
Aerosol Cans, not empty		
Non-Recyclable Metals		
Glass		
Antifreeze		Properly contained?
Motor Oil		
Biological Wastes		
Medical Waste, medications		
Medical Waste, sharps		
Batteries		Count bags:
Electronics		Describe:
Food Waste		
Yard Debris		
Wood, C&D		
Textiles		
Garbage, bagged		Count bags:
Fines		
Other		Describe:

Definitions

TARGET RECYCLABLES	**Paper** – Magazines, Junk Mail, Phone Books, Paper Bags, Cereal Boxes, Gift and Shoe Boxes, Writing and Printing Paper, Newspaper, Cardboard
	Paper – Tetrapak, (milk cartons, drink boxes, soy milk, and soup/broth boxes)
	Plastic – Bottles, Tubs (no lids), Buckets (5-gallon or less), Nursery Pots (no dirt)
	Metal – Aluminum, Tin and Steel Cans, Aerosol Cans (empty, no lids), Other Metals (less than 35 pounds; no larger than 24 inches in any dimension; no plastic, rubber, or wood)
NON-TARGET (Contamination)	**Paper** – Shredded, in bags (note how many paper and how many plastic bags)
	Paper – Shredded, loose
	Paper – Non-Recyclable Paper (waxed, metal-lined, plastic-lined, wet-strength and frozen food packaging)
	Cardboard – Wet or contaminated (unclean pizza boxes, waxed, or painted)
	Plastic Packaging – Clamshells and Other Packaging (lids, blister packaging, and other rigid packaging)
	Plastic Bags – Bagged (plastic bag of plastic bags), count
	Plastic Bags – Loose Grocery and Retail Bags, count
	Plastic Bags – Loose, Other Bags, count
	Plastic – Film (not bags)
	Plastic – Other Plastics (rigid or non-rigid), describe
	Plastic – EPS (Styrofoam), including peanuts, block foam, and other
	Plastic – Non-Recyclable Bottles, including motor oil and pesticides
	Aerosol Cans – Not Empty (25% full or more)
	Metal – Non-Recy.(inc. appliances, other mixed metals, auto parts), **and lids**
	Glass – Recyclable and Non-Recyclable Glass
	Antifreeze – Used or New Antifreeze in Bottles
	Motor Oil – Oil in bottles
	Biological Waste – inc. diapers, feminine hygiene products, IV tubing, bloody gauze and animal wastes
	Medical Waste – Medications
	Medical Waste – Sharps
	Batteries – Bagged or Loose
	Electronics – Items with a circuit board, including mice
	Food Waste – Including packaging where greater than 50% of weight is food
	Yard Debris – Grass Clippings, Branches, Garden Waste, Houseplants, Flower Bouquets
	Wood and Construction/Demolition
	Textiles – Clothing, Bedding, Shoes, etc.
	Garbage – Bagged Garbage (must be checked, if a bag of recyclables then must be sorted and keep count of bags, if garbage then do not open)
	Fines – Materials that fall through screen
	Other – Other non-target items

TARGET RECYCLABLES = Materials defined as acceptable for the curbside recycling program.

NON-TARGET MATERIALS = Recyclable and non-recyclable materials that are not intended for the curbside collection program.

BAG COUNTS

Sample # _____ Date: _____

Bagged Shredded Paper (in plastic)	Bagged Shredded Paper (in paper bag)
Bags of Recyclables	
Bags of Garbage	
Plastic Bags of Bags	
Loose Plastic Bags (Grocery & Retail)	
Loose Plastic Bags (Other bags)	

ATTACHMENT E
Materials for Training Session

Introduction

The following materials can be used to conduct an initial crew training session. Digital copies of these materials were provided with this manual. Additional information could also be used, and the most important consideration in any case is to tailor the training session to the experience level of the crew. Even if the crew is fairly experienced, however, at a minimum there should be a quick review conducted of the sorting categories and definitions, and the health and safety procedures.

Training Guide

The second page in this attachment shows a guide that be used for the crew training session, and includes a number of important points that should be discussed during the training session.

Recycling Guidelines

The third page in this attachment shows a recycling guide that is useful for providing a quick review of the materials that are considered to be recyclable. Any recent changes in this list should be discussed and it should be determined whether to include those changes in the sorting categories or not. For instance, if a particular change has not yet been widely publicized and one of the goals of the sorting test is to gauge how well people are following the rules, then the recent change should not be included in the definitions for a sorting category because that would create misleading data.

Sorting Definitions

The fourth page in this attachment shows a list of the sorting categories and definitions to be used for this study. This form will need to match the list of materials and definitions shown on the Sample Data Form (see Attachment D). As noted in the training guide, not everyone will need to know every category, since each person at the sorting table will only be dealing with part of this list. However, it is still useful to note the important aspects for some of the categories.

Health and Safety Checklist

The fifth and sixth pages of this attachment show a Health and Safety Checklist that can be used for this type of project. The first page of this checklist provides a list of important points that should be carefully reviewed with the sorting crew. After this review, each member of the sorting crew should sign a copy of this form, and then the project leader should counter-sign it and retain the signed copies in the project file. The second page of the Health and Safety Checklist is an accident/incident report form that would help collect key information should there be an accident or injury of some type.

Additional "On-the-Job" Training

The training session will presumably be conducted in a meeting room or employee break room, after which the crew will proceed to the sorting table and begin their activities. However, the training session does not end when the crew leaves the meeting room. Once the crew is at the sorting table, the locations of the fire extinguisher and eye wash station should be pointed out, and safe sorting practices should be reviewed. Table assignments (i.e., who is sorting which materials) will be made at this time and the definitions being used for the sorting categories should be reviewed with each person (since they can focus then on the specific materials of concern to them).

Training Session Guide
for the
Clark County Residuals Test

Introductions

Explain allocation study and facility operation

Explain sorting process, step-by-step:

- Place each sample on table, one can at a time.
- Remove material until get down to small bits.
- Each category goes into separate can or bucket, and the five-gallon buckets are weighed on a small scale and garbage cans on lager scale.
- All of small bits on top of screen go into a separate can or bucket.
- Tip the box to dump the fines onto a tarp and put that into a separate can.
- Count the plastic bags and record this number on the Bag Tally Form or other form. Note that other items (bags of recyclables, garbage and shredded paper) should be recorded during the sorting process as these are found.
- Weigh everything, dump cans and buckets and start next sample. Set aside some materials for photos or for further analysis.
- Goal is 8 samples: 3 end-of-belt residuals, 4 "other" residuals and one from screen.
- Note importance of developing a "system" once a sample is done, with a few people counting plastic bags, a few people helping at the scales and a few people dumping containers after they are weighed.

Review list of materials, note that table assignments means each person is only doing some of categories

Explain specific issues:

- Safe handling of materials to avoid being poked by a syringe or cut by glass or metal (don't push materials around on table with an open palm or other parts of hand, be careful picking up bags, need to safely pass materials to person assigned to that category, etc.).
- 50-50 rule, do not open bags of food or containers of liquid but categorize those based on material that is greater than 50% of the weight, except for aerosol cans and medications, which should be categorized based on the contents if the contents are 25% or more of the weight.
- Don't open bags, except check for bags of recyclables and okay to open and sort those, but if it is a bag of garbage (i.e., primarily non-recyclable) then put entire bag in a separate can.
- How to handle syringes.
- How to sort plastic bags.

Review health and safety checklist and get signatures on that form. Distribute PPE.

Proceed to sorting location, point out locations of fire extinguisher and eye wash station, and conduct on-the-job training of sorting practices for part of the first sample.


RECYCLING DONE RIGHT
Items should be clean and dry. Rinse only if needed.
wcnorthwest.com • recyclehelp@wcnx.org • 360-892-5370
RECYCLE CART
GLASS BIN
PLASTIC
Bottles
Jugs
Tubs
NO
Hoses, Stretchy Plastic, Chemicals
PAPER
Paper
Cardboard
Cartons
Paperboard
NO
To Go Containers, Paper Towels, Dirty Paper
METAL
Aluminum, Steel, Tin Cans
Aerosol Cans
Aluminum Trays
NO
Propane Tanks, Auto Parts, Sharp Items
GLASS
Jars
Bottles
NO
Cookware, Dishware, Plate Glass

List of Materials for Sorting

TARGET RECYCLABLES	**Paper** – Magazines, Junk Mail, Phone Books, Paper Bags, Cereal Boxes, Gift and Shoe Boxes, Writing and Printing Paper, Newspaper, and Cardboard
	Paper – Tetrapak, (milk cartons, drink boxes, soy milk, and soup/broth boxes)
	Plastic – Bottles, Tubs (no lids), Buckets (5-gallon or less), Nursery Pots (no dirt)
	Metal – Aluminum, Tin and Steel Cans, Aerosol Cans (empty, no lids), Other Metals (less than 35 pounds; no larger than 24 inches in any dimension; no plastic, rubber, or wood)
NON-TARGET (Contamination)	**Paper** – Shredded, in bags (note how many paper and how many plastic bags)
	Paper – Shredded, loose
	Paper – Non-Recyclable Paper (waxed, metal-lined, plastic-lined, wet-strength and frozen food packaging)
	Cardboard – Wet or contaminated (unclean pizza boxes, waxed, or painted)
	Plastic Packaging – Clamshells and Other Packaging (lids, blister packaging, and other rigid packaging)
	Plastic Bags – Bagged (plastic bag of plastic bags), count
	Plastic Bags – Loose Grocery and Retail Bags, count
	Plastic Bags – Loose, Other Bags, count
	Plastic – Film (not bags)
	Plastic – Other Plastics (rigid or non-rigid), describe
	Plastic – EPS (Styrofoam), including peanuts, block foam, and other
	Plastic – Non-Recyclable Bottles, including motor oil and pesticides
	Aerosol Cans – Not Empty (25% full or more)
	Metal – Non-Recy. (inc. appliances, other mixed metals, auto parts), **and lids**
	Glass – Recyclable and Non-Recyclable Glass
	Antifreeze – Used or New Antifreeze in Bottles
	Motor Oil – Oil in bottles
	Biological Waste – inc. diapers, feminine hygiene products, IV tubing, bloody gauze and animal wastes
	Medical Waste – Medications
	Medical Waste – Sharps
	Batteries – Bagged or Loose
	Electronics – Items with a circuit board, including mice
	Food Waste – Including packaging where greater than 50% of weight is food
	Yard Debris – Grass Clippings, Branches, Garden Waste, Houseplants, Flower Bouquets
	Wood and Construction/Demolition
	Textiles – Clothing, Bedding, Shoes, etc.
	Garbage – Bagged Garbage (must be checked, if a bag of recyclables then must be sorted and keep count of bags, if garbage then do not open)
	Fines – Materials that fall through screen
	Other – Other non-target items

TARGET RECYCLABLES = Materials defined as acceptable for the curbside recycling program.

NON-TARGET MATERIALS = Recyclable and non-recyclable materials that are not intended for the curbside collection program.

HEALTH AND SAFETY CHECKLIST
FOR THE CLARK COUNTY RESIDUALS TESTS

My signature on this form confirms that:

- I understand that the following rules are important for my safety.
- I will wear appropriate footwear, clothing and safety equipment.
- I am physically able to perform this work.

Rules and Cautionary Notes:

- The work is being conducted in a facility where heavy equipment and other traffic hazards are present. The worker must keep out of the way of such equipment, must work or walk only in approved areas, and must assume that equipment operators (for forklifts, front-end loaders, trucks, etc.) cannot see them.
- Glass, metal and other sharp objects may be present in the materials being handled. Care must be taken not to get cut, poked or scratched. Any cuts, stabs, scratches or other skin penetrations must be immediately reported.
- Workers with pre-existing back pain or other physical problems should notify the crew leader of that beforehand. Care must be taken to avoid aggravating existing conditions. Any injuries, pain or other problems that develop during the work should be brought to the attention of the crew leader immediately, and changes or other solutions discussed. Incidents need to be reported using the attached form, and possibly additional forms for the facility and/or the labor agency.
- Evacuation routes should be discussed as part of the initial orientation, as well as other facility rules (smoking restrictions, break areas, etc.) and the locations of bathrooms and first aid stations.
- Working under the influence of intoxicants, narcotics or other controlled substances is prohibited.
- Eating, drinking, smoking, chewing gum or tobacco, and any other practice that increases the probability of hand-to-mouth transfer is prohibited in the work area.

Minimum Safety Equipment:

I understand that the following must be worn during sorting and related activities: Hard Hat, Safety Glasses, Gloves, Boots (preferably steel-toed), and Safety Vest. Other items (Ear Plugs and Dust Masks) are not required but may be worn at the worker's option.

- -

I understand that all safety regulations must be observed, that any violation of safety rules is grounds for dismissal, and that any safety equipment provided by Clark County or Waste Connections (except ear plugs and dust masks) must be returned.

______________________________________ ________________
Signature of Worker Date

______________________________________ ________________
Signature of Witness Date

ACCIDENT / INCIDENT REPORT FORM
(Use additional pages if necessary)

Name of Injured: _____ Date and Time: _____

Employed by: _____

Location: _____

Site Condition (clean, rain, snow, etc.): _____

Nature of Illness/Injury: _____

Symptoms: _____

Action Taken: Air and Rest: _____ First Aid: _____ Medical: _____

Witnessed by: _____ Transported by:_____

Facility Treating: _____

Treatment: _____

If punctured by a needle, Injured (check one) __ declines __ desires Hepatitis B shots (consult with doctor)

What was person doing at time of accident/incident:_____

_____

P.P.E. Worn: _____

Cause of Accident/Incident: _____

_____

What actions were taken to prevent reoccurrence: _____

_____

Additional Comments: _____

_____

_____

Injured's Signature _____ Date _____

Supervisor's Signature _____ Date _____

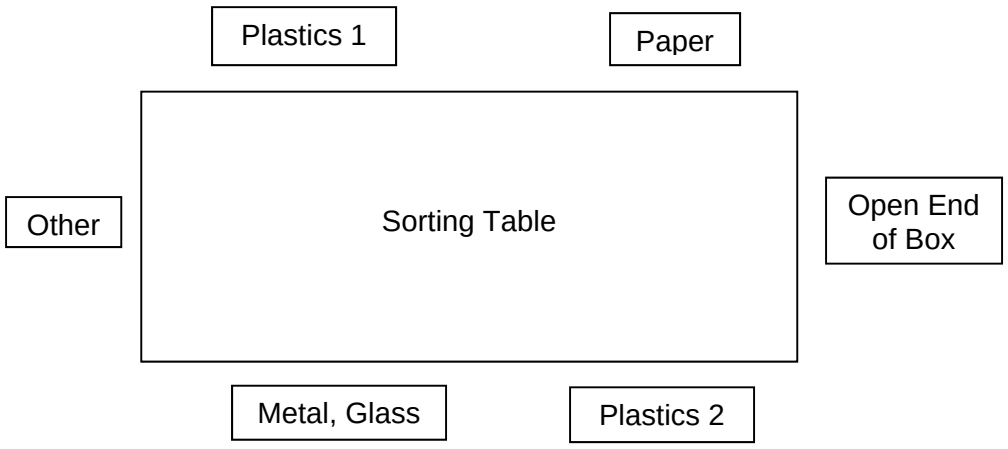
ATTACHMENT F
Sorting Station Assignments

Introduction

Part of the secret for accurate and efficient sorting is a clear division of labor, where each person on the sorting crew has a specific list of materials for which they are responsible. That said, if there are one or two materials present in large numbers (such as recyclable plastics), the sorting work will go more quickly if two people are pulling that material (preferably on opposite sides or ends of the table). It also helps the work go more quickly if sorting crew members are encouraged to pass materials to the person responsible for that item. Hence, it is helpful if one person is responsible for all of the paper categories, since crew members doing other materials will know to pass any paper items to that person, and likewise for plastic categories, metal/glass and "all other."

Recommended Station Assignments

The attached lists of station assignments have been developed over the past few years of residuals tests, and the diagram below shows where the recommended position is for each list. These lists and positions should not be viewed as being "cast in stone" because improvements are always possible, but these should at least provide a good starting point. A digital copy of the following lists was provided with this manual (see Table Assignments.docx).



One of the potential positions is shown above as "open end of box." There is no specific list of materials proposed for this position, but if there is a sixth person on the sorting crew, then they could stand here and assist with the positions on either side of them (Paper and Plastics 2).

Depending on the source and the type of residuals, there will be more or less of certain materials. Crew members should be encouraged to assist others if there is not a lot of their own materials but another person is struggling to collect all of their materials. This has sometimes happened with recyclable paper in the EOB residuals, for instance, where the person at the metal/glass position was able to help remove that material. Bear in mind, however, that this is also an opportunity for erroneous sorting to occur, since the person at the metal/glass position may not have a clear understanding of the items that should be included in the recyclable paper category, and so their work should be monitored more closely for a while.

PAPER

Recyclable Paper: magazines, junk mail, phone books, paper bags, cereal boxes, gift and shoe boxes, writing and printing paper, newspaper, and cardboard.

TetraPak: milk and soy milk cartons, drink boxes, and soup or broth boxes.

Cardboard, contaminated: food-soiled, waxed and other contaminated cardboard. DOES NOT INCLUDE CEREAL BOXES.

Shredded Paper, not bagged: loose shredded paper, to the extent this can be recovered.

Shredded Paper in Bags: count number of plastic bags and paper bags.

Non-Recyclable Paper: beverage cartons (6-pack and 12-pack cartons), frozen food packaging, plastic-coated plates, tissues, carbon paper, hardcover books, and paper packaging with metal or plastic parts.

PLASTICS 1

Recyclable Plastics: plastic bottles, tubs (no lids), buckets (5-gallon or less), and nursery pots (no dirt). This category is shared with the Plastic #2 position.

Plastic Packaging: all types of plastic packaging, such as trays, lids, “blister” packaging, clamshells, and tubs under 6 ounces.

Expanded Polystyrene: styrofoam.

Other Plastics: plastics that do fit into other categories.

PLASTICS 2

Recyclable Plastics: plastic bottles, tubs (no lids), buckets (5-gallon or less), and nursery pots (no dirt). This category is shared with the Plastic #1 position.

Non-Recyclable Plastic Bottles: empty motor oil bottles and bottles that have held pesticides and other toxic substances.

Plastic Bags: all plastic bags, to be sorted later into three categories: 1) bagged bags, 2) loose grocery/retail bags, 3) loose non-grocery bags.

Secondary Sort:

- Plastic Bags, bagged
- Plastic Bags, loose grocery and retail
- Plastic Bags, loose other

Plastic Film/Wrap: plastic sheeting and film.

METAL, GLASS

Recyclable Metals: aluminum cans, tin and steel cans, aerosol cans (empty), scrap metal (less than 35 pounds, no larger than 24 inches in any dimension, and no plastic, rubber, or wood).

Aerosol Cans, Not Empty: aerosol cans containing more than 25% residue.

Non-Recyclable Metals: metal pieces that are too large or heavy, or that are attached to other materials (including appliances and other mixed metals). Also includes metal lids.

Glass: recyclable glass bottles and non-recyclable glass (light bulbs, windows, mirrors, etc.).

OTHER

Antifreeze: containers of antifreeze.

Batteries: bagged or loose household batteries (D, C, AA and AAA), and rechargeable batteries.

Biological Wastes: diapers, feminine hygiene products, IV tubing, bloody gauze and animal wastes.

Electronics: items that contain a circuit board, including mice.

Food Waste: food waste and containers where more than 50% of the weight is food waste.

Garbage, Bagged: bags of garbage (where more than 50% of the materials in the bag are non-recyclable materials).

Medical Waste, medications: containers where 25% or more of the weight is medications.

Medical Waste, sharps: used syringes and similar items.

Motor Oil: containers with motor oil (if more than 25% of the weight).

Textiles: clothing, shoes, rope and similar products.

Wood, C&D: various types of wood and construction/demolition wastes.

Yard Debris: grass clippings, brush, branches, and garden wastes.

Other: everything else that is not recyclable, including hazardous wastes.

Fines: materials that fall through the 2” screen.

ATTACHMENT G
List of Digital Files Provided

Electronic Files Provided with this Manual

A number of digital files were provided with this manual, including:

Bag Tally Form.doc = form that can be used for keeping track of bagged materials in each sample.

H&SChecklist.doc = health and safety checklist shown in Attachment E.

Labels Samples.doc = labels that can be used to identify the type of residual, for the purposes of taking photos.

Mtl Labels.doc = labels that can be used to identify the sorted materials, for the purposes of taking photos.

MtlListHandout.doc = list of sorting categories, intended to be used during the training session.

SortDataClarkCounty2019.xlsx = spreadsheet for data analysis.

SortForm.docx = form that can be used for tracking weights of sorted materials for each sample.

Table Assignments.docx = lists of categories for individual sorting stations.

Training.docx = outline for training session.