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U.S. EPA Escaped Trash Assessment Protocol (ETAP)

Reference Manual

ACKNOWLEDGEMENTS

This protocol is a multi-regional collaboration by U.S. Environmental Protection Agency (EPA) personnel in both the Trash Free Waters and the Sustainable Materials Management Programs, with feedback from numerous external organizations. It presents the most efficient method of collecting and sorting mismanaged trash pollution that has escaped into the environment. Pilot testers, recognized below, provided meaningful modifications to the initial draft methodology after field use of the protocol. Collaborators also considered aspects of other trash-assessment protocols such as California's On-Land Visual Program and the Coastal Observation and Seabird Survey Team (COASST), the Marine Debris Monitoring and Assessment Project (MDMAP), the data card produced by Keep America Beautiful, and CalRecycle's packaging efforts.

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Contents

EXECUTIVE SUMMARY

The Escaped Trash Assessment Protocol (ETAP) was created by the United States Environmental Protection Agency's (EPA) Trash Free Waters Program (TFW) with support from Regional Staff in a variety of EPA programs including the Sustainable Materials Management program. TFW works to prevent and reduce the amount of trash entering our waterways. Trash that escapes waste management systems can end up in rivers, lakes, wetlands and coastal waters via transport mechanisms such as wind, stormwater, and improper disposal.

There is a lack of uniform data on the types of distribution of trash materials in the environment. This protocol provides an easy to use, consistent methodology for identifying a cleanup site, collecting the escaped trash, and cataloging the trash in a way that produces reliable data. This will give users a better understanding of the extent of litter in their community, the types of litter that are prevalent, and how best to reduce potential impacts.

ETAP can be used by anyone, particularly community beautification and pollution prevention groups, volunteer cleanup groups, watershed organizations, citizen scientists, state and local agencies, student environmental education and engagement organizations, and MS4 permit holders. Site leaders are encouraged to train others on the protocol before data collection begins. After site selection, characterization and cleanup, items recovered from the environment are sorted and categorized. Item tallies help provide users with a highly detailed trash profile for the area.

ETAP can be used to answer a broad range of management and monitoring questions. For example, the tool can be used to quantify and compare trash loadings across time, habitat type, land use type, etc. as well as identify trends in the specific material types and categories of trash collected. Groups can add features to the methodology to address the types of data they want to produce, such as certain item types or brand of trash collected.

ETAP is a living tool. TFW hopes that communities will benefit from the use of ETAP and make suggestions for any necessary changes. Over the next few years, innovation in packaging and the influx of trash tracking data may require an update to ETAP.

INTRODUCTION

Trash pollution is a growing problem in the U.S. and around the world. This document is intended to help individuals, communities, and agencies learn more about trash pollution and develop data-based solutions to the problem. It provides a consistent, easy-to-use protocol that can be applied in a variety of environments. The EPA Trash Free Waters (TFW) program developed this Escaped Trash Assessment Protocol (ETAP) in collaboration with EPA's Sustainable Materials Management program and many partners around the country who field tested it and provided valuable feedback.

What is escaped trash? Escaped trash refers to all types of mismanaged man-made materials that have been directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the environment – this includes litter and floatable debris. Trash has become one of the most pervasive forms of pollution facing the world's freshwater and marine aquatic habitats. It is also becoming an expensive problem in the U.S., costing more than $11 billion in clean up each year (Keep America Beautiful, 2010).

ETAP was developed as a tool to help communities characterize and quantify trash pollution and identify emerging data trends both on-land and in aquatic environments. Its ultimate purpose is to provide a broad-reaching and comprehensive method for collecting and analyzing escaped trash in a uniform and consistent way so that assessments can be compared across time and geography.

Please read this document in its entirety before planning a site cleanup event. This reference manual begins with a discussion of the sources, movement, and impacts of aquatic trash. Guidelines on the protocol itself begin on page 13, with instructions for selecting sites (Step 1), conducting cleanups and categorizations (Step 2), and entering data into the tool for analysis (Step 3). Examples of how ETAP can be used to inform upstream decisions can be found on page 28.

This document also contains a short photo guide to the California On-Land Visual Trash Assessment (Appendix 1); a Field Site Summary Sheet for entering the characteristics of your site (Appendix 2); a Field Data Card, for recording tallies and other findings in the field (Appendix 3); a Field Reference Sheet that explains the various trash item categories within the data card (Appendix 4); examples of how to use the data card (Appendix 5); a volume-to-weight conversion table to assist with measurement (Appendix 6); and optional table cards to use during categorization (Appendix 7).

Sources of Aquatic Trash

The amount of waste produced by U.S. consumers continues to rise, more than tripling between 1960 and 2018 (U.S. EPA, 2020). In 2018, the U.S. generated 292.4 million tons of municipal solid waste, or 4.9 pounds per person per day. Unfortunately, not all of this trash is recycled, composted or disposed of effectively.

Trash enters waterways from many sources. Stormwater runoff from urban areas is a leading source -- most communities do not have screens or trash capture devices in their stormwater systems to collect litter before it is washed off streets into waterways (Moore & Allen, 2000). Trash can also be intentionally (and illegally) dumped, and it can unintentionally escape from waste management systems, e.g., from overfilled trash bins, or during transportation to landfills (Ocean Conservancy, 2017). Over time, improperly disposed of trash from inland areas travels to coasts by wind, stormwater conveyances, streams, and rivers (GESAMP, 2015). Lightweight materials carried by the wind and stormwater can be dispersed far from their original sources.

A well-known paper "Marine Pollution: Plastic Waste Inputs from Land into the Ocean," published in *Science,* estimated that approximately 8 million metric tons of plastic leaks into our oceans globally each year (Jambeck et al., 2015). In 2020, several of the same authors of that 2015 study gathered to provide an updated estimate on the United States' contribution of plastic waste to land and ocean. Researchers found that in 2016, the U.S. generated the largest amount of plastic waste of any country in the world at 42 million metric tons. The amount of that waste estimated to leak into the environment is five times larger than the amount predicted for 2010, rendering the U.S.' contribution among the highest in the world (Jambeck et al., 2020).

Movement in the Environment

Accumulating trash pollution has been documented in inland waterways and rivers as well as oceans, so solutions should not be entirely marine-focused. In fact, many researchers suggest working on upstream and inland efforts to prevent trash from getting into waterways and the ocean.

The movement of trash in the environment varies based on many factors such as the size, weight, density and buoyancy of the trash. Small, light-weight trash items, such as plastic or synthetic rubber, may travel from land via rivers and streams all the way to mid-ocean locations, whereas other trash items may remain trapped in freshwater environments.

In the ocean, transport of trash, particularly plastics, is complex. Biophysical and chemical processes contribute to plastic breakdown and buoyancy (Ye & Andrady, 1991). Approximately half of all plastics are neutrally to positively buoyant and thus remain close to the ocean surface (U.S. EPA, 1992). The other half sink until reaching neutral buoyancy or resting on the sea floor.

As international concerns on this issue rise, available information about aquatic debris and plastic pollution increases. By incorporating

Figure 1: Oceanic gyres are high pressure convergence zones, supported by ocean current dynamics, where trash in the ocean (i.e. "marine debris" and microplastics) can accumulate.

marine litter and plastic pollution action plans into the international G7, G20, United Nations Environment Assembly (UNEA) and trade agreements like the U.S.- Mexico- Canada Agreement (USMCA), many governments are making a statement about the need to (1) more deeply understand the sources and fate of trash in the ocean and freshwater bodies, and (2) find effective local solutions to a global, non-point source pollution problem (Japan Ministry of the Environment, 2019; USMCA, 2020).

The Plastic Problem

Plastic has garnered increased attention as it accounts for most of the recorded litter and because of its persistence and negative effects on the environment, wildlife, and human health (National Geographic, 2020). Plastic trash is found floating on surface waters, suspended throughout the water column and residing on the floor of almost all bodies of water, as well as throughout terrestrial habitats and urban, residential centers (Eriksen et al., 2014; Keep America Beautiful, 2009). Escaped plastic trash is transported to the ocean via streams, rivers, storm drains, and wind, where it moves with the ocean currents and persists in the marine environment for years, continuously breaking down into smaller and smaller pieces called microplastics.

Plastic resin pellets (used in plastic manufacturing), plastic microfibers from washing synthetic textiles, and microplastics generated from tire abrasion and used in personal cosmetics and cigarette filters are all commonly found in the environment (Boucher & Friot, 2017). Macro-plastics (larger sized plastic trash) can eventually break down into microplastics, a process which takes longer in the ocean than on land due to cool oceanic temperatures (Ye & Andrady, 1991; U.S. EPA, 1992).

Surveys of the North Pacific central gyre for floating plastics and plankton verify that the amount of plastic material in the ocean is increasing over time, both because of increased contributions of plastics from land sources and because of the retention of existing plastics in ocean gyres (Day & Shaw, 1987).

Aquatic, Terrestrial, and Habitat Impacts of Trash

There is a substantial body of evidence documenting the harmful physical and chemical effects of trash on aquatic and terrestrial species. It has been estimated that plastic waste adversely affects many species globally, including 86% of sea turtles, 44% of seabirds, and 43% of marine mammals (Marine Debris, 2016). The most common threats to wildlife both in aquatic and terrestrial environments include physical hazards from ingestion and entanglement, and toxicological threats from ingestion of contaminants attached to and trapped within plastic particles (Oceana, 2020).

Problems associated with the ingestion of plastics include development of internal and external wounds, impairment of feeding, decreased mobility and predatory avoidance, and reproductive failure (Wright et. al., 2013). Entanglement in packaging bands, synthetic ropes, lines, nets and other debris may impact an animal's ability to swim resulting in difficulty moving, finding food, or escaping predators (Oceana, 2020). Ultimately, entanglement can lead to infection, loss of limbs, drowning, strangulation, or suffocation.

Contaminants accumulated on the surface of plastic particles as well as chemical additives and fillers within the plastic can be released to the environment when the plastics break down into smaller particles as a result of ultraviolet radiation, mechanical forces, and weathering (Gewert et al., 2015). Many of these toxic chemicals, such as PCBs and DDTs and plasticizers such as phthalates, are known endocrine disruptors and developmental toxicants (Costa et. al, 2008). Researchers are

currently looking at the effects that trash and associated compounds have on food webs, as microplastics have been found in every part of the marine food chain (Oceana, 2020).

As trash accumulates, habitat structure is modified, sunlight is reduced in underlying waters, and oxygen levels can be depleted (Oceana, 2020). Trash can settle to the bottom of a waterbody or float on the surface, impacting aquatic flora and fauna throughout the water column. As the physical structure of the habitats are modified, species that are dependent on these habitats for foraging and shelter are negatively impacted. Additionally, when trash travels between different habitats, it can carry non-native species that may become invasive and disrupt the ecology of distinct environments (Carlton et. al, 2017).

Trash that accumulates in the open ocean can act as a new habitat as it travels or can even act like a Fish Aggregation Device (FAD). FADs are used to increase efficiency in fishing as they attract a variety of marine life including pelagic fish. When many individuals congregate at these trash FADs, the likelihood of ingestion or entanglement increases (NOAA, 2017).

Impacts to Recreation, Tourism and Economy

Trash pollution can directly interfere with recreation and navigation, impede commercial and recreational fishing, threaten human health and safety, and reduce tourism.

Aquatic trash reduces the aesthetic and recreational values of rivers, beaches, and marine resources. The buildup of plastic debris on beaches, in public parks, and along waterway access locations is of concern to communities because unsightly trash and entangled wildlife reduces the area's attractiveness to local residents and tourists.

“Ghost fishing,” the accidental harm to fish and invertebrates by lost fishing nets, traps, and pots, undermines economic opportunities in commercial and recreational fishing (NOAA, 2015). Ghost fishing competes with active fishing for limited resources and decreases the reproductive capacities of fish and invertebrate stocks. Abandoned, lost, or otherwise discarded fishing gear in the oceans contribute to an estimated 10% of global marine litter (Macfadyen et. al, 2009).

Trash items that pool water, such as tires, support mosquito production and associated risks of diseases that have negative biological and public health impacts beyond a waterbody. Beaches in New York and New Jersey were closed to protect the public from medical waste that washed ashore in 1988. It was estimated that the loss of revenue from beach closures in 1988 to New Jersey alone was in the range of $706 million to nearly $3 billion (Grebe, 2013; U.S. EPA, *Trash-Free Waters*).

A recent study funded by NOAA estimated that if marine debris was nearly eliminated in coastal Alabama, beach visits would increase by over 300,000 visitor days and contribute an additional $35 million in tourism spending (English et al., 2019). The same study modeled that if the amount of marine debris doubled on those same Alabama beaches, beach visits would decrease by 1 million visitor days, tourism spending would decrease by over $113 million, and there would be a loss of more than 2,000 local jobs (English et al., 2019).

Escaped trash also imposes harsh economic impacts on the local communities spending millions of dollars to address it every year (Marine Debris, 2016). For example, nearly 50 million people live in Washington, Oregon, and California and over 85% of that population live adjacent to the ocean or along waterways that lead to the ocean (Stickel et al., 2012). In 2012, EPA conducted a study to quantify the cost incurred to clean up litter and prevent trash from entering waterways by 90 cities in California, Oregon, and Washington. Each city was located along the coast or in watersheds draining

to the ocean. The results of the study reveal that these west coast communities, regardless of their size, spend an annual average of $13 per resident to control litter and reduce trash pollution, a total more than $520 million dollars a year (Stickel et al., 2012).

Trash Prevention

Prevention of trash and litter can reduce local and downstream pollution, conserve energy, reduce the toxicity of our waste in the environment, cut costs for consumers and businesses, and reduce the financial burden of cleanup. Existing prevention strategies to reduce trash pollution include expanding curbside pickup, switching to secure waste bins, reducing single-use packaging, increasing the market value of recyclable materials, and reusing valuable materials.

There are also various technologies and best management practices that help to reduce trash and litter. Some effective examples include street sweeping, curb screens for trash reduction, adaptations of storm water management systems, targeted education and outreach, and trash cans with lids that prevent materials from escaping into the environment. Strategic placement and convenient access to waste receptacles are also key for decreasing urban litter (Keep America Beautiful, 2009).

TRASH DATA COLLECTION

The Importance of a Uniform Methodology

To reduce trash and its impacts on natural habitats, human health, and the economy, changes are needed at the consumer, business, local, state, and federal government levels. Statistically significant data are essential to empower stakeholders to address aquatic pollution and improper waste disposal. While many students, scientists, businesses, and organizations are tracking litter, inconsistent methods of data collection and analysis compromise the collective impact of these efforts.

Most available qualitative and quantitative data on trash in the environment come from coastal, riverbank, or other community cleanups. This information is dependent on organizations and volunteers tracking the item type, quantity, and location of collected trash. Based on current available data, most tracked litter is made up of disposable items used daily by people – largely food and beverage packaging.

The items listed below were the Top 10 items collected during the 2019 International Coastal Cleanup where volunteers around the world removed over 20 million pounds of trash from the environment (Ocean Conservancy, 2020):

1. Food wrappers (candy, chips, etc.)
2. Cigarette butts
3. Plastic beverage bottles
4. Plastic bottle caps
5. Straws & stirrers
6. Plastic cups & plates
7. Plastic grocery bags
8. Plastic take out/away containers
9. Other plastic bags
10. Plastic lids

Over a decade before, a 2009 study of roadway litter estimated 51.2 billion pieces of litter on U.S. roadways nationwide, 91% of which are smaller than four inches in size (Schultz, 2009). This was extrapolated to 6,729 pieces of litter per mile on each side of the roadway. Cigarette products made up the largest percentage (37.7%).

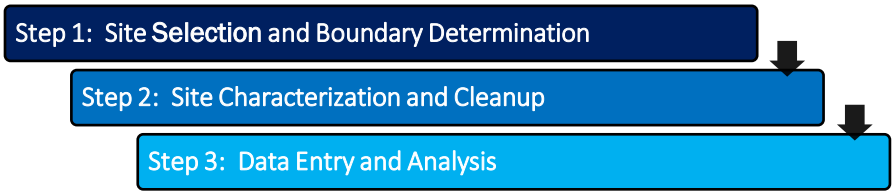
Unfortunately, the datasets that are currently available do not reflect one universal method or unit of measurement. Trash weight can be a misleading indicator, since the trash of most concern is small, buoyant, and persistent (U.S. EPA, *Trash-Free Waters*). Comparing the weight of 100 cigarettes found on a beach to one illegally dumped couch does not accurately convey the amount of litter found during a cleanup. Oftentimes, cleanups occur at hotspots and thus cannot be extrapolated into regional load estimates. As a result, most of the available data is not comparable across agencies or organizations, and much of the data collected during community cleanups do not meet the rigor needed for statistical analysis.

In addition, there is a need to systematically measure trash levels to establish baseline conditions and evaluate the success of educational, institutional, operational, and structural efforts to control trash. Cleanup results can be compared over time to determine mitigation effectiveness and further steps needed to reduce trash at a particular site. These data could be used to identify problem areas where trash accumulates during dry weather due to littering or dumping and in wet weather due to transport from upstream sources. The data could also be used to assess the effectiveness of targeted management measures and provide evidence for groups to prompt change.

EPA has developed ETAP in order to align stakeholders collecting litter data by providing one standardized method designed to address existing data gaps. ETAP provides a consistent methodology that can be used by non-scientists and scientists alike working in all accessible environments from urban to rural, terrestrial to aquatic, and inland to coastal. The data can help users identify dry and wet weather trash distribution, longitudinal variability within watersheds, and variability across watersheds by comparing various site assessments within a region. ETAP can be used for a multitude of purposes including citizen and community engagement in information gathering, ambient monitoring, evaluation of materials management actions, determination of trash accumulation rates, and comparing sites based on surroundings, land use, or public access. With this information, a focused and effective approach to reducing trash pollution is possible.

STANDARD OPERATING PROCEDURES (SOP) OF ETAP

ETAP includes the following three steps:



Step 1: Site Selection and Boundary Determination

1A. Site Selection

The first task in assessing a cleanup site is to select the area of interest. This area should be a continuous space that is not broken up by structures such as bridges or waterways, or large gaps that are not going to be cleaned (see Figure 2).

Figure 2: A map showing three separate cleanup sites. These sites cannot be combined because they are separated by a waterway and are not a continuous space (Photo courtesy of Sydney Barnes-Grant).

Your group or organization may already know which site(s) you will be studying. If this is the case for you, **skip to Step 1B**.

If you have a large jurisdiction and are unsure what areas would be best to focus on cleaning, the following approaches may be helpful to focus efforts.

- Consider what the intention is behind wanting to collect ETAP data in your community– are you trying to do baseline monitoring for a certain area or trend monitoring to see if an upstream control is having an impact? Are you hoping to cleanup a significantly degraded site and encourage citizen stewardship of a special location? Select any number of sites that meet your organization's data collection goals. For example, if you are trying to determine if a

particular stormwater conveyance, convenience store, or roadway is contributing to the local trash pollution problem to better target source reduction efforts, you may want to select a variety of sites both upstream and downstream of that potential source.

- Conduct a rapid or drive-by visual assessment at each site using a tool similar to California's On-Land Visual Trash Assessment (VTA) protocol. This rapid visual assessment can be used as a foundation and will help you determine hotspot trash areas which need the most attention (see Appendix 1: Visual Trash Assessment for guidelines and photos of different levels of trash, as a reference).

1B. Determination of Boundary Coordinates

Once you have selected your cleanup site, define the boundaries of the overall site to be assessed by the cleanup team on your **Field Site Summary** (Appendix 2). If you have multiple teams collecting litter, you may choose to designate subsections of your overall site. If you divide your site into subsections, please provide boundary coordinates for each subsection on the last page of the **Field Site Summary**.

Depending on the size of your site, you may need stakes or cones to demarcate boundaries. You can also make note of boundary points with landmarks such as a statue or oak tree. If possible, **record the latitude/longitude coordinates of the corners of the site** using a GPS or cell phone (i.e. Google Maps). Coordinates should be recorded to the 5th decimal place for accuracy. or Having a very specific boundary will result in consistent and accurate data. It is essential that you **estimate the area within the site boundaries** (use square feet as a unit of measurement). If unable to collect corner coordinates, landmarks can help approximate the site corners by looking at satellite imagery via Google Maps or other software, and the area of the site can be estimated. This will be useful if the site needs to be revisited in the future and to determine the density of waste in the site.

Hint: Start with a small area! If you are conducting your clean up in alleys, for example, start with one block. On a beach, use cones to mark off a small area. Start collecting the trash and then see how much trash starts coming into your sorting station. It can get overwhelming if you start with too large an area.

Figure 3. Here we have a cleanup site (Gasworks Park in Seattle, WA) with drawn-in boundaries. If we did not know the coordinates of the edges of this park, we could use landmarks to approximate them (Photo courtesy of Sydney Barnes-Grant).

Mark boundaries of site if coordinates not available (example indicators below).

- Landmark 1: NE corner of parking lot
- Landmark 2: NW corner of parking lot
- Landmark 3: Edge of tree-line on NW side of parking, lot facing the water
- Landmark 4: West side of park boundary
- Landmark 5: Southside of park, all along waterfront
- Landmark 6: Around edge of boathouses all the way to parking lot

*Note: If you are conducting your cleanup study in a stream or riverine environment, it may be beneficial to note additional information on the **Field Site Summary** to better define your assessment area. Bankfull width, the distance between the stream or riverbanks at the maximum water inundation level, and wetted width, the portion of the stream or river channel covered in water, can help more carefully prescribe the boundaries of your cleanup site (USFWS, 2019; USDA, Stream Channel Terminology).*

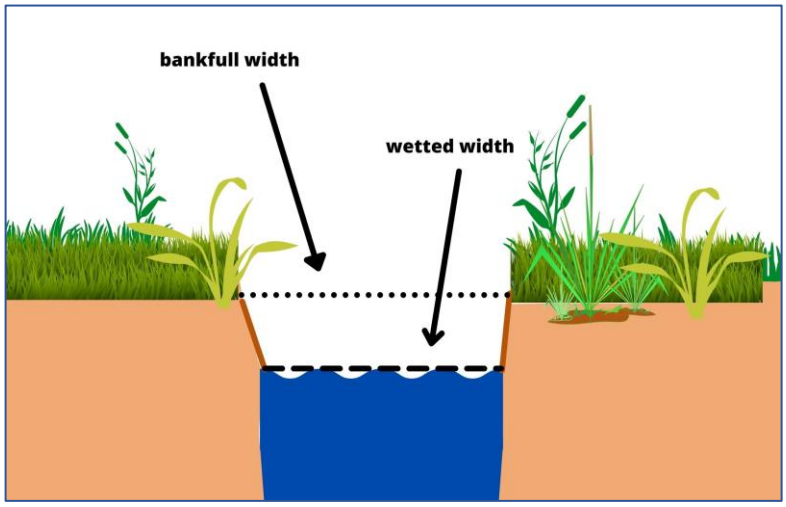


Figure 4. Diagram showing the difference between measuring bankfull and wetted width.

Step 2: Site Characterization and Cleanup

2A. Site Characteristics

Once your site has been selected and demarcated, record its characteristics on the **Field Site Summary Sheet** (Appendix 2). Site characterization notes should be completed prior to any trash collection or assessment.

Site characteristics include:

- **Proximity** to water, storm drain, or critical habitat, either within site or nearby. Provide the number of features observed within the site boundary and the number of features observed up to 100 feet outside of the site boundary. Please take photos of site, including critical proximity features.
  Include any notes as appropriate.
  - Nearby waterways
  - Storm drains
  - Critical Habitat

- **Trash condition** of the site, estimated using a simple visual assessment tool like the On-Land Visual Trash Assessment (see Table 1 and Appendix 1). If your site has variable levels of trash throughout the site, record the most predominant condition for your site. It is also recommended to take a landscape picture of your site (at a distance that lets you identify trash on-site in the image) for future reference and quality control.

	Trash Condition Category	Definition
A	Not Littered	*Effectively no trash is observed in the assessment area.* *Approximately less than one piece per two car lengths on average.* *There may be some small pieces in the area, but they are not obvious at first glance.* *One individual could easily clean up all trash observed in a very short timeframe.*
B	Slightly Littered	*Predominantly free of trash except for a few littered areas.* *On average, one piece per two car lengths.* *The trash could be collected by one or two individuals in a short period of time.*
C	Littered	*Predominantly littered except for a few clean areas.* *Trash is widely/evenly distributed and/or small accumulations are visible on the street, sidewalks, or inlets.* *At least two or three pieces per car length on average.* *It would take a more organized effort to remove all trash from the area.*
D	Very Littered	*Trash is continuously seen throughout the assessment area.* *Large piles and a strong impression of lack of concern for litter in the area.* *There is often significant litter along gutters.* *It would take a large number of people during an organized effort to remove all trash from the area.*

Table 1. Table to determine how much litter is in specific area (VTA, 2015).

- Indicate the number of **preventative measures** within the site or nearby. If applicable, note whether the receptacles are overflowing or without a lid.
  - Are there any trash, recycling, cigarette, or fishing line receptacles, dumpsters, or other receptacles nearby? How many? Are they overflowing? Do they have a

lid? Indicate the number of receptacles within or near the site AND the number of receptacles within or near the site that are overflowing or without a lid (e.g. a trash receptacle within the site that is overflowing should be recorded as both within the site AND overflowing).
    - Prevention signage
    - Trash booms or other capture devices – a trash boom is a floating device that captures and contains objects in a collection area.

- Land use(s) within the boundaries of your site *(Circle all that apply):*
    - High density residential (5+ dwellings per acre)
    - Low density residential (2-4 dwellings per acre)
    - Rural residential (1-5 acre lots)
    - Retail and wholesale (i.e. stores, restaurants, post offices & hotels)
    - Commercial & services (i.e. local government, education, research centers, offices, churches, hospitals, & military)
    - Light and other industrial (i.e. light & unspecified industrial, warehousing, food processing)
    - Heavy Industrial (i.e. heavy fabrication & assembly raw materials processing)
    - Recreational (i.e. parks, golf courses, bike trails, etc.)
    - K-12 schools
    - Shoreline
    - Cemetery
    - State/ national park or wilderness

- General observations *(Including but not limited to):*
    - Recent big public event in the area
    - Nearby buildings, roads, parking lots, and/or ditches
    - Excessive trash near buildings
    - Transit hub or bus stop
    - Other features that could contribute to trash condition

Please provide as many characteristics as possible to create an accurate representation of the cleanup spot. These notes could help target the specific polluters in a region and give insight into which waste management and prevention strategies to implement.

2B. Site Cleanup Methods

There are two effective methods to clean up and categorize trash at your site(s): (1) Collect and catalog trash in the field, and (2) collect trash and then catalog at a later time. Both approaches are built upon a divide-and-conquer approach and the ability to focus on accurate categorization. The first method is more useful when there is a large group, while the second may be more appropriate for smaller groups.

It is critical that all trash be collected in your site area, even the fragments of litter. This is because we want to be able to compare the density of trash in each site to other sites or over time. If you have a large area and many volunteers, you may want to consider designating just a specified area as the assessment area, using your most dedicated volunteers, while the rest of the area is cleaned up but not assessed. When creating the boundaries of the site, be sure to only include the area that was assessed.

Suggested items to bring to cleanup site:

It is recommended that site leaders provide a combination of the items listed below to aid in trash sorting and clean up. Some items may not be necessary depending on level of effort, the weather and site conditions.

- Grabbers
- Gardening gloves (with varied size options)
- Clipboards
- Pencils
- Field data cards
- Large trash bags
- 5-gallon buckets
- Tarp
- Fold-up table
- Canopy (with sides for windy conditions)
- Luggage scale
- First aid kit

Safety Considerations

Safety precautions are critical to any cleanup. Organizations facilitating a cleanup should follow a safety plan for volunteers and train its team leaders in safety protocols. Some common-sense safety rules include the following:

1. Have a well-equipped first aid kit handy
2. Wear protective gloves and sturdy footwear
3. Stay hydrated
4. Listen to weather reports and cancel or leave if a storm threatens your safety
5. Park in a safe location and secure your valuables
6. Never enter private property without permission
7. Never wade into swift water or walk on unstable stream banks
8. Know how to identify poisonous vegetation and venomous reptiles/insects
9. Don't pick up dangerous items (e.g. broken glass) – notify the team leader
10. Leave the site if you feel concerned about your personal safety

Method 1– Cataloging trash in the field at the same time as collecting trash

This method is best for a larger group, where 12 or more volunteers can be grouped into at least three volunteer pairs on both teams. With the addition of an "afternoon relief" team, this would call for 18 volunteers in total. Larger groups can handle larger site areas, or you can divide your area into segments. If the area is smaller or there is a limited number of volunteers, it may be easier to execute Method 2 (see below). Method 1 is also preferential in pleasant weather conditions because the sorting will occur outside.

Dedicate a central location at your site to be "home base," where trash will be piled and sorted. Next, divide your group into two teams.

Team One

The first team will fan out and pick up all the trash within your site's established boundaries. If an exceptionally heavy or submerged item cannot be picked up, make a note of it and its location relative to the area. Items that are dangerous or too heavy to move should be left in place – safety first! Volunteers may catalog data about any items to be left in place, if you wish these to be included in the final site analysis.

Note that some material, like a concrete structure that is attached to the ground, is not considered trash in this methodology and can be left. However, loose concrete or rubble should be removed and categorized if possible.

Once your bag or bucket is full or your subsection is clean, bring the trash back to the meeting point. Again, the goal is to collect ALL of the trash in the site or segment, even fragments.

Hint: Buckets and grabbers work well. You can dump the buckets on the sorting table. If you have enough buckets, volunteers can leave their full bucket and go out with a fresh bucket to collect more trash.

Figure 5. Volunteers at a sorting station comb through a pile of smaller items and categorize them according to material type (Photo courtesy of Zero Waste Washington).

Figure 6. Osprey Initiative, Inc. staff perform ETAP after cleaning out a Litter Gitter in Three Mile Creek, Mobile, AL (Photo courtesy of Osprey Initiative, Inc.).

Team Two

The second team will set up the base station where they will categorize and count the trash that is picked up. It is recommended to have a tarp, table, and/or pop-up canopy for optimal categorizing conditions.

In teams of two, volunteers will open each bag (or bucket) of trash as it arrives from the cleanup teams and begin to sort, catalog and count the items (see Section 2C below for information on how to categorize items). Counts should be recorded in the **Field Data Card** (Appendix 3).

If you have divided your overall site into segments, be sure the counting teams (Team 2) are carefully accepting trash only from their designated trash pickup teams (Team 1).

Hint: Even a breeze can blow your items around as your volunteers are counting the trash. It is suggested to use small pails or containers to collect each category of trash and/or put up a screen to prevent the wind from disrupting counting and cataloging.

With this method, the clean-up team will likely complete its work before all items can be cataloged and sorted by the volunteers at home base. To avoid overly fatiguing volunteers and maintain high data quality, clean up volunteers (Team 1) should take a break after all trash has been cleaned up from the site. Catalog volunteers (Team 2) should take breaks as needed. If there are enough volunteers for a third team, this team may arrive later in the day and take over the cataloging work, leaving the earlier two teams free to depart or rest.

Figure 7. A volunteer picks up plastic from a local riverbank using a trash grabber tool.

Method 2 – Cataloging trash at a later time

This method uses a single team to both collect trash and then later catalog the trash for the site or each segment. It is an optimal method to consider when weather conditions are unpleasant because it allows your team to focus on removing the trash from an area and sort it later in conditions that are more suitable, like inside a building or warehouse. Smaller teams with more variable volunteer schedules may prefer this method.

The second method starts with designating a meeting point where the full contents of the site cleanup (all full trash bags or buckets) can be stored after trash is collected. It is recommended that this be an easily accessible point near your cleanup site. If access to an indoor trash storage and sorting area is not feasible, you may use a tarp, folding table, and/or canopy to create a temporary storage space at or near your site.

Once a "home base" has been determined, your entire group will fan out and collect all the trash in the area. When the site has been cleaned, volunteers should store all collected trash in the pre-determined location and take a break.

Collected trash can be stored overnight if the selected meetup point is a secure location that will not allow trash to escape into the environment.

In pairs, you will open each bag and sort, catalog and count items (see Section 2C below for more detail on cataloging).

2C. Cataloging Method

Both methods will use this categorizing reference when sorting trash.

- Pair up in teams of two to do the cataloging and counting.
- Please see Appendix 3 for the **Field Data Card**, Appendix 4 for the **Field Reference Sheet**, Appendix 5 for **Examples of Using the Field Data Card**, Appendix 6 for a **Volume-to-Weight Conversion Table** and Appendix 7 for **ETAP Table Cards.**

In the **Field Data Card**, items are first identified by their *Material Group (*paper, glass, metal, or plastic or as a specialized category), then by the *Item Type*. Choose the item type that best describes your trash item. For example, for aluminum soda cans you would go to the material group "Metal" and the item type "Bottles, Cans & Containers." See **Appendix 4: Field Reference Sheet** for item descriptions.

Add a tally for each item under the appropriate *Item Condition* column describing the item's level of degradation (see **Appendix 4: Field Reference Sheet** for photo examples of item condition). This info could prove useful for determining if collected material is legacy litter or if it has recently escaped into the environment.

If there are any identifying features of the trash items, record these in the *Item Notes* column (e.g. brand/product name, language on packaging, unusual features).

For fragments/pieces of glass, plastic and foam that are less than 2.5cm in their longest dimension, use a measuring cup and record one tally for each cup of fragments found.

The data card has blank rows at the bottom for to track a specific item that would otherwise be lumped into a broader category or an item of interest that is not otherwise included (e.g. microplastic pieces (<5mm in size), nurdles, etc.).

*Hint: Reference **Appendix 5: Examples of Using the Field Data Card** for more insight on how to properly count and catalog trash. **Appendix 7: ETAP Table Cards*** can be used during the sorting process to help distinguish between piles according to the categories on your **Field Data Card.**

Figure 8. Plastic beverage bottles sorted and cataloged (Photo courtesy of Emma Maschal).

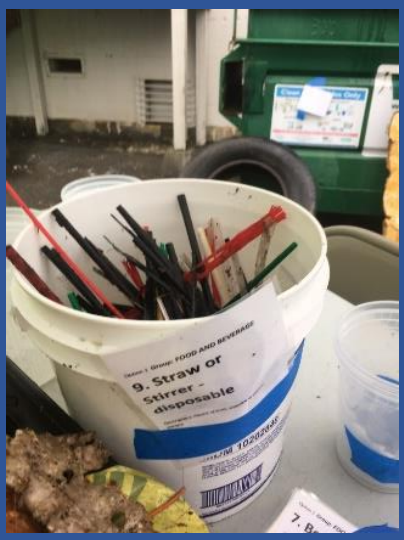


Figure 9. A plethora of disposable plastic straws and stirrers are compiled in a bucket and measured.

Figure 10. Improperly disposed of cigarette butts collected and cataloged during a cleanup.

2D. Double Counting for Quality Assurance

Quality assurance for each project will vary based on the data quality objectives of the project. Minimum quality assurance recommendations for this protocol are to re-sort (by item condition) and recount at least four item types (piles) of trash at each site. If multiple teams are cataloging trash, then the four piles selected for QA should be sorted and counted the second time by a different team. Record the double-counted category tallies on a separate **Field Data Card**.

2E. Photographing and Measuring Trash

Once all items have been cataloged and sorted into piles according to the categories on your **Field Data Card**, take a photograph of each sorted pile to visually document the amount of trash picked up. You can record the photo ID for each pile in the notes section of the **Field Data Card** or on the back**.** Taking photos will assist in data quality assurance and control.

Note: When you take photos, please use this system to identify your photos by site name or event and date: EventName_Date_Photo#. For example: JuniperCreek_Sept 10 2018_01.

Figure 11. Plastic and Styrofoam items collected from an in-stream cleanup (Photo courtesy of Mobile Baykeeper).

Measure the volume and/or weight of materials collected. Consider whether you want to measure the volume or weight of your collected items – we recommend noting both if possible.

Note: While measuring weight is often seen as a more user-friendly approach, it can produce misrepresentative results. Waterlogged objects recovered from riverine and coastal environments can often skew measurements when combined with or compared to dry items. Lightweight composite materials such as Styrofoam and fragmented pieces of plastic can also give an inaccurate representation of the amount of material collected.

- **Volume can be measured by estimating the amount of space the trash takes up in a 5-gallon bucket or a 55-gallon trash bag.** The easiest way to do this is to account for the percent fullness of the container/bag (without compacting whatever is inside). The volume of smaller items such as bottle caps or balloon fragments can be measured using smaller containers. Large, bulky objects like building materials, furniture, and appliances can be measured in cubic feet.

Weight can be measured by using a portable luggage scale.

*Hint: Reference Appendix 6: **Volume-to-Weight Conversion Table** for more insight how to measure collected trash.*

First, separate all sorted piles**.** You can choose the approach for measuring that works best with your volunteers:

a) Measure individual piles based on how you cataloged them and record each volume and/or weight on the **Field Data Card**.
b) Gather the piles into categories based on dominant material (plastic, metal, etc.), measure those piles and record each volume and/or weight on the **Field Data Card**.
c) Record the total weight and/or volume of material collected that will be disposed of as garbage, recycled, and composted at the bottom of your **Field Data Card**.
    - Garbage – Waste to be sent to the landfill. Trash that is too fouled/degraded to be sent to recycling markets.
    - Recycle – This includes salvageable cardboard, paper, metal, glass, and some plastics (based on your local recycling guidelines).
    - Compost – Items that will be composted such as paper or other natural products and compostable plastics.

Hint: Be sure to note units (cubic feet, cubic yards, pounds, ounces, grams, etc.) with each measurement. Luggage scales work well but are not sensitive to very lightweight items/piles and so some of your weights will be recorded as "zero." This is expected.

2F. Disposing of Materials Properly

Recycle, compost and dispose of the trash according to local regulations.

Figure 12. A volunteer weighs a bag of trash collected from the Anacostia River in Washington, D.C. (Photo courtesy of Emma Maschal).

Step 3: Data Entry and Analysis

3A. Spreadsheet Summary

Once the cleanup activity is completed, your data may be entered into the ETAP excel sheet. The spreadsheet is organized into six sheet tabs:

1. Instructions: Includes this section of the reference manual along with other details that may be helpful in using the spreadsheet.
2. Data Card: Where all the item information should be entered.
3. Summary Plots: Summary tables and charts of data collected.
4. Field Site Summary: A printable version of the Field Site Summary form (Appendix 2).
5. Field Data Card: A printable version of the ETAP field data card (Appendix 3).
6. Field Reference Sheet: A printable version of the field reference sheet (Appendix 4).

If you are interested in submitting data to your state agency for 303(d) listing purposes, be sure to check with that agency first to be sure they will accept the data, and for any additional information they might require.

3B. Data Entry

Use the 'Data Card' sheet tab in the spreadsheet to enter information. In order to use the summary plots properly you will need to ensure that all green cells in the 'Data Card' sheet are filled in. Information required includes:

- Total number of tallies for each item under the appropriate *Item Condition* column.
- The size of the area where trash was collected in square feet.
- The total weight (lbs) and/or volume (ft^3) of items disposed of as garbage.
- The total weight (lbs) and/or volume (ft^3) of items recycled.
- The total weight (lbs) and/or volume (ft^3) of items composted.
- For items that were 'write in,' add the item type, material type, industry, and packaging/product descriptor. Descriptors can be found below and in the spreadsheet below the data card in their respective tables.

Material Type	Industry	Packaging/ Product
Plastic	Food & Beverage	Packaging
Foam	Retail, Food & Beverage	Service ware
Paper	Retail	Product
Glass	Automotive	Unknown
Metal	Smoking	
Tires	Home & Office	
Large	Fishing	
Chemicals	Illegal dumping	
Medical	Recreation	
Other/Mixed	Other/ Unknown	

Weight, *Volume*, and *Item Notes* may be entered in the blue columns; however, this information will not be used to summarize data automatically. The project/site leader should set expectations with their group for recording information in the blue columns.

After you have entered all information collected into the green cells, formulas will be calculated in the yellow cells. The *Totals* column provides the total number of items collected for each item type by adding the *Intact/ Un-fouled* column and the *Degraded/ Heavily Fouled* column. The *Totals* row provides: the total number of items collected that were intact, the total number of items collected that were degraded, and the overall total number of items collected at the site. The item density at the site is calculated below the data card table using the total number of items collected at the site divided by the site size in square feet.

3C. Analysis

In addition to the totals that were generated within the 'Data Card' sheet, entering all of the information in the green cells of the 'Data Card' sheet will generate some basic calculations and data charts in the 'Summary Plots' sheet that may be helpful in visualizing your data.

Disposal Method	Total Weight (lbs)	Total Volume (ft^3)
Garbage	110	18
Recycled	10	4
Compost	1	1
Total	121	23

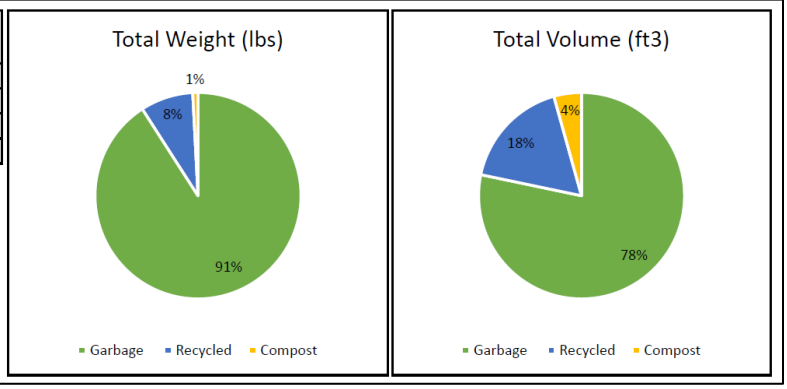


Figure 13. Table showing the weight and volume of items collected based on the final disposal method used by the team. Pie charts are generated that show the portion of the total weight and volume of items collected that were disposed of as garbage, recycled, and composted.

Material Type	Item Count
Plastic	172
Foam	32
Paper	21
Glass	6
Metal	31
Tires	1
Large	0
Chemicals	1
Medical	3
Other/Mixed	44
Total Items Found	311

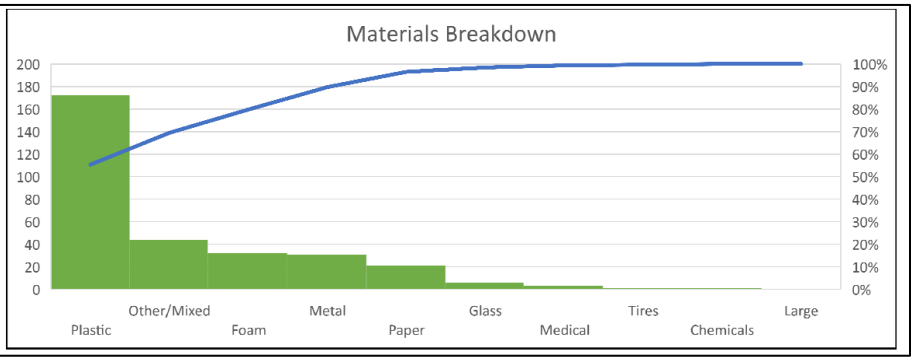


Figure 14. Table that calculates the number of items collected by material type. The Pareto chart plots the number of items collected for each material type in descending order with a cumulative line as a percentage of the total.

Industry	Industry Sum
Food & Beverage	201
Retail, Food & Beverage	29
Retail	0
Automotive	1
Smoking	9
Home & Office	7
Fishing	25
Illegal dumping	0
Recreation	7
Other/ Unknown	32
Total Items Found	311

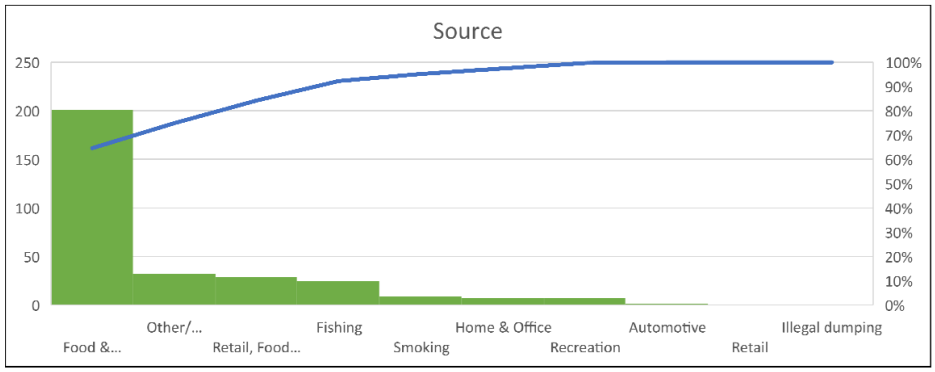


Figure 15. Table that calculates the number of items collected by the industry source. The Pareto chart plots the number of items collected from each industry in descending order with a cumulative line as a percentage of the total.

Packaging or Products	Packaging or Product Sum
Packaging	110
Serviceware	120
Product	41
Unknown	40
Total Items Found	311

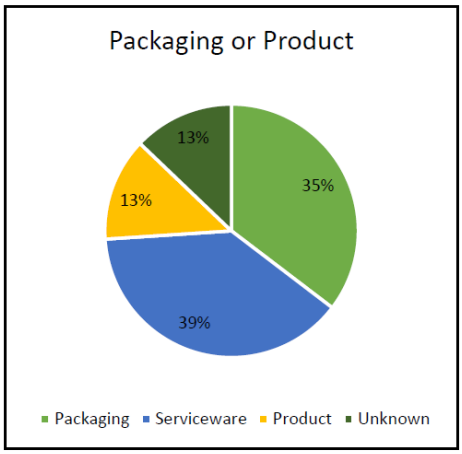


Figure 16. Table calculates the number of items collected that are packaging, service ware, products, or unknown. The pie chart shows the portion of the total weight and volume of items collected that were packaging, service ware, products, or unknown.

Item condition	
Intact/ Un-fouled	269
Degraded/ Heavily Fouled	42
Total Items:	311

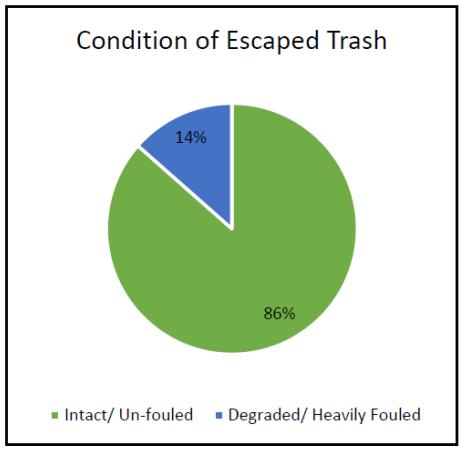


Figure 17. Figure 3C.5. Table calculates the number of items collected that were intact/unfouled and degraded/ heavily fouled. Pie charts are generated that show the portion of the total number of items collected that were intact and degraded.

The total number of items found should be consistent across all tables if the green cells were correctly filled out in the 'Data Card' sheet.

There are a number of uses for ETAP, depending on a group's particular focus and interests. For example, you may wish to conduct site assessments before and after implementing a trash-prevention policy or voluntary action, to test its impacts; other groups may be interested in conducting site assessments to identify key sources of localized trash pollution. Perhaps your group is conducting site assessments in order to collect data on the potential threats posed by trash pollution to local waterways or storm drain systems, or to assess the impact of land use changes on the level of trash pollution in each area. No matter what your goals are, once ETAP has been completed your group can choose to use your data how you see fit.

USING ETAP TO INFORM UPSTREAM DECISIONS

The ETAP tool can be used to inform a variety of upstream management solutions to local trash pollution. A baseline for the types and quantities of materials found in the environment can also be used to focus preventative measures in a community. Over time, ETAP can be used to assess the effectiveness of various Best Management Practices (e.g. installation of catch basin inserts, more frequent street sweeping, etc.). This tool can help document if recent educational, institutional, operational, or structural efforts successfully reduced trash loadings.

Litter profiles at cleanup sites provide insight on trends and patterns in the volume of litter collected and common item types and brands found. This information can lead to the development of a more targeted and effective public education campaign encouraging source reduction. It can also be useful for communities who want to work collaboratively with local businesses to prevent specific materials from escaping into the environment.

Case Study

The Mobile Bay National Estuary Program (MBNEP) piloted and helped EPA refine ETAP. MBNEP began using ETAP to characterize collected trash as part of a Three Mile Creek Trash Abatement Program in 2018. One of the Program's goals was to improve the quality of local waterways by addressing trash problems at sources identified using ETAP data. Data indicated Styrofoam and single-use plastics accounted for over 80% of litter trapped by "Litter Gitters," in-stream trash-capture devices, in the watershed. In an effort to reduce sources, MBNEP developed a "Ditch the Disposables" campaign. Partnering with a popular restaurant in a low-income, primarily minority community in Prichard, AL, a week-long campaign was used to gauge customer preferences and tolerances related to biodegradable packaging. After providing a week's supply of paper food packaging products for use during the campaign, MBNEP surveyed 279 restaurant customers to determine their willingness to absorb small cost increases for more eco-friendly packaging. They found 83% of patrons were willing to incur price increases ranging from five to 35 cents to switch from typical Styrofoam to more sustainable packaging. The restaurant owner expressed interest in switching to alternative food packaging if an affordable option exists. MBNEP hopes to continue the campaign at another local restaurant to expand the survey sample size and inform future source reduction steps.

Finally, data collected using the ETAP tool can also be used to identify hotspots. This can help inform municipal leaders where action needs to be taken or policies need to be put in place (e.g. illegal dumping enforcement). Hotspot mapping can also provide insight for municipal solid waste programs regarding where to invest in infrastructure, such as recycling and trash receptacles, recycling centers, reuse centers, or transfer stations, to prevent trash from escaping into the environment. In addition, the protocol can inform trash capture device siting, trash provisions in stormwater permits, and potential waterbody impairment listings under Clean Water Act Section 303(d).

Case Study

Dog River Clearwater Revival (DRCR), a watershed-based nonprofit organization, received EPA funding to create a Comprehensive Trash Abatement Program in Mobile, Alabama. DRCR is using ETAP to determine litter composition and sources in combination with a hydrologic model and a geospatial analysis of the watershed developed by the Mobile Bay NEP to identify correlations among high-velocity areas during peak flows, various upstream land uses, and significant litter accumulation. The analysis is designed to: identify areas with the highest potential for trash to enter waterways; point to the potential locations of sources for effective targeted investments in enhanced litter abatement activities. Using the results from ETAP, DRCR is partnering with Partners for Environmental Progress to encourage businesses to join the Create a Clean Water Future Campaign and create "Green Teams" to increase awareness, reduce use, establish recycling programs and implement a "Truck Bed Trash Program" to reduce trash from being blown out of the back of trucks.

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APPENDICES

Appendix 1: Visual Trash Assessment
The On-Land Visual Trash Assessment was developed by EOA, Inc for the San Francisco Bay Area Stormwater Management Agencies Association to provide qualitative estimates of the amount of trash generated on specific street segments, sidewalks and adjacent land areas. Below are examples of levels of trash.

Condition A – Low Trash Level (i.e., Not Littered)

Effectively no trash can be observed on a city block or the equivalent. There may be some small pieces in the area, but they are not obvious at first glance and one individual could quickly pick them up (VTA, 2015).

Figure 18. Photos and descriptions provided by California Visual Trash Assessment.

Condition B – Moderate Trash Level (i.e., Slightly Littered)

Predominantly free of trash except for a few pieces that are easily observed along a city block, or the equivalent. The trash could be collected by one or two individuals in a short period of time (VTA, 2015).

Figure 19. Photos and descriptions provided by California Visual Trash Assessment.

Condition C – High Trash Level (i.e., Littered)

Trash is widely/evenly distributed and/or small accumulations are visible on the street, sidewalks, or inlets. It would take a more organized effort to remove the litter (VTA, 2015).

Figure 20. Photos and descriptions provided by California Visual Trash Assessment.

Condition D – Very High Trash Level (i.e., Very Littered)

Trash is continuously seen throughout the area, with large piles and a strong impression of lack of concern for litter in the area. There is often significant litter even along gutters that are swept (VTA, 2015).

Figure 21. Photos and descriptions provided by California Visual Trash Assessment.

Appendix 2: Field Site Summary Sheet

Date:

Recent weather:

Approximate number of days since the last rainfall event:

Organization name:

Team leader:

Number of people participating in the clean-up event:

Duration of time (in hours) spent cleaning the site:

Site name:

Site description *(road, beach, creek, city, etc.):*

Overall site Boundaries *(Identify coordinates of the boundary points of the site. Coordinates should be recorded to the 5th decimal place for accuracy. For in-stream assessments, measuring bankfull width and/or wetted width at transects along the stream reach and the total reach length assessed may be preferred. Attach map if possible):*

Boundary	Latitude	Longitude	Notes (landmarks, roads, etc.)

Total area of site (ft^2) :

Proximity to water, storm drain, or critical habitat. *Include photos.*

Features	Number of features within site boundary	Number of features less than 100 ft from site boundary
Waterways		
Storm drains		
Critical Habitat		

Weight and volume of collected material *(if data can be collected):*

	Weight (lbs)	Volume (ft^3)
Garbage		
Recyclables		
Compost		

Trash condition of the site *(circle the most predominant condition for your overall site):*

A	Not Littered	*Effectively no trash is observed in the assessment area.* *Approximately less than one piece per two car lengths on average.* *There may be some small pieces in the area, but they are not obvious at first glance.* *One individual could easily clean up all trash observed in a very short timeframe.*
B	Slightly Littered	*Predominantly free of trash except for a few littered areas.* *On average, one piece per two car lengths.* *Trash could be collected by one or two individuals in a short period of time.*
C	Littered	*Predominantly littered except for a few clean areas.* *Trash is widely/evenly distributed and/or small accumulations are visible on the street, sidewalks, or inlets.* *At least two or three pieces per car length on average.* *It would take a more organized effort to remove all trash from the area.*
D	Very Littered	*Trash is continuously seen throughout the assessment area.* *Large piles and a strong impression of lack of concern for litter in the area.* *There is often significant litter along gutters.* *It would take a large number of people during an organized effort to remove all trash from the area.*

Preventative measures *(indicate number within or near the site of: 1. receptacles as described below, 2: overflowing receptacles, and/or 3: receptacles without a lid (e.g. a trash receptacle within the site that is overflowing should be counted both in the within site column and the overflowing column)):*

Receptacles	Within site	Near Site	Overflowing	Without lid
Trash receptacle				
Recycling receptacle				
Cigarette receptacle				
Fishing line receptacle				
Dumpster				
Other				
Trash capture device			[redacted]	
Litter prevention signage				

Land use(s) within the boundaries of your site *(check all that apply):*

	Land Use Type
	High density residential (5+ dwellings per acre)
	Low density residential (2-4 dwellings per acre)
	Rural residential (1-5 acre lots)
	Retail & wholesale (i.e. stores, restaurants, post offices & hotels)
	Commercial & services (i.e. local govt, education, research centers, offices, churches, hospitals, & military)
	Light and other industrial (i.e. light & unspecified industrial, warehousing, food processing)
	Heavy Industrial (i.e. heavy fabrication & assembly raw materials processing)
	Recreational (parks, golf courses, bike trails)
	K-12 schools
	Shoreline
	Cemetery
	State/ national park or wilderness

General observations *(including but not limited to recent large public event in the area, excessive trash near buildings, nearby roads and highways, transit hubs or bus stops, and other features that could contribute to trash condition):*

Subsections

Please identify boundaries for sections of your overall site that are assessed by each team. The subsection ID numbers should match the data sheet ID numbers. Please note both weight and volume measurements if possible. Include notes, as appropriate.

Subsection 1 boundaries:

Subsection 1 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 2 boundaries:

Subsection 2 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 3 boundaries:

Subsection 3 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 4 boundaries:

Subsection 4 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 5 boundaries:

Subsection 5 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 6 boundaries:

Subsection 6 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 7 boundaries:

Subsection 7 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 8 boundaries:

Subsection 8 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 9 boundaries:

Subsection 9 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Subsection 10 boundaries:

Subsection 10 square footage: *(lbs and/or ft³)* Garbage: Recyclables: Compost:

Appendix 3: Field Data Card

		Item condition		Weight (lbs)	Volume (ft^3)	Item Notes
	Item Type	Intact/ Un-fouled	Degraded/ Heavily Fouled			Identifying features: Product, Language, Event, etc.
Plastic	Bottles & Containers					
	Straws & Stirrers					
	Bottle Caps & Tabs					
	Beverage Rings					
	Food Wrappers & Snack Bags					
	Food & Drink Pouches					
	Cups					
	Lids					
	Utensils					
	Plates & Bowls					
	Clamshells					
	Grocery & Retail Bags					
	Small Fragments (1 tally = 1 cup)					
	Other Plastic					
Foam	Cups					
	Plates & Bowls					
	Clamshells					
	Other Foam (1 tally = 1 cup small pieces)					
Paper	Cardboard					
	Bags					
	Newspaper, Junk Mail, Receipts & Office Paper					
	Cups					

	Beverage & Food Cartons					
	Other Paper					
Glass	Bottles, Jars & Containers					
	Small Fragments & Other Glass (1 tally = 1 cup)					
Metal	Bottles, Cans & Containers					
	Bottle Caps & Tabs					
	Other Metal					
Fishing	Hooks, Lures, & Floats					
	Traps & Trap Parts					
	Nets & Ropes (1 tally = 1 foot)					
	Fishing Line (1 tally = 1 foot)					
	Tangled Fishing Line Bundles (1 tally = 1 square foot)					
	Other					
Auto	Tires					
	Other					
Smoking	Cigarettes & Cannabis					
	E-Cigarettes & Vaping					
	Lighters					
Other	Chemical, Paint & Other Hazardous					
	Batteries & Electronics					

	Building Materials					
	Furniture & Carpet					
	Appliances					
	Medical Waste, Sharps, & Biohazardous					
	Textiles, Clothing & Shoes					
	Toiletries/ Personal Hygiene					
	Balloons					
	Toys, Sports, & Rec Equipment					
	Whole Bags of Mixed Trash					
	Write in					
	Write in					
	Write in					
	Write in					
	Write in					
Total						

Disposal Method	Total Weight (lbs):	Total Volume (ft^3):
Garbage		
Recycled		
Compost		

Site Size (ft^2)

Appendix 4: Field Reference Sheet

Group	Item Type	Descriptions
Plastic	Bottles & Containers	Plastic bottles and jugs of any size or resin. Examples include plastic bottles and jugs for soda, water, sports drinks, juice, tea, milk, wine coolers, and liquor bottles. Includes bottles labelled “compostable” or “bio-based.”
Plastic	Straws & Stirrers	Plastic drinking straws and stirrers. Includes “compostable” or “bio-based.”
Plastic	Bottle Caps & Tabs	Loose plastic bottle caps, plastic pull tabs, lids, and seals made of plastic, used in the packaging/sealing of beverage containers. Does not include bottle caps that are still on a beverage bottle.
Plastic	Beverage rings	Beverage packaging rings to hold soft drinks or beer cans. Examples: 4-pack, 6-pack, 8-pack, & 12-pack beverage rings commonly used for canned or bottled beverages.
Plastic	Food Wrappers & Snack Bags	Wrappings or bags used to package food, such as wrappers for candy and gum, snack bags, chip bags, zipper-closeable bags, condiment packets, and produce bags. Includes wrappers labelled “compostable” or “bio-based.” Does not include pouches (see PLASTIC: Food & Drink Pouches).
Plastic	Food & Drink Pouches	Plastic pouches made of thicker, multi-layer flexible material. May have a flat bottom so that package would stand up on its own, but not always. Material is thicker than potato chip bags. Examples include plastic coffee packages; juice pouches; baby food pouches with or without plastic screw top; soup pouches; salad dressing pouches; wine pouches; and backpacking meals in pouches.
Plastic	Cups	Includes plastic cups of all sizes other than foam.
Plastic	Lids	Plastic lids from plastic tubs and containers, such as cottage cheese, yogurt, butter, etc.
Plastic	Utensils	Plastic forks, knives, and spoons.
Plastic	Plates & Bowls	Plastic plates and bowls of all sizes other than foam.
Plastic	Clamshells	Hinged plastic (not foam) take-out containers of any size that open like the shell of a clam.
Plastic	Grocery & Retail Bags	Plastic shopping bags used to contain merchandise, given out by the store or restaurant with the purchase (including dry cleaning bags). This type does not include full bags of trash (see "OTHER: Whole Bags of Mixed Trash"). Includes bags labelled “compostable” or “bio-based.”
Plastic	Small Fragments (1 tally = 1 cup)	Film or hard plastic pieces of unknown origin less than 2.5 cm in their longest dimension. If less than 1 cup of fragments are found record one tally *If you want to collect and count microplastic pieces (<5mm in size) using this protocol, we suggest that you use a write-in space.
Plastic	Other Plastic	Plastic that cannot be put in any other category. Includes film/flexible plastic other than grocery and retail bags (see PLASTIC: Grocery & Retail Bags) and balloons (see “OTHER: Balloons”). Includes durable plastic products other than toys and games (see "OTHER: Recreation"), and furniture (see "OTHER: Furniture & Carpet"). Examples include salad dressing bottles, condiment bottles, butter, yogurt, and cottage cheese tubs, buckets, laundry baskets, totes, garbage cans, flower pots, and plastic pipes; and film products such as agricultural film (films used in various farming and growing applications, such as silage greenhouse films, mulch films, and wrap for hay bales), plastic sheeting used as drop cloths, plastic mailing pouches, shrink-wrap, and bubble wrap. Includes items labelled “compostable” or “bio-based.” Does not include any personal care products or bottles (see "OTHER: Toiletries/personal hygiene").
Foam	Cups	Foam (also known as expanded polystyrene or styrofoam) cups of all sizes.
Foam	Plates & Bowls	Foam Plates and Bowls of all sizes.
Foam	Clamshells	Hinged foam take-out containers of any size that open like the shell of a clam.
Foam	Other Foam (1 tally = 1 cup small pieces)	All other foam items, including foam ice chests, foam packing peanuts and other product packing foam, and foam used for home food packaging such as foam meat trays and egg cartons.

Paper	Cardboard	Cardboard has a center wavy layer sandwiched between two outer layers. Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons. This category does not include chipboard boxes such as cereal boxes or tissue boxes (see "PAPER: Other Paper").
Paper	Bags	Paper Bags made from kraft paper. Paper may be brown (unbleached) or white (bleached). Examples include paper grocery bags, fast food bags, and department store bags.
Paper	Newspaper, Junk Mail, Receipts & Office Paper	Paper used for newspapers, receipts, white ledger and other office paper, magazines and catalogs, glossy inserts, stapled college class schedules, manila envelopes, junk mail, carbonless forms, catalogs, and brochures. Does not include hardback or paperback books or telephone directories (see "PAPER: Other Paper").
Paper	Cups	Paper cups, often lined with either plastic or wax, such as to-go coffee cups.
Paper	Beverage & Food Cartons	Gable-top containers such as milk cartons and orange juice cartons, and aseptic containers used for products like soy milk, coconut water, or soup. These are often paper containers lined with plastic.
Paper	Other Paper	Items made mostly of paper that do not fit into any of the above types. Examples include tissue boxes, paperboard boxes for software, self-adhesive notes, hard cover and paperback books, telephone directories, sepia, carbon paper, photographs, sheets of paper, stick-on labels, and paper mailing envelopes lined with bubble wrap or plastic, plates, bowls, paper straws, paper and waxed paper wrappings, wooden stirrers, cup and beverage holders, napkins or paper towels, and pizza boxes, cereal boxes, cardboard egg cartons, ice cream cartons and other frozen food boxes, and boxes used to hold 6 or more individual beverages.
Glass	Bottles, Jars & Containers	Glass bottles, jars, or containers of any size or color designed to contain beverages such as beer, wine, wine coolers, liquor, soda, water, tea, juice, sports & health drinks or contains food such as, pickles, olives, mayonnaise, jam, and sauces.
Glass	Small Fragments & Other Glass (1 tally = 1 cup)	Glass products that do not fit into another category, or that are not distinguishable by type of product. Fragments less than 2.5 cm in their longest dimension.
Metal	Bottles, Cans & Containers	Metal bottles, cans or containers of any size designed to contain beverages such as beer, juice or soda; also includes canned food and pet food.
Metal	Bottle Caps & Tabs	Pull tabs, bottle caps, lids, and seals made of metal and used in the packaging/sealing of metal beverage containers.
Metal	Other Metal	Products made entirely from metal or predominantly metal products that do not fit into any other category. Includes items such as metal clothes hangers, metal pipes, aluminum tin foil, and small appliances comprised mainly of metal such as toasters and hair dryers. Does not include electronics such as microwaves (see "OTHER: Batteries & Electronics"), or major appliances such as refrigerators (see "OTHER: Appliances").
Fishing	Hooks, Lures, & Floats	Includes fishing hooks, lures, bouys, & floats.
Fishing	Traps & Trap Parts	Traps used to catch crabs, lobster, fish, or other organisms.
Fishing	Nets & Ropes (1 tally = 1 foot)	Nets and ropes. 1 tally = 1 continuous foot. Example: 5 continuous feet of rope equals 5 tallies.
Fishing	Fishing Line (1 tally = 1 foot)	1 tally = 1 continuous foot of fishing line
Fishing	Tangled Fishing Line Bundles (1 tally = 1 square foot)	Tangled bundle of fishing line larger than 1 square foot in size
Fishing	Other	Fishing related items that do not fit into other fishing categories

Automotive	Tires	Includes tires from all types of automotive vehicles and all sizes.
Automotive	Other	All motorized vehicle related items other than tires, including hubcaps, tailpipes, batteries used for motorized vehicles, motor oil and other vehicle fluids, rearview mirrors, lights, or window glass known to be from an automobile or other motorized vehicle, and whole auto-bodies, trucks, trailers, and truck cabs.
Smoking	Cigarettes & Cannabis	Discarded ends, pieces or filters of cigarettes, cigars and cannabis products, unsmoked items, chewing tobacco, pipe tobacco, matches, matchbooks and packaging for tobacco and cannabis products such as paper boxes, plastic or foil wrappings, or other materials used to package cigarettes, cigars, cannabis, chewing or pipe tobacco, including individual cigarette packages and unused cigarette papers. Spent smokeless tobacco is included.
Smoking	E-Cigarettes & Vaping	Includes all e-cigarette and vaping items.
Smoking	Lighters	Includes lighters of all types and sizes.
Other	Chemical, Paint & Other Hazardous	Examples include latex paint, oil-based paint, spray paint, stains and varnishes, pesticides, caustic cleaners, fluorescent and LED bulbs/lamps, and mercury-containing items such as thermostats and thermometers. This category includes empty containers of these materials. This category does not include motor oil and other vehicle fluids (see "Automotive: Others").
Other	Batteries & Electronics	Electronics and e-related materials such as cell phones, portable electronic book readers, tablets, laptop computers, computer games and other electronic toys, CD players, camcorders, digital cameras, cell phone and other device chargers, microwaves, stereos, VCRs, DVD players, radios, audio/visual equipment, keyboards, printers, televisions, computers and computer monitors, tapes, CDs, DVDs and batteries of all types, including lithium batteries.
Other	Building Materials	Includes brick, concrete, gypsum board, fiberglass insulation, roofing waste, asphalt, lumber, plywood, pallets, nails, screws, toilets, sinks, carpet, and other building and infrastructure related materials. Other ceramic can be included here as well, such as ceramic dishware and garden pottery. (For light bulbs/lamps, see “OTHER: Chemical, Paint & Other Hazardous.”)
Other	Furniture & Carpet	All large and hard-to-handle items not defined elsewhere, including furniture, mattresses, carpet, lawn furniture, and box springs.
Other	Appliances	Includes large appliances such as refrigerators, dishwashers, stoves, and dryers. This category does not include electronics such as stereos or microwaves (see OTHER: Batteries & Electronics").
Other	Medical Waste, Sharps, & Biohazardous	Medical waste includes needles, syringes, I.V. tubing, medications, ointments, creams, nutritional supplements such as vitamins, etc. used to heal or supplement the nutrition of people or animals. Also includes medicine and medical equipment packaging.
Other	Textiles, Clothing & Shoes	Items made of thread, yarn, fabric, cloth, or rubber. Examples include clothes, fabric trimmings, draperies, leather belts, flip flops, and bathroom rugs. This type does not include furniture, carpet, or mattresses (see "OTHER: Furniture & Carpet").
Other	Toiletries/ Personal Hygiene	Bottles and containers of health care products such as cosmetics, shampoo, hair care styling products, lotion, personal hygiene products such as toothbrushes and toothpaste, pads and tampons, diapers, make-up sponges, gloves, and condoms.
Other	Balloons	Balloons made of all types of materials.
Other	Toys, Sports, & Rec Equipment	Includes balls of all types, frisbees, sporting equipment of all types, other toys of all shapes and sizes, non-automotive bicycles, scooters, and tricycles.
Other	Whole Bags of Mixed Trash	Whole, closed bags of trash of any size. We do not ask you to open and sort the waste.
Write in	Write in	Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire.

Photo Examples of Item Condition

Intact / Un-fouled	Degraded / Heavily Fouled
 	  
There is no evidence of object degradation or organisms growing on it so this would be classified as intact and unfouled. Some indicators of the object being intact/ unfouled are preservation of the original color, no signs of abrasion or rusting, shiny, and texture intact.	*There is clear evidence of weathering, degradation, and/or accumulation of organisms on the object. Some indicators of the object being degraded/ heavily fouled are extreme rust, abrasion, color bleached or undetectable, pitted, rounded and worn edges, and a brittle or cracked surface.*

Appendix 5: Examples of Using the Field Data Card

Example A: *Disposable coffee cup lid*

If you were to categorize a Starbucks coffee cup lid using ETAP, the lid would be categorized under the Plastic materials group and as "Lids." You would place this in the Plastic AND "Lids" pile. When counting, it would be a plastic item.

Next, you will categorize the condition of the lid. If there are no signs of degradation, the lid will be counted under the "Intact/Un-fouled" Item condition column. See further description and examples of Item Condition in the Field Reference Sheet.

Under the Notes column, you might add the brand (for example, Starbucks). If you have multiple Starbucks lids, put the number of these lids next to the brand in the note section (i.e. Starbucks– 12).

Example B: *Disinfectant wipe*

A disinfectant wipe would be categorized in the Other materials group as "Toiletries/Personal Hygiene" and placed in this pile for counting. You will also assess the condition (intact versus degraded) and tally the item under the appropriate column.

Under the Notes column, you might add the type of toiletry/personal hygiene product and the total number if you have multiple (i.e. Wipes – 8).

Example C: *Plastic fragment*

To categorize a small piece of plastic, you would place it under the Plastic materials group. If it can't be easily identified as an item (beverage bottle, bottle cap, etc.) the plastic piece would go into the "Fragments" category and pile for counting.

The Item Condition would be categorized as "Un-fouled" if the plastic piece was not fragmented due to degradation, but by the item having been run over by a car, for example.

All of the plastic fragments collected during a site assessment can be measured together using a measuring cup and recording the total number of cups of fragments.

Appendix 6: Volume-to-Weight Conversion Table

Below is the U.S. EPA Office of Resource Conservation and Recovery 2016 Volume-to-Weight Conversion Factors document for reference when measuring collected trash.

Standard Volume-to-Weight Conversion Factors

Category	Recyclable Materials	Volume	Estimated Weight (lbs)	Source
Appliances	Major Appliances			
	Dishwasher	1 unit	125	1
	Clothes Dryer	1 unit	125	1
	Stove	1 unit	150	1
	Refrigerator	1 unit	250	1
	Clothes Washer	1 unit	150	1
Automotive	Lead-Acid Battery			
	Auto	one	36	3
	Truck	one	47	3
	Scrap Tire			
	Light Duty Tires (passenger, light truck)	one	22.5	5
	Commercial Tires	one	120	5
	Fluids			
	Used Motor Oil	gallon	7.4	2
	Antifreeze	gallon	8.42	2
	Other Automotive			
	Oil Filters not crushed	drum	175	1
	Oil Filters crushed	drum	700	1
	Oil Filters	gallon	5	1
Carpeting	Carpet			
	Carpet	cubic yard	147	6
	Carpet Padding	cubic yard	62	6
Commingled Recyclable Material	Containers (Plastic bottles, Aluminum cans, Steel cans, Glass bottles) and Paper			
	Commingled Recyclables	cubic yard	262	4
	Containers (Plastic bottles, Aluminum cans, Steel cans, Glass bottles), Corrugated Containers and Paper			
	Campus Recyclables	cubic yard	92	7
	Commingled Recyclables	cubic yard	111	4
	Containers (Plastic bottles, Aluminum cans, Steel cans, Glass bottles) – No paper			
	Campus Recyclables	cubic yard	70	7
	Commingled Recyclables	cubic yard	67	4
	Commercial Recyclables	cubic yard	113	8
	Containers (Cans, Plastic) - No glass			
	Campus Recyclables	cubic yard	32	7
	Containers (Cans, Plastic) and Paper - No glass			
	Residential Recyclables	cubic yard	260	2
	Containers (Food/beverage, Glass) Corrugated Containers and Paper			
	Commercial Recyclables	cubic yard	88	2
	Commercial Recyclables	cubic yard	58	21
	Multifamily Recyclables	cubic yard	96	2
	Multifamily Recyclables	cubic yard	51	21

Category	Recyclable Materials	Volume	Estimated Weight (lbs)	Source
Commingled Recyclable Material	*Single family Recyclables*	cubic yard	126	2
	Containers (Food/beverage, Glass) Corrugated Containers and Paper- No glass			
	Compus Recyclables	cubic yard	139	2
	Commercial Recyclables	cubic yard	155	2
Electronics	Computer Equipment			
	Desktop	one	27	24
	Laptop	one	9.8	24
	Monitor			
	CRT	one	40	1
	15"	one	30	2
	17"	one	45	2
	21"	one	60	2
	Flat Panel	one	24	1
	Mixed Monitors	one	29.4	24
	Televisions			
	CRT < 19 inch	one	41	1
	CRT ≥ 19 inch	one	73	1
	Flat Panel	one	29	1
	Mixed TVs	one	67.3	24
	Peripheral Devices			
	Printers	one	16.1	24
	Mice	one	0.2	9
	Keyboards	one	2.9	9
	Mobile Devices			
	Cellular Phone	one	0.22	9
	Mixed Electronics			
	Brown Goods	cubic yard	343	6
	Computer-related Electronics	cubic yard	354	6
	Other Small Consumer Electronics	cubic yard	438	6
Food				
	Fats, Oils, Grease	55-gallon	412	2
	Organics - commercial	cubic yard	135	21
	Source Separated Organics - commercial	cubic yard	1,000	15
	Food Waste - restaurants	cubic yard	396	21
	Food Waste	cubic yard	463	4
	Food Waste	cubic foot	22-45	4
	Food waste - university	gallon	3.8	22
	Food Waste	64 gallon toter	150	4
	Food waste	2 cubic yard full towable	2,736	4
Glass	Bottles			
	Loose	cubic yard	380	4

Category	Recyclable Materials	Volume	Estimated Weight (lbs)	Source
Metals	Aluminum Cans			
	Uncompacted	cubic yard	46	4
	Uncompacted	case = 24 cans	0.7	11
	Baled	cubic yard	250-500	10
	Steel Cans			
	Whole	cubic yard	50-175	10
	Baled	cubic yard	700-1,000	10
	Steel Cans - Institution			
	Whole	can	0.09	7
	Whole	cubic yard	136	7
Paper	Newsprint			
	Loose	cubic yard	360-800	1
	Baled	cubic yard	750-1,000	10
	Books - paperback, loose	cubic yard	428	23
	Old Corrugated Containers			
	Flattened	cubic yard	106	4
	Baled	cubic yard	700-1,100	10
	Old Corrugated Containers and Chip Board			
	Uncompacted	cubic yard	74.54	4
	Office Paper			
	Computer Paper			
	Loose	cubic yard	375-465	1
	Compacted/Baled	cubic yard	755-925	1
	Mixed			
	Loose	cubic yard	110-380	1
	Loose	cubic yard	323	4
	Compacted	cubic yard	610-755	1
	Shredded	cubic yard	128	4
	Mixed Baled	cubic yard	1,000-1,200	10
	Miscellaneous			
	Cartons (milk and juice) uncrushed	cubic yard	50	7
Plastic	PET			
	PET Bottles - baled	30"x42"x 48"	525-630	12
	PET Thermoform - baled	30"x42"x 48"	525-595	12
	HDPE			
	HDPE Dairy - baled	30"x42"x 48"	525-700	12
	HDPE Mixed - baled	30"x42"x 48"	525-700	12
	Mixed PET and HDPE			
	Loose	cubic yard	32	7
	Mixed Bottles/Containers #1 - #7			
	Loose	cubic yard	40.4	4
	Mixed Bottles/Containers #3 - #7			

Category	Recyclable Materials	Volume	Estimated Weight (lbs)	Source
Plastic	*Loose*	cubic yard	25.7	4
	Film			
	LDPE, loose	cubic yard	35	13
	LDPE, compacted	cubic yard	150	13
	LDPE, baled	30" x 42" x 48"	1,100	13
	Miscellaneous			
	Trash Bags	cubic yard	35	6
	Grocery/Merchandise Bags	cubic yard	35	6
	Expanded Polystyrene Packaging/Insulation	cubic yard	32	6
Textiles	Mixed Textiles			
	Loose	cubic yard	125-175	10
	Baled	cubic yard	600-750	10
Wood	Wood			
	Wood Chips, green	cubic yard	473	1
	Wood Chips, dry	cubic yard	243	1
	Saw Dust, wet	cubic yard	530	1
	Saw Dust, dry	cubic yard	275	1
	Pallets	one	25	1
	Pallets and Crates	cubic yard	169	18
	Christmas Trees, loose	cubic yard	30	1
Yard Trimmings	Yard Trimmings			
	Leaves	cubic yard	250-500	1
	Leaves (Minnesota)	cubic yard	300 - 383	15
	Mixed Yard Waste			
	Uncompacted	cubic yard	250	1
	Compacted	cubic yard	640	1
	Prunings & Trimmings	cubic yard	127	6
	Branches & Stumps	cubic yard	127	6
Municipal Solid Waste	MSW - Commercial			
	Commercial - dry waste	cubic yard	56-73	16, 8
	Commercial - all waste, uncompacted	cubic yard	138	21
	Mixed MSW - Residential, Institutional, Commercial			
	Uncompacted	cubic yard	250-300	14
	Compacted	cubic yard	400-700	14
	Mixed MSW - Multifamily uncompacted	cubic yard	95	21
	MSW - Landfill			
	Compacted - MSW Small Landfill with Best Management Practices	cubic yard	1,200-1,700	17
	Compacted - MSW Large Landfill with Best Management Practices	cubic yard	1,700-2,000	17

Category	Recyclable Materials	Volume	Estimated Weight (lbs)	Source
Municipal Solid Waste	*Compacted - MSW Very Large Landfill with Best Management and Cover Practices, Combined MMSW/Industrial/and other solid waste, or/and Leachate Recirculation*	cubic yard	>2,000	17
C &D	Concrete			
	Large Concrete with Re-bar	cubic yard	860	18
	Large Concrete without Re-bar	cubic yard	860	18
	Small Concrete with Re-bar	cubic yard	860	18
	Small Concrete without Re-bar	cubic yard	860	18
	Asphalt Paving			
	Large Asphalt Paving with Re-bar	cubic yard	773	19
	Large Asphalt Paving without Re-bar	cubic yard	773	19
	Small Asphalt Paving with Re-bar	cubic yard	773	19
	Small Asphalt Paving without Re-Bar	cubic yard	773	19
	Roofing			
	Composition Roofing	cubic yard	731	18
	Other Asphalt Roofing	cubic yard	731	18
	Other Aggregates	cubic yard	860	18
	Wood			
	Clean Dimensional Lumber	cubic yard	169	18
	Clean Engineered Wood	cubic yard	268	18
	Other Recyclable Wood	cubic yard	169	18
	Painted/Stained Wood	cubic yard	169	18
	Treated Wood	cubic yard	169	18
	Gypsum Board			
	Clean Gypsum Board	cubic yard	467	18
	Painted/Demolition Gypsum	cubic yard	467	18
	Aggregate			
	Large Rock	cubic yard	999	18
	Small Rock/Gravel	cubic yard	999	18
	Dirt and Sand	cubic yard	929	18
	Remainder/Composite Construction and Demolition	cubic yard	417	18
	Construction & Demolition Bulk	cubic yard	484	20
	Metal			
	Major Appliances	cubic yard	145	18
	Other Ferrous	cubic yard	225	18
	Other Non-Ferrous	cubic yard	225	18
	Remainder/Composite Metal (avg of metals, without used oil filters)	cubic yard	143	18
	HVAC Ducting	cubic yard	47	18

1	Oregon Department of Environmental Quality. 2007 Oregon Material Recovery and Waste Generation Rates Report September 2008 08-LQ-092. Attachment B: Measurement Standards and Reporting Guidelines 07-LQ-134. http://www.deq.state.or.us/lq/pubs/docs/sw/MRAttachmentB.pdf
2	Department of Ecology, State of Washington. Coordinated Prevention Grant Conversion Sheet. March, 2014. www.ecy.wa.gov/pubs/1107016.pdf
3	Factor developed using lead per battery data from Battery Council International. Recycling Rates 2009 to 2013. April 2014. http://c.ymcdn.com/sites/batterycouncil.org/resource/resmgr/BCI_Recycling_Rate_Study_200.pdf applied to battery composition data from Sullivan, JL and Gaines, L. 2010. A Review of Battery Life Cycle Analysis: State of Knowledge and Critical Needs. October 2010. Center for Transportation Research, Energy Systems Division, Argonne National Laboratory ANL/ESD/10-7.
4	Keep America Beautiful. Volume-to-Weight Recycling and Trash Conversion Factors Report. December 2013.
5	Rubber Manufacturers Association (RMA). 2013 U.S. Scrap Tire Management Summary. November 2014. http://www.rma.org/download/scrap-tires/market-reports/US_STMarket2013.pdf
6	California Integrated Waste Management Board. Targeted Statewide Waste Characterization Study: Detailed Characterization of Construction and Demolition Waste. June 2006. http://www.calrecycle.ca.gov/publications/Documents/Disposal%5C34106007.pdf
	Brown Goods: larger, non-portable electronic goods that have some circuitry. Examples include microwaves, stereos, VCRs, DVD players, radios, audio/visual equipment, and non-CRT televisions (such as LCD televisions).
	Computer-related Electronics: electronics with large circuitry that is computer-related. Examples include processors, mice, keyboards, laptops, disk drives, printers, modems, and fax machines.
	Other Small Consumer Electronics: portable non-computer-related electronics with large circuitry. Examples include personal digital assistants (PDAs), cell phones, phone systems, phone answering machines, computer games and other electronic toys, portable CD players, camcorders, and digital cameras.
7	Keep America Beautiful, Recycle-Bowl Competition. Accessed February 2015. http://recycle-bowl.org/wp-content/uploads/Recycle-Bowl-Estimating-Data-Fact-Sheet.pdf
8	Great Forest. Volume to Weight Conversion Ratios for Commercial Office Waste in New York City. January 2013. Primary data; Commingled; large commercial properties (500,000 sq. ft – 1m sq. ft) in the New York metropolitan area. http://www.greatforest.com/files/FileUpload/files/Great%20Forest%20-%20Waste%20Conversion%20Paper%20-
9	US EPA Electronics Waste Management in the United States Through 2009. May 2011.
10	WasteCare Corporation. Some Typical Loose and Baled Weights of Various Materials. Accessed April 2015. http://www.wastecare.com/Products-Services/Balers/aboutbalers.htm.
11	The Aluminum Association. U.S. Aluminum Beverage Can Recycling. http://www.aluminum.org/sites/default/files/section_images/UBCRecyclingRate2013.pdf
12	The Association of Postconsumer Plastic Recyclers (APR). Model Bale Specifications. http://www.plasticsrecycling.org
13	Caldwell, Maggie. Recycling Plastic Film and Shrink Wrap. May 16, 2014. http://www.federalinternational.com/blog/recy
14	Caterpillar Performance Handbook. 40th Edition. January 2010.
15	Minnesota Pollution Control Agency. Data provided by professional composter. 2015. Source separated organics - food scraps, non-recyclable paper (paper plates/towels/etc) and compostable plastics.
16	Minnesota Department of Administration 2015 hauler records (excludes organics).
17	Minnesota Pollution Control Agency. 2013 MPCA MSW Landfill Annual Report Data.
18	California Integrated Waste Management Board. Targeted Statewide Waste Characterization Study: Detailed Characterization of Construction and Demolition Waste. June 2006
19	Tellus scaled down by factor from Florida C&D study -- Converting C&D Debris from Volume to Weight: A Fact Sheet for C&D Debris Facility Operators, University of Florida, 2000.
20	Florida Dept of Environmental Protection http://www.dep.state.fl.us/waste/categories/recycling/cd/canddmain.htm
21	CalRecycle. 2014 Generator-Based Characterization of Commercial Sector Disposal and Diversion in California. September 10, 2015. http://www.calrecycle.ca.gov/Publications/Documents/1543/20151543.pdf Organics - putrescible material hauled by a contracted third party to a permitted facility mainly engaged in producing compost or mulch, or in anaerobic digestion of organics. Minor mechanical separation of contaminants or recyclable materials may occur at the facility prior to composting or digestion.
22	Goldstein, Nora. "Food Scraps Composting Laboratory". *BioCycle*. January 2013, Vol. 54, No. 1, p. 33. https://www.biocycle.net/2013/01/22/food-scraps-composting-laboratory/
23	U.S. EPA. Standard Volume-to-Weight Conversion Factors. Last updated: February 28, 2006. https://www.epa.gov/smm/metrics-waste-reduction
24	National Center for Electronics Recycling (NCER). http://www.electronicsrecycling.org/ Mixed monitors and TVs: total pounds collected divided by total units collected.

Appendix 7: ETAP Table Cards

Group: PLASTIC

1. Bottles & Containers

Description: Plastic bottles and jugs of any size or resin. Examples include plastic bottles and jugs for soda, water, sports drinks, juice, tea, milk, wine coolers, and liquor bottles. Includes bottles labelled "compostable" or "bio-based."

Group: PLASTIC

2. Straws & Stirrers

Description: Plastic drinking straws and stirrers. Includes "compostable" or "bio-based."

Group: PLASTIC

3. Bottle Caps & Tabs

Description: Loose plastic bottle caps, plastic pull tabs, lids, and seals made of plastic, used in the packaging/sealing of beverage containers. Does not include bottle caps that are still on a beverage bottle.

Group: PLASTIC

4. Beverage Rings

Description: Beverage packaging rings to hold soft drinks or beer cans. Examples: 4-pack, 6-pack, 8-pack, & 12-pack beverage rings commonly used for canned or bottled beverages.

Group: PLASTIC

5. Food Wrappers & Snack Bags

Description: Wrappings or bags used to package food, such as wrappers for candy and gum, snack bags, chip bags, zipper-closeable bags, condiment packets, and produce bags. Includes wrappers labelled "compostable" or "bio-based." Does not include pouches (see PLASTIC: Food & Drink Pouches).

Group: PLASTIC

6. Food & Drink Pouches

Description: Plastic pouches made of thicker, multi-layer flexible material. May have a flat bottom so that package would stand up on its own, but not always. Material is thicker than potato chip bags. Examples include plastic coffee packages; juice pouches; baby food pouches with or without plastic screw top; soup pouches; salad dressing pouches; wine pouches; and backpacking meals in pouches.

Group: PLASTIC

7. Cups

Description: Includes plastic cups of all sizes other than foam.

Group: PLASTIC

8. Lids

Description: Plastic lids from plastic tubs and containers, such as cottage cheese, yogurt, butter, etc.

Group: PLASTIC

9. Utensils

Description: Plastic forks, knives, and spoons.

Group: PLASTIC

10. Plates & Bowls

Description: Plastic plates and bowls of all sizes other than foam.

Group: PLASTIC

11. Clamshells

Description: Hinged plastic (not foam) take-out containers of any size that open like the shell of a clam.

Group: PLASTIC

12. Grocery & Retail Bags

Description: Plastic shopping bags used to contain merchandise, given out by the store or restaurant with the purchase (including dry cleaning bags). This type does not include full bags of trash (see "OTHER: Whole Bags of Mixed Trash"). Includes bags labelled "compostable" or "bio-based."

Group: PLASTIC

13. Small Fragments (1 tally = 1 cup)

*Description: Film or hard plastic pieces of unknown origin less than 2.5 cm in their longest dimension. If less than 1 cup of fragments are found record one tally *If you want to collect and count microplastic pieces (<5mm in size) using this protocol, we suggest that you use a write-in space.*

Group: PLASTIC

14. Other Plastic

Description: Plastic that cannot be put in any other category. Includes film/flexible plastic other than grocery and retail bags (see PLASTIC: Grocery & Retail Bags) and balloons (see "OTHER: Balloons"). Includes durable plastic products other than toys and games (see "OTHER: Recreation"), and furniture (see "OTHER: Furniture & Carpet"). Examples: salad dressing bottles, condiment bottles, butter, yogurt, and cottage cheese tubs, buckets, laundry baskets, totes, garbage cans, flower pots, and plastic pipes; and film products such as agricultural film (films used in various farming and growing applications, such as silage greenhouse films, mulch films, and wrap for hay bales), plastic sheeting used as drop cloths, plastic mailing pouches, shrink-wrap, and bubble wrap. Includes items labelled "compostable" or "bio-based." Does not include any personal care products or bottles (see "OTHER: Toiletries/personal hygiene").

Group: FOAM

15. Cups

Description: Foam (also known as expanded polystyrene or styrofoam) cups of all sizes.

Group: FOAM

16. Plates & Bowls

Description: Foam Plates and Bowls of all sizes.

Group: FOAM

17. Clamshells

Description: Hinged foam take-out containers of any size that open like the shell of a clam.

Group: FOAM

18. Small Fragments & Other Foam (1 tally = 1 cup of small pieces)

Description: All other foam items, including foam ice chests, foam packing peanuts and other product packing foam, and foam used for home food packaging such as foam meat trays and egg

Group: PAPER

19. Cardboard

Description: Cardboard has a center wavy layer sandwiched between two outer layers. Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons. This category does not include chipboard boxes such as cereal boxes or tissue boxes (see "PAPER: Other Paper").

Group: PAPER

20. Bags

Description: Paper Bags made from kraft paper. Paper may be brown (unbleached) or white (bleached). Examples include paper grocery bags, fast food bags, and department store bags.

Group: PAPER

21. Newspaper, Junk Mail, Receipts & Office Paper

Description: Paper used for newspapers, receipts, white ledger and other office paper, magazines and catalogs, glossy inserts, stapled college class schedules, manila envelopes, junk mail, carbonless forms, catalogs, and brochures. Does not include hardback or paperback books or telephone directories (see "PAPER: Other Paper").

Group: PAPER

22. Cups

Description: Paper cups, often lined with either plastic or wax, such as to-go coffee cups.

Group: PAPER

23. Beverage & Food Cartons

Description: Gable-top containers such as milk cartons and orange juice cartons, and aseptic containers used for products like soy milk, coconut water, or soup. These are often paper containers lined with plastic.

Group: PAPER

24. Other Paper

Description: Items made mostly of paper that do not fit into any of the above types. Examples include tissue boxes, paperboard boxes for software, self-adhesive notes, hard cover and paperback books, telephone directories, sepia, carbon paper, photographs, sheets of paper, stick-on labels, and paper mailing envelopes lined with bubble wrap or plastic, plates, bowls, paper straws, paper and waxed paper wrappings, wooden stirrers, cup and beverage holders, napkins or paper towels, and pizza boxes, cereal boxes, cardboard egg cartons, ice cream cartons and other frozen food boxes, and boxes used to hold 6 or more individual beverages.

Group: GLASS

25. Bottles, Jars & Containers

Description: Glass bottles, jars, or containers of any size or color designed to contain beverages such as beer, wine, wine coolers, liquor, soda, water, tea, juice, sports & health drinks or contains food such as, pickles, olives, mayonnaise, jam, and sauces.

Group: GLASS

26. Small Fragments & Other Glass (1 tally = 1 cup)

Description: Glass products that do not fit into another category, or that are not distinguishable by type of product. Fragments less than 2.5 cm in their longest dimension.

Group: METAL

27. Bottles, Cans & Containers

Description: Metal bottles, cans or containers of any size designed to contain beverages such as beer, juice or soda; also includes canned food and pet food.

Group: METAL

28. Bottle Caps & Tabs

Description: Pull tabs, bottle caps, lids, and seals made of metal and used in the packaging/sealing of metal beverage containers.

Group: METAL

29. Other Metal

Description: Products made entirely from metal or predominantly metal products that do not fit into any other category. Includes items such as metal clothes hangers, metal pipes, aluminum tin foil, and small appliances comprised mainly of metal such as toasters and hair dryers. Does not include electronics such as microwaves (see "OTHER: Batteries & Electronics"), or major appliances such as refrigerators (see "OTHER: Appliances").

Group: FISHING

30. Hooks, Lures & Floats

Description: Includes fishing hooks, lures, buoys, & floats.

Group: FISHING

31. Traps & Trap Parts

Description: Traps used to catch crabs, lobster, fish, or other organisms.

Group: FISHING

32. Nets & Ropes (1 tally = 1 foot)

Description: Nets and ropes. 1 tally = 1 continuous foot. Example: 5 continuous feet of rope equals 5 tallies.

Group: FISHING

33. Fishing Line (1 tally = 1 foot)

Description: 1 tally = 1 continuous foot of fishing line.

Group: FISHING

34. Tangled Fishing Line Bundles (1 tally = 1 square foot)

Description: Tangled bundle of fishing line larger than 1 square foot in size.

Group: FISHING

35. Other Fishing

Description: Fishing related items that do not fit into other fishing categories.

Group: AUTOMOTIVE

36. Tires

Description: Includes tires from all types of automotive vehicles and all sizes.

Group: AUTOMOTIVE

37. Other Automotive

Description: All motorized vehicle related items other than tires, including hubcaps, tailpipes, batteries used for motorized vehicles, motor oil and other vehicle fluids, rearview mirrors, lights, or window glass known to be from an automobile or other motorized vehicle, and whole auto-bodies, trucks, trailers, and truck cabs.

Group: SMOKING

38. Cigarettes & Cannabis

Description: Discarded ends, pieces or filters of cigarettes, cigars and cannabis products, unsmoked items, chewing tobacco, pipe tobacco, matches, matchbooks and packaging for tobacco and cannabis products such as paper boxes, plastic or foil wrappings, or other materials used to package cigarettes, cigars, cannabis, chewing or pipe tobacco, including individual cigarette packages and unused cigarette papers. Spent smokeless tobacco is included.

Group: SMOKING

43. E-cigarettes & Vaping

Description: Includes all e-cigarette and vaping items.

Group: SMOKING

39. Lighters

Description: Includes lighters of all types and sizes.

Group: OTHER

40. Chemical, Paint & Other Hazardous

Description: Examples include latex paint, oil-based paint, spray paint, stains and varnishes, pesticides, caustic cleaners, fluorescent and LED bulbs/lamps, and mercury-containing items such as thermostats and thermometers. This category includes empty containers of these materials. This category does not include motor oil and other vehicle fluids (see "Automotive: Others").

Group: OTHER

41. Batteries & Electronics

Description: Electronics and e-related materials such as cell phones, portable electronic book readers, tablets, laptop computers, computer games and other electronic toys, CD players, camcorders, digital cameras, cell phone and other device chargers, microwaves, stereos, VCRs, DVD players, radios, audio/visual equipment, keyboards, printers, televisions, computers and computer monitors, tapes, CDs, DVDs and batteries of all types, including lithium batteries.

Group: OTHER

42. Building Materials

Description: Includes brick, concrete, gypsum board, fiberglass insulation, roofing waste, asphalt, lumber, plywood, pallets, nails, screws, toilets, sinks, carpet, and other building and infrastructure related materials. Other ceramic can be included here as well, such as ceramic dishware and garden pottery. (For light bulbs/lamps, see "OTHER: Chemical, Paint & Other Hazardous.")

Group: OTHER

44. Furniture & Carpet

Description: All large and hard-to-handle items not defined elsewhere, including furniture, mattresses, carpet, lawn furniture, and box springs.

Group: OTHER

45. Appliances

Description: Includes large appliances such as refrigerators, dishwashers, stoves, and dryers. This category does not include electronics such as stereos or microwaves (see OTHER: Batteries & Electronics").

Group: OTHER

46. Medical Waste, Sharps, & Biohazardous

Description: Medical waste includes needles, syringes, I.V. tubing, medications, ointments, creams, nutritional supplements such as vitamins, etc. used to heal or supplement the nutrition of people or animals. Also includes medicine and medical equipment packaging.

Group: OTHER

47. Textiles, Clothing & Shoes

Description: Items made of thread, yarn, fabric, cloth, or rubber. Examples include clothes, fabric trimmings, draperies, leather belts, flip flops, and bathroom rugs. This type does not include furniture, carpet, or mattresses (see "OTHER: Furniture & Carpet").

Group: OTHER

48. Toiletries/ Personal Hygiene

Description: Bottles and containers of health care products such as cosmetics, shampoo, hair care styling products, lotion, personal hygiene products such as toothbrushes and toothpaste, pads and tampons, diapers, make-up sponges, gloves, and condoms.

Group: OTHER

49. Balloons

Description: Balloons made of all types of materials.

Group: OTHER

50. Toys, Sports & Recreational Equipment

Description: Includes balls of all types, frisbees, sporting equipment of all types, other toys of all shapes and sizes, non-automotive bicycles, scooters, and tricycles.

Group: OTHER

51. Whole Bags of Mixed Trash

Description: Whole, closed bags of trash of any size. We do not ask you to open and sort the waste.

Group: OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].

OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].

OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].

OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].

OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].

OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].

OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].

OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].

OTHER – [Write in]

Description: [Use this category to track any other specific item included in a broader category above or otherwise not included here, if you desire].