Baseline Waste Composition Study

PRESENTED to the City of Missoula, Montana

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BY Cascadia Consulting Group

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Introduction and Background

In 2016, the City of Missoula (City) adopted the Missoula Zero Waste Resolution (ZERO by FIFTY) to reduce waste by 90 percent by 2050. In 2020, the City contracted with Cascadia Consulting Group (Cascadia) to estimate the quantity and composition of waste going to disposal in the city of Missoula (Missoula) across several sectors. To achieve this objective, Cascadia developed a comprehensive model that includes data from City staff, Republic Services (Republic), local material processers, waste generation trends, and waste characterization data from geographical areas with demographics comparable to Missoula collected by Cascadia and from other available studies. This model uses 2019 tons and reflects pre-pandemic waste generation practices. The outputs of this model provide the City with a baseline to identify sectors and material types with the greatest recovery potential. The data can be used to support programs, policy or education to meet the City's ZERO by FIFTY goal.

This report summarizes the data sources and methodology used to create the model, composition estimates, and recommendations for the City to increase diversion based on the modeling and analysis. This report is accompanied by an Excel workbook with model results as well as structured inputs for entering and estimating garbage and construction and demolition (C&D) tonnages and changes to the composition of the waste stream in Missoula over time.

Data Sources & Methodology

This section includes the scope of the model, data sources, the material list, and a summary of the methodology used to develop the model.

SCOPE OF THE MODEL

The model was designed to estimate 2019 City of Missoula garbage tons and composition using regional reported data and waste composition data from other studies. The model separates disposed garbage from the city into five distinct sectors defined below.

Sectors

- Single family – garbage generated by residential single family and mobile home properties and collected by Republic.
- Multifamily – garbage generated by residential properties with five or more dwelling units and collected by Republic. Typically, waste bins are shared among multiple dwelling units.
- Commercial – garbage generated by non-residential properties including businesses, industries (e.g. factories), and institutions (e.g. correctional facilities, hospitals, schools) and collected by Republic.
- Self-haul – garbage hauled by residences or businesses that transport their waste themselves to a transfer station or disposal site.
- Construction & Demolition (C&D) – material generated as a result of construction or demolition activities that is either self-hauled or hauled in open drop boxes.

DATA SOURCES

The model uses data inputs from the following sources:

- 2019 City of Missoula and Missoula County Census Bureau data
- 2019 Republic tonnage reports & estimates
- 2019 tonnage reports by regional processers for material recovery
- 2020 Missoula government operations service levels
- Generation rate and composition data from over 50 waste characterization datasets conducted in Washington, California, Oregon, Colorado, and British Columbia, Canada.

Waste characterization studies provide valuable data to estimate the material composition of waste streams and calculate generation rates. Waste characterization studies involve analyzing a representative number of samples and using that data to estimate the overall composition. A single sample is a specified amount of material (for example, 200 pounds or one cubic yard) that is randomly selected from the waste stream. Each sample is hand sorted by a field crew into predetermined material categories and each material is weighed to determine its portion in the composition of that sample. Many samples are collected and analyzed in a single study to ensure representation of the overall waste stream. A typical waste characterization hand sort follows the steps described in Figure 1.

Figure 1. Waste Characterization Study Protocol

Table 1 presents the number of samples from existing waste characterization studies used to develop the Missoula model as composition data inputs. Sample counts are provided by sector and region.

Table 1. Number of Samples Included in Composition Data Inputs

Sector	Total	California	Washington	Oregon	Colorado	British Columbia, CA
Single family	**1,158**	538	288	173	159	0
Multifamily	**282**	188	0	94	0	0
Commercial	**2,624**	1,591	766	267	0	0
Self-hauled Municipal Solid Waste (MSW)	**1,145**	634	241	270	0	0
C&D	**848**	0	471	135	40	202

MATERIAL LIST

The model divides the garbage stream into 30 material types. Each material type was assigned to a material class, and a recoverability group based on current acceptability in the local commingled recycling program (hauled by Republic) and at local composting facilities.[1] The material list selected for the model was designed to align material types from the multiple waste characterization studies and highlight recoverable materials of interest that are either accepted in existing programs in Missoula or are materials for which the City would like to expand recovery programs. The material list and assigned recoverability categories are outlined in Table 2 below.

[1] While there is currently no central program for C&D recovery, a few material reuse companies are mentioned later in this report.

Table 2 Material List and Recoverability Categories

Material Type	Recoverability
Paper	
Corrugated Cardboard	Recyclable Materials
Newspaper	Recyclable Materials
Other Recyclable Paper	Recyclable Materials
Compostable Paper	Compostables Materials
Polycoated Paper	Other Materials
Non-recoverable Paper	Other Materials
Plastic	
#1 & #2 Plastic Containers	Recyclable Materials
Other Recyclable Plastics	Recyclable Materials
Shopping Bags	Other Materials
Other Film	Other Materials
Non-recoverable Plastics	Other Materials
Metal	
Tin/Steel Cans	Recyclable Materials
Aluminum Cans	Recyclable Materials
Other Recoverable Metal	Recyclable Materials
Non-recoverable Metal	Other Materials

Material Type	Recoverability
Glass	
Glass Containers	Recyclable Materials
Non-recoverable Glass	Other Materials
Organics	
Food	Compostables Materials
Yard Waste	Compostables Materials
Non-recoverable Organics	Non-recoverable
C&D	
Clean Wood	Recoverable C&D
Concrete, Asphalt & Aggregates	Recoverable C&D
Carpet	Other Materials
Other C&D	Other Materials
Other Materials	
Textiles	Other Materials
Electronic Waste	Other Materials
Bulky Items	Other Materials
Tires	Other Materials
Household Hazardous Waste	Other Materials
Non-recoverable Other	Other Materials

The model utilizes demographic data including population, employment rates, and total number of households in Missoula in 2019 to estimate the composition and quantity of disposed waste in Missoula.[2] The demographic assumptions are presented in Table 2 below.

Table 3. Population and Employment Demographics for Missoula (2019)

Missoula Population	**75,516**	**persons**
Missoula Est. Employment	53,163	persons
Percent of population employed	70%	
Total Households	**31,393**	**households**
Single family & mobile homes	20,405	households
Percent serviced by Republic	85%	
Multifamily Units	10,988	units

SUMMARY OF METHODOLOGY

The following methodology was used to estimate total tons of garbage by material type generated in 2019. The first step was to acquire 2019 garbage tonnage data from Republic and apply demographic data to allocate the tons by sector. The second step was to estimate the material composition of each sector by

[2] Demographic assumptions are based on 2019 data from the Census Bureau.

compiling existing waste datasets and modeling adjustments based on regional waste collection systems and practices.

Estimating Annual Tons

The following steps describe the methodology used to estimate the annual tons of garbage from each sector:

1. Republic provided records that separated garbage tons into three groups by collection method:
   - Residential – combination of garbage collected from single family and multifamily sources
   - Commercial – combination of garbage collected from commercial and multifamily sources
   - Industrial – garbage collected in permanent and temporary roll-offs and compactors

2. Cascadia extracted multifamily tons from the residential and commercial tons based on estimated multifamily household counts, a general multifamily disposal rate of tons per household per year, and typical multifamily complex size based on data from the Census Bureau. This method assumes that garbage from multifamily units in small complexes is collected on residential routes and garbage from large complexes is collected on commercial routes.

3. Cascadia divided industrial tons into commercial and C&D tons using Republic's reported "open top percent". This ratio was used because debris boxes that collect C&D material are exclusively open top.

4. Republic used tip rates to differentiate self-hauled waste as MSW or C&D. Republic provided an estimated ratio for the self-hauled materials coming from Missoula city limits. They based this estimate on their observations and totaling tonnages from known Missoula based charge accounts.
   - Republic estimated that 50 percent of their self-hauled MSW is from the city of Missoula. Another 25 percent is estimated to come from Ravalli County, and the remaining 25 percent is from Missoula County (other than the city of Missoula) and other surrounding counties.
   - Republic estimated 50 percent of all C&D for disposal comes from the City of Missoula and the remainder is from outlying areas.

The reported Missoula City tons that are collected directly by Republic are highly reliable because they are linked to specific collection routes. It is important to note that there is less certainty around the allocation to sectors. There is even more uncertainty around the self-haul MSW tons because the Republic Services Missoula Landfill accepts MSW and C&D material from the remainder of the Missoula County and surrounding counties. Plus, there is no system currently in place for tracking the sources of self-hauled waste.

Composition Modeling

The methods used to estimate the composition of garbage generated by each sector are described below.

- Single family
  - Cascadia modeled the garbage composition by estimating an overall single family generation composition (garbage + recycling + organics) from existing data and subtracting both the estimated tons recycled (based on tonnage data reported by Republic) and the estimated tons of self-hauled yard waste (based on tonnage data from Garden City Compost).

- Single family waste generation is typically the most consistent sector in terms of waste composition and the best studied sector. The increased number of cart studies done by Cascadia in the last five years – in which all three streams are collected directly from the generator and sorted – has greatly improved the quality of data available from this sector.

- Multifamily
  - The garbage composition for Missoula was modeled assuming little to no multifamily waste is recycled or composted. Multifamily properties have limited access to recycling and organics collection (although these streams are becoming more accessible over time). In some cases, multifamily yard waste is recovered through landscaping services and taken off-site, so this material will not appear in the composition data.
- Commercial
  - Commercial composition is based on data from the commercial sector, though there are not currently many commercial generation datasets available. While there is limited commercial recovery in Missoula, the recovery taking place (e.g., cardboard, back-of-house food waste from grocers) is consistent with operational practices in other regions. Commercial composition is less consistent between regions than residential sectors since there is a large and unique range of activities involved in generating the disposed material in a given region (e.g., office settings versus barber shops or hospitals). To be comparable with Missoula, waste composition data was taken from regions with low industrial activity and a college town atmosphere. The most prevalent materials in the commercial composition are consistent with what is expected for a city like Missoula.
- Self-haul
  - Based on conversations with Republic, about 15 percent of Missoula single family households self-haul their garbage. Aligning this statistic with Missoula's average household generation rate, in tons per household per year, it is estimated that a little more than 50 percent of self-hauled garbage comes from single family homes. The model took this into account by proportionally combining a typical self-haul composition with the single family composition to model the final self-haul waste composition. Compared to commercially collected waste compositions, waste composition data for self-hauled waste typically has a higher level of variability due to the variety of activities resulting in self-hauled waste.
- C&D
  - C&D composition in Missoula is modeled from general C&D composition from existing studies. Waste composition from the C&D sector can be highly variable based on the type of construction activity. Cascadia cross checked recovery reports for per capita quantities of "Concrete, Asphalt & Aggregates" and "Clean Wood" to the final estimated composition. Knowing that the primary C&D activity in Missoula currently is new construction, the final modeled composition is a reasonable proxy.

Model Results

TONNAGE ESTIMATES

Table 4 shows the estimated garbage tons by sector in Missoula in 2019. The table includes an estimate of tons per person per year (tons/pp/yr). C&D generates the most tons as a single sector (29%) but residential sources (combining single family and multifamily sectors) generate the highest percentage of tons (38%).

Table 4. Estimates of Missoula Garbage by Sector (2019)

	tons/yr	% of total	tons/pp/yr
Hauler Collected Garbage	**81,190**	**64%**	**1.08**
Residential	47,880	38%	0.63
Single Family	33,420	27%	
Multifamily	14,460	11%	
Commercial	33,310	26%	0.44
Other Garbage	**44,750**	**36%**	**0.59**
Self-hauled MSW	8,000	6%	0.11
Construction & Demolition	36,750	29%	0.49
Total Garbage	**125,940**	**100%**	**1.67**

City Operations

The City of Missoula (City) is the ninth largest employer in the city. The City subscribes to approximately 120 yards per week of regular garbage service. Using an estimated density factor of 74 pounds per cubic yard of service, this equates to generating an estimated 233 tons per year of garbage. Seasonal and on-call containers are not included in this estimate.

COMPOSITION ESTIMATES

Figure 2. Tons by Recoverability Group and Sector (2019)

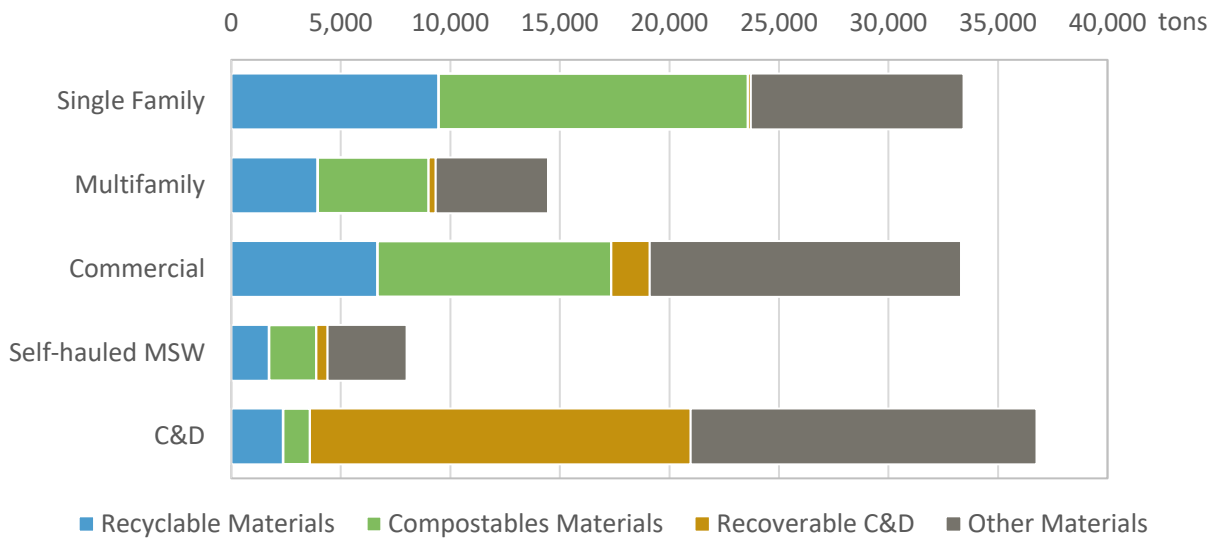

Figure 2 shows the tons by recoverability group and sector. Each material type was assigned to a recoverability group (Recyclable, Compostable, Recoverable C&D, and Other Materials) based on their acceptance in currently diversion programs. The majority of waste in Missoula is generated from the C&D, commercial, and single family sectors, but the single family sector generates the most recoverable waste materials.

Table 5 presents the modeled composition of garbage by sector. The largest material class of garbage in the single family sector is Organics (41.6%), followed by Paper (22.8%) and Other Materials (19.5%). Over 70% of the material generated by single family homes is recoverable. The multifamily sector also has a high recovery potential, with over 60% of garbage is either recyclable or compostable. Like single family, the largest material class is Organics (35.8%), followed by Paper (25.1%). Commercial waste is predominantly Organics (29.8%) followed by Paper (23.6%) and Plastic (14.5%). Just over 50 percent of commercial garbage is recoverable. The self-haul is estimated to be a little be less than 50% recoverable with Organics (28.2) as the largest material class. The majority of the C&D sector is C&D material (71%), but only 47.3% of C&D waste is identified as Recoverable C&D.[3]

[3] Republic commented that model estimate of C&D generated clean wood seems high. This could be because there is more recovery or reuse of wood occurring in Missoula than other areas. At this time, there is not enough information to account for this behavior in the model.

Table 5. Modeled Garbage Composition by Sector

	Single Family		Multifamily		Commercial		Self-haul		C&D	
Material	Est. %	Est. Tons	Est. %	Est. Tons	Est. %	Est. Tons	Est. %	Est. Tons	Est. %	Est. Tons
Paper	**22.8%**	**7,618**	**25.1%**	**3,629**	**23.6%**	**7,854**	**16.1%**	**1,291**	**4.5%**	**1,659**
Corrugated Cardboard	5.8%	1,940	3.7%	542	5.6%	1,865	4.5%	362	1.6%	596
Newspaper	1.3%	428	3.1%	441	0.6%	201	0.8%	64	0.1%	19
Other Recyclable Paper	10.6%	3,552	9.3%	1,345	6.6%	2,198	7.0%	561	1.1%	399
Compostable Paper	3.9%	1,287	6.2%	902	7.8%	2,596	2.4%	191	0.2%	80
Polycoated Paper	0.5%	156	1.3%	193	0.6%	216	0.3%	25	0.0%	18
Non-recoverable Paper	0.8%	255	1.4%	206	2.3%	778	1.1%	87	1.5%	547
Plastic	**6.5%**	**2,169**	**12.8%**	**1,850**	**14.5%**	**4,815**	**6.8%**	**545**	**7.5%**	**2,758**
#1 & #2 Plastic Containers	2.2%	742	2.2%	321	1.8%	600	1.4%	115	0.1%	28
Other Recyclable Plastics	1.0%	328	2.7%	388	1.3%	433	1.0%	79	0.1%	27
Shopping Bags	0.2%	72	0.2%	33	0.7%	239	0.2%	14	0.1%	40
Other Film	2.1%	705	2.6%	371	6.4%	2,132	1.9%	156	1.4%	529
Non-recoverable Plastics	1.0%	322	5.1%	737	4.2%	1,412	2.3%	182	5.8%	2,133
Glass	**5.7%**	**1,920**	**3.7%**	**539**	**2.2%**	**739**	**5.0%**	**399**	**1.2%**	**442**
Glass Containers	5.7%	1,896	3.1%	449	1.4%	468	3.7%	297	0.1%	35
Non-recoverable Glass	0.1%	24	0.6%	89	0.8%	271	1.3%	102	1.1%	408
Metal	**2.1%**	**696**	**4.5%**	**651**	**4.2%**	**1,404**	**4.4%**	**352**	**4.0%**	**1,472**
Tin/Steel Cans	0.7%	245	0.4%	51	0.6%	195	0.5%	37	0.0%	10
Aluminum Cans	0.7%	248	0.6%	86	0.2%	81	0.4%	36	0.0%	7
Other Recoverable Metal	0.2%	77	2.2%	317	1.9%	640	2.2%	177	3.4%	1,249
Non-recoverable Metal	0.4%	126	1.4%	197	1.5%	489	1.3%	102	0.6%	205
Organics	**41.6%**	**13,891**	**35.8%**	**5,178**	**29.8%**	**9,931**	**28.2%**	**2,254**	**5.2%**	**1,918**
Food	14.9%	4,983	22.5%	3,253	19.9%	6,628	10.2%	815	1.3%	484
Yard Waste	23.5%	7,851	6.3%	915	4.3%	1,439	14.3%	1,147	1.8%	661
Non-recoverable Organics	3.2%	1,057	7.0%	1,009	5.6%	1,865	3.7%	292	2.1%	773
C&D Materials	**1.8%**	**599**	**6.9%**	**1,001**	**13.4%**	**4,458**	**21.9%**	**1,753**	**71.0%**	**26,097**
Clean Wood	0.0%	10	1.8%	259	4.3%	1,448	5.4%	428	37.7%	13,869
Concrete, Asphalt & Aggregates	0.4%	130	0.4%	55	0.9%	309	1.1%	84	9.5%	3,500
Carpet	0.6%	206	0.5%	75	1.0%	347	2.2%	174	1.0%	362
Other C&D	0.8%	252	4.2%	612	7.1%	2,353	13.3%	1,066	22.8%	8,367
Other Materials	**19.5%**	**6,527**	**11.1%**	**1,612**	**12.3%**	**4,109**	**17.6%**	**1,407**	**6.5%**	**2,403**
Textiles	8.1%	2,715	4.0%	582	3.2%	1,074	5.8%	468	0.9%	336
Electronic Waste	0.2%	81	1.3%	191	0.8%	256	0.5%	39	0.2%	74
Bulky Items	0.6%	190	1.4%	210	1.9%	647	3.7%	299	1.9%	715
Tires	0.0%	5	0.1%	21	0.4%	147	0.9%	71	0.0%	2
Household Hazardous Waste	0.0%	13	0.4%	63	1.4%	476	0.2%	19	0.3%	114
Non-recoverable Other	10.5%	3,524	3.8%	545	4.5%	1,509	6.4%	511	3.2%	1,162
Recyclable Materials	28.3%	9,457	27.3%	3,940	20.1%	6,679	21.6%	1,728	6.5%	2,371
Compostables Materials	42.3%	14,122	35.1%	5,070	32.0%	10,663	26.9%	2,153	3.3%	1,225
Recoverable C&D	0.4%	141	2.2%	314	5.3%	1,757	6.4%	512	47.3%	17,369
Other Materials	29.0%	9,701	35.5%	5,135	42.7%	14,211	45.1%	3,607	43.0%	15,785
Totals	**100.0%**	**33,420**	**100.0%**	**14,460**	**100.0%**	**33,310**	**100.0%**	**8,000**	**100.0%**	**36,750**

Percentages for material types may not total 100% due to rounding.

Table 6 - Table 10 present the top five most prevalent recoverable materials in the garbage for each sector. In almost all sectors, the most prevalent material is an organic material. Yard waste accounts for 23.5 percent of the single family garbage; food is 22.5 percent of the multifamily sector; food is 19.9 percent of the commercial sector; yard waste is 14.3 percent of the self-haul sector. Most prevalent recyclable materials were mostly fiber, including corrugated cardboard and other recyclable paper, which were listed for four of the five sectors.

Table 6. Top Five Most Prevalent Recoverable Material Types, Single family

Material	Est. Percent	Est. Tons
Yard Waste	23.5%	7,851
Food	14.9%	4,983
Other Recyclable Paper	10.6%	3,552
Corrugated Cardboard	5.8%	1,940
Glass Containers	5.7%	1,896
Single Family Remaining Total	**60.5%**	**20,222**

Table 7. Top Five Most Prevalent Recoverable Material Types, Multifamily

Material	Est. Percent	Est. Tons
Food	22.5%	3,253
Other Recyclable Paper	9.3%	1,345
Yard Waste	6.3%	915
Compostable Paper	6.2%	902
Corrugated Cardboard	3.7%	542
Multifamily Remaining Total	**48.1%**	**6,957**

Table 8. Top Ten Most Prevalent Recoverable Material Types, Commercial

Material	Est. Percent	Est. Tons
Food	19.9%	6,628
Compostable Paper	7.8%	2,596
Other Recyclable Paper	6.6%	2,198
Corrugated Cardboard	5.6%	1,865
Clean Wood	4.3%	1,448
Commercial Remaining Total	**44.2%**	**14,735**

Table 9. Top Ten Most Prevalent Recoverable Material Types, Self-haul

Material	Est. Percent	Est. Tons
Yard Waste	14.3%	1,147
Food	10.2%	815
Other Recyclable Paper	7.0%	561
Clean Wood	5.4%	428
Corrugated Cardboard	4.5%	362
Self-hauled MSW Remaining Total	**41.4%**	**3,313**

Table 10. Top Ten Most Prevalent Recoverable Material Types, C&D

Material	Est. Percent	Est. Tons
Clean Wood	37.7%	13,869
Concrete, Asphalt & Aggregates	9.5%	3,500
Other Recoverable Metal	3.4%	1,249
Yard Waste	1.8%	661
Corrugated Cardboard	1.6%	596
C&D Remaining Total	**54.1%**	**19,875**

Recommendations

The following recommendations are potential avenues to maximize use of the model results, gather additional data, and increase diversion of material from the landfill. Cascadia based the recommendations on our understanding of the current diversion data, programs available to the City and the results of the model. The recommendations require additional research, thorough planning, investments in infrastructure and a cost-benefit analysis to determine if they are suitable for Missoula. But if executed, the recommendations would result in measurable environmental benefits including reductions in energy, natural resource use, landfill methane, or an increase of carbon storage in plants and trees, reductions in water used for irrigation and pesticide usage from applied compost.

How to Use the Model Results

- First, **consider magnitudes such as tons by sectors and tons by recoverability and sector**. This will help identify generators and streams to target for future diversion programs and help the City prioritize efforts.
- If you have questions about a specific material, **consult your local hauler and processers to help gather more data**. Please note that different materials have different densities, and the composition model uses tons rather than volume. For example, haulers may notice high quantities of plastic film compared to glass, but glass is much heavier and will have a more significant presence in the composition model as a result.
- **Do not use the data to right-size processing facilities or equipment**. There are a few low-cost studies that could be performed for these types of capital investments (like an incoming tonnage survey described below) that could improve this data set. If the City plans for a large capital investment, a study that will provide more precision such as a full waste composition study is recommended.

Future Waste Measurements

- **Keep annual tonnage records to track changes over time** and request data from Republic on a regular basis. Having a backlog of data over time will improve estimates and provide valuable information for future studies.
- **Identify other recycling processors** for both MSW and C&D **and establish a tracking system for tons** that are accepted from Missoula. It will be beneficial to track the current flows of materials generated in Missoula and to understand which facilities have processing capacity when trying to expand diversion programs.
- **Obtain more accurate estimates of C&D and self-haul tons** generated in Missoula. As described above, since the tonnage from these sectors were best guess estimates from Republic, it could be helpful to gather more information. The City of Missoula, in partnership with Republic, might consider conducting a survey, asking drivers of self-haul vehicles where their material originated from and the generator type as well as track the weights of these surveyed vehicles. Data collection could occur at the landfill for one week, during key seasons over a single year. Survey data can be used to estimate the portion of all inbound tons that are self-haul MSW versus C&D and the portion of inbound tons from the City of Missoula versus surrounding areas.

Diversion Programs

- **Expand organics collection of yard waste to all single family residents**. The model estimates that this sector disposes of the most yard waste (7,851 tons per year). Increasing yard waste collection and composting from single family residential dwellings could have a significant impact on organics diversion.
- **Expand organics collection of food waste to commercial customers**. The model estimates that the commercial sector disposes of 6,628 tons of food waste per year, more than any other sector. In addition, there are fewer commercial customers than residential customers, creating a smaller participant base to maintain lower levels of contamination through education and outreach. Beginning with a pilot program to collect food and compostable paper among a small selection of businesses could provide an opportunity to solve any challenges and/or barriers before rolling out a city-wide commercial organics collection program.
- **Expand source-separated recycling collection to all residents**.
    - Republic maintains a very low contamination rate for recycling, which is essential to their operations, as they currently send mixed recyclables elsewhere for processing. It is important to note that increasing participation in the recycling program does pose an additional risk of increasing the contamination rate. Maintaining a low contamination rate may require only accepting a short list of materials and increasing outreach efforts to educate residents about what belongs in the recycling bin.
    - Since there is not well-established recycling service currently in place, the City may consider a dual stream recycling collection system to maintain (or increase) the quality of the recyclable material, especially for paper.
- **Increase recycling and organics collection at City buildings and facilities.** As the ninth largest employer in Missoula, increasing recycling at City buildings could not only conserve resources and divert a significant amount of material, but the City could become a leading example in the community.
- **Provide yard waste recovery services at primary self-haul sites** (including the Missoula Landfill). Yard waste is the most prevalent material in the self-haul MSW stream (14.3%) and can be made into mulch and offered to the community at a small free or free of charge to be used as a landscaping amendment.
- **Find additional ways to divert "Concreate, Asphalt & Aggregates" from C&D**, an estimated 3,500 tons. C&D fines (small pieces of concrete/asphalt) can be used as landfill cover, asphalt shingles can be ground and used in the production of asphalt paving mixes, and ground-down concrete can be used in several applications including construction, landscaping, and erosion control. Collection and processing of these materials may be beneficial to City operations and will keep these valuable resources out of the landfill.