



FOOD SCRAP RECYCLING

2018 Landscape Assessment
Denver, Colorado

PREPARED BY:

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EXECUTIVE SUMMARY

The Natural Resources Defense Council (NRDC) estimates that 40% of food in the United States is wasted, the impacts of which reverberate across the nation socially, environmentally, and economically. To test potential solutions and develop a model of success for reducing food waste, NRDC, with support from the Rockefeller Foundation, is piloting policies, programs, engagement, and other efforts to reduce the generation and disposal of wasted food scraps in Denver, Colorado.

NRDC contracted with Resource Recycling Systems (RRS) to assist in a collection of research activities designed to provide NRDC with a better understanding of the current food scrap recycling capacity available in the City and County of Denver, as well identify the needs, opportunities, and barriers related to expanding food scrap recycling. The results of the research aim to provide guidance for City government on policies that do not require direct legislative action and programs to reduce wasted food and more effectively recycle food scraps.

The specific objectives of the project include:

- Identify and map existing food scrap processing facilities in the region including materials accepted, throughput, capacity, and potential for expansion.
- Review and assess existing food scrap recycling infrastructure in the City and County of Denver.
- Create a map of food scrap feedstock availability.
- Identify barriers and opportunities for expanded food scrap recycling including prioritized recommendations for action.

Processing Capacity Evaluation

In total, 845,587 tons of organic materials (including yard, wood waste, and industrial and agricultural compost) were diverted from disposal in Colorado in 2017; this represents 6.0% of the total waste stream generated in the state¹. Although exact data on the tons of food scraps (food residuals, source separated organics with food, and green waste) processed in the state is not publicly reported, interviews indicate that the total in 2017 was around 180,000 to 200,000 tons.

Over one-quarter (27.7%) of all permitted compost facilities in the state (10 out of 36) are located within 50 miles from the center of Denver². There are no active stand-alone anaerobic digesters in the region; the project team identified 10 waste water treatment plants (WWTPs) with operating anaerobic digesters. There are nearly 200 community gardens in the Denver area; however, none of them are currently accepting food scraps generated off-site for composting.

The project team estimates that between 382,000 and 425,500 tons of organics are processed within 50 miles of Denver; this represents 68 to 81% of the total residential and commercial organics (not including industrial / agricultural) materials processed in the state. Of that total, approximately 39,000 to 54,000 tons are estimated to include food residuals³. The project team estimates that the existing regional processors could process up to 360,000 additional tons of organics, with between 31,000 and 51,500 additional tons of food residuals on an annual basis. However, the interviews indicate that while there is capacity available, processors may not be willing to use the available capacity. Looking beyond the currently available capacity, there is an estimated 465,000 to

¹ 2017 annual data reported by commercial composters to CDPHE.

² 101 W. 14th Ave., Denver CO 80202

³ This includes food mixed with yard waste.

827,000 of additional *potential* capacity in the region. The vast majority of this potential capacity is related to a single facility, Heartland Biogas.

A summary of the processing infrastructure in the region, by type, is provided in Figure 1. The web-based ArcGIS map of the regional facilities data is available on-line: <https://arcg.is/OSnDz1>.

Figure 1: Processing Capacity Landscape Summary

Type	Summary
Permitted Compost Facilities	Although there is available capacity in the region, processors are choosing not to utilize the capacity for food residuals due to outside, unfavorable market conditions. Only 20% (2 out of 10) permitted sites in the region currently accept a significant amount of food residuals for processing and the largest processor is currently not accepting new tons of post-consumer food residuals due to issues with litter control. None of the potential processors indicated that they are interested in processing new tons of food residuals. The result is a high-risk processing situation in which the entire region, not just Denver, is relying on two companies to process all food scraps. The system is not resilient and system shocks can impede progress toward increased recovery of food scraps.
Potential Facilities	There are two sites that may be commissioned in the next year; these include the re-opening of the Heartland Biogas AD facility and the development of the Larimer County Regional compost site. If the AD facility does once again become operational in the region, there will be ample capacity to process food residuals.
Transfer Stations	The nearest compost facility is 21 miles, one way, from central Denver. Thus, the consolidation and transfer of direct loads of organics plays a key role in the processing facility landscape. There are six facilities located less than 20 miles from Denver, three of which transfer organics for processing. However, not all sites are accessible to all haulers, driving a potential need for a transfer operation in the northern portion of the City.
Agricultural Composting Operations	Agricultural sites, including dairy and cattle farms, that compost manure and yard waste are not required to be permitted as commercial compost sites under Section 14 regulations. They must, however, register with the Colorado Department of Agriculture (CDA) under the state’s fertilizer management program, a much easier process. Interviews indicate that there is significant agricultural composting occurring in Weld County and, to a lesser extent, Adams County. It is also technically possible for these agricultural sites to accept a small amount of vegetative food scraps for compost processing. Despite this opportunity, interviews with Department of Agriculture staff indicate that none of the farm or agriculture operations appear to be interested in accepting off-site food residuals or organics.
Waste Water Treatment Plants	The project team identified 10 wastewater treatment plants (WWTPs) with AD in the region, yet no facilities in either the region or state currently accept food scraps for processing. The low tip fees at landfills, high population growth in the region, and the potential multi-million dollar price tag of retrofits and upgrades required to accept food scraps make this an unlikely outlet for significant tons in the near future.
Backyard Composting, Drop-Offs, and Community Gardens	<u>Backyard Composting:</u> The volume of material that can be processed through backyard composting is significantly lower than at a conventional facility but is still valuable as a food waste recycling option. Denver already has several programs aimed at increasing backyard composting including Master Composter classes, Learn to Compost Classes, direct mailers, and social media engagement. <u>Drop-offs:</u> There is only one drop-off site accepting food residuals in the City and County of Denver, the city owned free drop-off located at the Cherry Creek Transfer Station. There is little potential to significantly increase recovery at the existing drop-off and no indication that additional drop-offs, either public or privately operated, are planned in the near future. <u>Community Gardens:</u> None of the community gardens reported that they currently accept food scraps for composting, either from members or non-members. However, there are models of successful community garden composting in the US that may serve as examples for Denver.

The key take-aways from the processing capacity research are:

- Less than two years ago, processing capacity was not an issue. Recently, however, the closure of Heartland Biogas AD facility (2017) and a litter-related issue at A1, both in Weld County, are putting pressure on regional capacity. However, if the A1 issue is resolved, and the Heartland facility is able to re-open in the near future, processing capacity will not be a challenge.
- The collection and operational economics combined with the low market demand for finished compost made from food scrap feedstock have resulted in a scenario where available capacity is not being activated by processors. Examples include Waste Management's choice to not fully utilize the permitted compost capacity at the Denver Arapahoe Disposal Site (DADS) and Western Disposal's (Boulder County) decision to not renew their compost permit.
- Landfill tip fees are low in the region, and compost processing costs (and tip fees) are comparatively high; as a result, it is hard for private sector actors to economically justify capital investments needed to improve or expand their compost operations.
- Contamination in organics streams that include food scraps is a major issue. Compounding the issue is that if processors do choose to invest in more capital to improve their processes and deal with the contamination, the gate fees will need to be raised to cover costs, making composting even less attractive economically.
- Although there are two active food scrap compost processors in the region, the market relies primarily on a single private sector operation for the vast majority of processing; this reliance results in a market that is not resilient to disruptions.
- Interviews indicate that there is little likelihood that a processor will open a new facility in the region in the short term due to the market economics and NIMBYism.
- Although a viable outlet elsewhere in the US, AD at waste water treatment plants is not being used as a processing solution in the region and it does not seem likely it will be used in the near term. There is still potential that it could be a part of the long-term solution.

Collection and Policy Review

Trash, recycling, and organics collection in Denver is provided by a mixture of private and public sector actors. Denver Solid Waste Management (SWM) is responsible for providing residential and Denver facility (e.g. libraries, jails, fire stations) services. Denver SWM also provides service to Denver Public Schools (DPS) through an intergovernmental agreement. Private sector haulers are responsible for managing the waste generated by multi-family residents and commercial entities.

There are no state requirements for food scrap or organics composting. However, in 2017 the state did adopt its first diversion rate goals, which while currently not enforced or actively tracked by county, may provide a policy driver for increased diversion in the future. In Denver, there are two significant policies that impact the landscape:

- 1) Hauler Licensing: The city requires all private sector haulers to obtain a license to operate within its borders. Other communities and counties have used hauler licensing as a tool to leverage the adoption of expanded service offerings and requirements, potentially including organics.
- 2) Denver Water Soil Amendment Requirement: Denver Water requires that property owners must apply 4 cubic yards of solid amendment per 1,000 feet of permeable area prior to installing landscape material. Property owners must provide documentation to Denver Water prior to having the water for the property

turned on. The requirement recommends the use of Class I or II compost but does not require it. The requirement is unique to Denver Water.

Based on the assessment, the project team identified the following key take-aways related to collection and policy:

- The three main policy and collection related barriers to food scrap recycling are: 1) Residential disincentive – Denver SWM charges a fee for organics collection while trash and recycling service does not charge a user fee; 2) Private sector service cost and demand - The cost of service is a barrier to generators, and on the other side, the lack of customer demand for service limits the number of haulers offering service; and 3) No local policy to support supply – There are no policies in Denver that encourage diversion of organics including food scraps.
- There are no regional or state policies aimed at supporting or increasing market demand for finished compost product, the lack of strong demand makes it harder for compost processors to operate in an economically sustainable model.
- Denver Water has a soil amendment use policy in place to help increase demand for compost products locally; however, other Denver agencies and nearby municipalities lack policies requiring use of compost in landscaping or construction, which, if adopted, could help drive the compost products market. Additionally, the existing Denver Water policy does not require the use of Class I or II compost.
- While Denver staff has invested significantly in residential, school, and facility organics collection program growth, there is not a sustained commitment or dedicated staff person in the City focused on commercial or multi-family organics or recycling.
- Property managers generally control multi-family material management service decisions, making it hard for individual residents to opt for organics collection service.

Feedstock Analysis

NRDC estimates that 108,530 tons of food waste are generated by commercial entities in the City and County of Denver.⁴ Using the NRDC dataset, the project team created a map of estimated total food waste generated annually in the City of Denver by zip code and NAICS code. Overall, the largest amount of food waste estimated to be generated in the City is located in the northernmost part of the city, around central business districts and major highways. The least amount generated is in the southeast and southwest parts of the city. The top three zip codes in terms of total estimated food waste generated, 80216, 80202, 80239, account for approximately one-third of the total estimated food waste generated in the City. The online map can be accessed by following the link <https://arcg.is/1XbCSa>

Stakeholder Meetings

Over a period of two months, the RRS project team conducted a series of targeted interviews and meetings with a variety of food scrap composting stakeholders. The 14 total interviews provided in-depth input on the barriers, gaps, and opportunities to improve the landscape for food scrap recycling. Stakeholders included city and county

⁴ NRDC, “Estimating Quantities and Types of Food Waste at the City Level”, October 2017. Food waste generation estimates were based on different formulas depending on the type of facility. For example, estimates for hospitals were based on number of beds and estimates for hotels, grocery stores, and restaurants were based on number of employees.

staff, haulers, non-profits, state regulators, local thought and trend leaders, and regional organics processors. The key takeaways from the stakeholder meetings include:

- Contamination, particularly in the post-consumer commercial and the residential curbside streams, is one of the most challenging issues for processors in the region. There is also a high level of contamination in the food scraps generated at Denver International Airport (DEN), a city owned and managed facility.
- Although multi-family housing makes up more than 35% of the housing in Denver, there is a minimal amount of Denver staff effort aimed at addressing the sector. Likewise, city staff does not have a sustained approach targeting increased food scrap composting by commercial generators.
- Assistance and engagement to build support among elected officials in Weld, Adams, and Denver County has the potential to reduce some of the current market risk related to processing capacity.
- Education and engagement to help reduce contamination, support the market for finished products, and expand demand for collection service were prioritized by stakeholders. Although there are organizations and non-profits working to increase composting access and messaging, there is a lack of coordination between these groups and the City, and within the City, across departments.
- Transporting residential materials for processing at out-of-county facilities is costly for the City of Denver as well as for private haulers servicing commercial generators in the City and County. This is especially true in the northern portion of the city.
- Physical infrastructure including a transfer station that can pre-treat organics to reduce contamination and a publicly owned compost facility in the region were identified as key regional needs. Currently, there are no publicly owned compost operations within 50 miles of Denver.
- Adoption of local, regional, or state policies designed to bolster the market for end- products were mentioned by many stakeholders as a significant regional need. Requirements for the purchase of locally sourced compost, state policy to require soil amendment in CDOT, and tax incentives for utilization of compost were mentioned as examples of potential policy drivers. Additionally, policy at the state or local level to drive increased recovery such as variable rates for residential trash or multi-family targeted policies were mentioned as important tools for consideration.

Recommendations

Using a systems-based approach in which evaluates all facets of materials management from collection to policy to end-markets; the project team evaluated Denver’s food scrap recycling system and developed a set of prioritized recommendations. The high priority recommendations are those that the project team believes should be considered for action in the near term as they are either low hanging fruit or are recommendations that can have a large impact on the region. The recommended action steps are presented, by area of engagement, in Figure 2.

Figure 2: Recommended Action Steps (high priority recommendations are in **Bold**)

Area of Engagement	Action Steps
Collection	<ul style="list-style-type: none"> Support expansion of Denver SWM residential organics collection programs. Support Denver's plans to build a new transfer station.
Processing	<ul style="list-style-type: none"> Encourage the full use of permitted compost operations at Denver Arapahoe Disposal Site (DADS), potentially through a third part operator. Encourage Denver SWM to enter into longer term processing contracts with organics processors. Send elected officials, and publicly release, letters of support for compost operations in Weld, Adams, and Denver counties. Facilitate discussions with wastewater treatment plants to investigate AD processing for targeted streams of food scraps.
End Markets	<ul style="list-style-type: none"> Examine local policies to support market demand in the region. Organize stakeholder group(s) to examine state requirements for compost use. Support the adoption of agreements between processors / haulers and municipalities / counties to buy back compost products made from local feedstock. Coordinate joint a marketing campaign to drive demand for finished compost.
Education and Engagement	<ul style="list-style-type: none"> Conduct targeted commercial education to increase participation for select generators and decrease contamination. Enact an employee engagement campaign at Denver International Airport to decrease contamination and increase diversion. Support internal city operations for education and outreach in all sectors.
Supporting Policies	<ul style="list-style-type: none"> Investigate city and county level policies to drive supply of food scraps for processing. Support Denver SWM pay-as-you-throw efforts.
Public / Private Coordination	<ul style="list-style-type: none"> Establish local partnerships with like-minded non-profit entities to expand reach of marketing and build support for reduced food waste. Activate Denver cross departmental (Denver SWM, DDPHE, Mayor’s Office for Sustainability) coordination. Explore coordination with the state recycling non-profit (Colorado Association for Recycling (CAFR)).

TASK 1: PROCESSING CAPACITY EVALUATION

The aim of Task 1 was to provide NRDC with an understanding of the processing capacity for food scraps today and into the future in the Denver metro region. To complete the task, the project team conducted the following activities:

- **Facility Identification and Survey:** Developed a complete listing of all processing facilities located within a 50-mile radius (drive distance) of Denver. In addition to permitted compost sites, the listing included stand-alone anaerobic digestion (AD) facilities and those co-located at wastewater treatment plants, large community or on-site composting opportunities, and transfer stations. A summary of the facilities is included in the narrative and an Excel spreadsheet with site-specific details, gathered through direct interviews and secondary research, is included separately.
- **ArcGIS Map:** Created a dynamic web-based ArcGIS map of the regional facilities. For each identified location, the interactive map includes site-specific details. The map is available on-line: <https://arcg.is/0SnDz1>
- **Evaluation of Processing Capacity:** Provided a review of the overall landscape for food scrap processing infrastructure in the region including an evaluation of the annual throughput and both the currently available and potentially available capacity in the region.

SUMMARY FINDINGS

The processing facility landscape today is in a period of flux. The largest facility in the state (Heartland Biogas) was closed in February 2017 and in early summer 2018 the largest compost processor in the region, A1, decided to halt the delivery of commercial post-consumer organics. Thus, while just a year and a half ago the state seemed to have ample processing capacity, capacity has recently become a pressing issue. While stakeholders in the region are collaborating on ways to re-open access to existing capacity, and most expect that the short-term issues will be resolved, the relative landfill disposal fees, transportation costs, contamination in the stream, and the market for finished composts are limiting the growth of processing infrastructure in the long term.

The entire system is currently relying on two privately owned and operated firms to process nearly 100% of the source separated organics and food residuals in the region. This reliance on a small number of processors means the system is subject to potential upheaval. There is little market diversification and the public sector has no control over processing. Interviews indicate it is unlikely that a new actor is willing to enter the market in the near term due to the high costs of investment (potentially \$10M+), the low landfill tip fees⁵, and the uncertainty around the future of composting support in Weld County. Property costs, NIMBYism, and lack of available property make the prospects of a new facility being developed in Denver County highly unlikely, and while Adams County may offer a potential location and has a high concentration of manure feedstocks, the economic and transportation issues

⁵ For 2018, the national MSW landfill tip fee average was \$55.11/ton. In the Mountains/Plains region (CO, MT, ND, SD, UT, WY), the average tip fee was \$43.57/ton." <https://erefdn.org/product/analysis-msw-landfill-tipping-fees-2/>. For comparison, Denver SWM pays less than \$20 / ton to dispose of MSW in the landfill, and although an in-depth tipping fee evaluation was beyond the scope of this project, the tip fees for MSW in Colorado's front range are generally between \$17 / ton to \$30 / ton.

would still be a barrier to new site development. The exception to this is a planned regional compost facility in Larimer County which, while a potentially significant expansion of processing capacity in the Front Range, will be too far away to be a viable outlet for Denver.

Despite the challenges, overall, there is ample permitted and available capacity to process food residuals in the Denver region today. Additionally, there is the potential to more than double the available capacity in the future through the re-commissioning of closed sites and expansion of existing sites. While research shows that there is available physical capacity, the market, economic, and political barriers in the region may result in a situation where the available and future capacity cannot be fully realized. This is exemplified by the fact that multiple facilities permitted to accept food residuals have chosen not to do so, and in fact one processor has decided to let their permit expire in the last several months.

REGULATORY FRAMEWORK

The Colorado Department of Public Health and Environment (CDPHE) is charged with the permitting, enforcement and oversight of solid waste management, including organics processing. This responsibility includes the enforcement of Section 14 of the state regulations related to the oversight of commercial compost facilities⁶. A commercial compost facility is defined in Colorado as a facility that 'accepts a fee for solid waste composting, or any solid waste composting facility that composts solid waste to create a compost or soil amendment and distributes the compost'. The statutes include specific definitions that pertain to food scraps, and as discussed in the side bar, the regulatory structure and permits are based on the defined feedstock types and amounts. State statutes define *food residuals* as including both pre- and post-consumer food discards from households and commercial / institutional generators. The category also includes compostable food serviceware and packaging⁷. Additionally, the state statutes define *source separated organics* as compostable material separated at the point of generation 'including but not limited to yard waste, food residuals, vegetative waste, woody materials, and compostable products'. Lastly, *green waste* includes 'yard waste, vegetative plant wastes from the vegetable food processing industry, untreated wood wastes, paper products and pre-consumer vegetative food waste'.

Colorado Regulations and Facility Designation

Commercial compost sites in Colorado are designated Class I, II, or III. The designations are based upon the type and amount of feedstock processed.

Feedstock: *There are three types of feedstock defined in the state regulations: **Type 1:** Vegetative waste, **Type 2:** Animal waste, manure, source separated organics (SSO), food residuals, and food processing vegetative waste, **Type 3:** Biosolids, mixed solid waste, processed solid waste and sludges, and food processing residuals not included in Type 1 or 2.*

Classification: *Class I facilities compost only Type 1 feedstocks with less than 50,000 cubic yards of feedstock onsite or compost only SSO and food residuals generated together with less than 5,000 cubic yards of SSO onsite and composting area less than 2 acres in size. Class I also includes composting at the site of generation or an agricultural zoned property that does not meet the regulatory exemptions for permitting. Class II facilities process Type 1 feedstocks and manure and have less than 50,000 cubic yards onsite at any one time. A Class III facility processes Type 1, Type 2, and / or Type 3 feedstocks and is the most stringently regulated class in the state.*

⁶ The section 14 regulations do not apply to composting of biosolids at waste water treatment plants (WWTP), backyard composting as defined by the state regulations, or agricultural composters. The regulations were last updated in 2016.

⁷ CDPHE 6 CCR 1007-2, Part 1. Regulations pertaining to Solid Waste Sites and Facilities.

STATE SUMMARY

In total, there are 36 permitted commercial compost facilities in Colorado⁸, eight of which are co-located at landfills. Of these 36 sites, 46% are designated Class III processors and can accept all feedstock types while 37% of the sites are designated Class I and are limited in the amounts and types of feedstocks they accept. The remaining facilities are Class II and are *not* permitted to accept food residuals.

In 2017, 406,472 tons of compost feedstock were processed in Colorado. This is a 40.5% increase over the reported tons of compost feedstock processed in 2016⁹. An additional 149,159 tons of ‘organic material’ (including yard waste and wood waste) was processed in 2017 as well 289,956 tons of industrial and agricultural compost feedstock. In total, 845,587 tons of organic materials were diverted from disposal in Colorado in 2017; this represents 6.0% of the total waste stream generated in the state¹⁰. If industrial and agricultural waste are excluded, the total tons composted in 2017 was reported to be 555,631. Although exact data on the tons of food scraps (food residuals, source separated organics with food, and green waste) processed in the state is not publicly reported, interviews indicate that the total in 2017 was around 180,000 to 200,000 tons. The reported tons processed in Colorado in 2017 are displayed in Figure 1.1.

Figure 1.1: Tons of Organic Materials Processed in Colorado in 2017¹¹

Source	Material	2017 Tons
Municipal Solid Waste (residential and commercial)	Compost feedstock (food waste, yard waste)	406,472
	Organic materials (yard waste, wood waste)	149,159
	TOTAL	555,631
Industrial Material	Compost Feedstock (industrial, agricultural)	289,956
Combined Total	TOTAL	845,587

REGIONAL THROUGHPUT, AVAILABLE, AND POTENTIAL CAPACITY

Starting with the permitted compost sites and active utilities with waste water treatment and discharge permits, and followed by interviews with state and regional stakeholders, the project team created an exhaustive list of sites in the region currently or potentially processing food scraps. The project team next conducted online research and follow-up phone interviews with facility staff to confirm the status of each facility, understand what materials are accepted for processing, and make determinations on throughput and capacity. The interviews and data research were used to determine three key levels of information for *all organics* (including all compostable materials such as manure, biosolids, animal mortalities, yard waste, and food residuals) as well as *food only* (pre- and post-consumer, residential yard waste mixed with food scraps). The three key pieces of information are described below:

- **Annual Throughput:** Estimated tons of material processed on an annual basis.
- **Available Capacity:** Current available capacity without significant facility expansions or upgrades. Available capacity is not necessarily an indication of the likelihood that facilities would utilize the capacity.

⁸ Reported by CDPHE on February 2018 for 2017 calendar year.

⁹ RRS interviewed state and local sources to try to identify the reason for the large increase. Although no individual reasons were provided, the increase is thought to be due to expanded residential recycling in Denver, the universal organics collection ordinance in Boulder, new commercial routes targeting restaurants and grocery stores, as well as the Heartland Biogas facility efforts to source new feedstocks in late 2016 and early 2017.

¹⁰ 2017 annual data reported by commercial composters to CDPHE.

¹¹ Colorado Department of Public Health and Environment Solid Waste Annual Report, 2018

- **Potential Capacity:** Capacity available only with significant expansion or facility upgrades. As with available capacity, the potential capacity data is not an indication of the likelihood that the expansions or upgrades would occur.

Findings: Over one-quarter (27.7%) of all permitted compost facilities in the state (10 out of 36) are located within 50 miles from the center of Denver¹². Of the facilities in the region, 50% are permitted Class III and 30% are Class I. There are no active stand-alone anaerobic digesters in the region; the project team identified 10 waste water treatment plants (WWTPs) with operating anaerobic digesters. There are nearly 200 community gardens in the Denver area.

Based on the interview and research findings, the project team estimates that between 382,000 and 425,500 tons of organics are processed within 50 miles of Denver; this represents 68 to 81% of the total residential and commercial organics (not including industrial / agricultural) materials processed in the state. Of that total, approximately 39,000 to 54,000 tons are estimated to include food residuals¹³. Current estimates place the annual regional processing capacity up to 360,000 additional tons of organics, with between 31,000 and 51,500 additional tons of food residuals on an annual basis. However, the interviews indicate that while there is capacity available, processors may not be willing to use the available capacity.

Looking beyond the currently available capacity, there is an estimated 465,000 to 827,000 of additional *potential* capacity in the region. The vast majority of this potential capacity is related to a single facility, Heartland Biogas (more information on the facility is included below). The potential capacity for food scraps includes an evaluation of expanded backyard composting in Denver, exempt agricultural composting operations, and WWTPs. Figure 1.2 displays the estimated totals.

Figure 1.2: Estimated Throughput, Capacity, and Potential

	Type	Low Estimate	High Estimate
Annual Throughput (All)	<i>All organics</i>	382,000	452,500
	Food only ¹⁴	39,000	54,000
Available Capacity	<i>All organics</i>	315,000	360,000
	Food only	31,000	51,500
Potential Capacity	<i>All organics</i>	465,000	827,000
	Food only (no WWTP)	210,250	370,350
	Food only (with WWTP included)	223,500	412,500

¹² 101 W. 14th Ave., Denver CO 80202

¹³ This includes food mixed with yard waste.

¹⁴ These represent the interview results and are most likely low for two reasons. 1) Western Disposal processed an estimated 20K – 30K tons of SSO with food in 2017 which is *not* included in the annual throughput as the facility let their permit expire in 2018. 2) The tons processed at Heartland Biogas in 2017 are not included in the annual throughput totals as the facility is currently closed. Together, this could be as much as 50K to 100K tons of organics with food residuals. The interviews indicate that a significant portion of the tons from both Western and Heartland are most likely being directed to other facilities in the region, namely A1, but it is also assumed that some of those tons are either being sent to out-of-region facilities, landfilled, no longer being source separated for diversion, or are otherwise not ‘counted’ in the totals in Figure 1.

CAPACITY BY FACILITY TYPE

The remainder of this report provides a narrative summary of the data contained within the associated data set and ArcGIS map by facility type.

Permitted Compost Facilities

Current Capacity: 315,000 to 360,000 tons all organics, 31,000 to 51,500 tons food only.

Potential Capacity: 60,000 to 120,000 tons all organics, 10,000 to 20,000 tons food only.

Likelihood of Expanded Capacity: Low.

Summary: Only 20% (2 out of 10) permitted sites currently accept a significant amount of food residuals for processing (A1 Organics and East Regional Landfill), and a third site accepts a very small amount of food residuals (Stromo Composting). The largest processor in the region, A1 Organics, is currently not accepting new tons of post-consumer food residuals (either residential source separated organics or commercial source separated organics or food residuals) due to issues with litter control. Additionally, there are processors (Waste Management [WM] operating at Denver Arapahoe Disposal Site and Western Disposal in Boulder) who, although permitted to process food residuals, have chosen not to accept them in their streams. No other processors indicated that they are interested in processing food residuals. Although there is available capacity in the region, processors are choosing not to utilize the capacity for food residuals due to outside, unfavorable market conditions. Overall, this results in a high-risk processing situation in which the entire region, not just Denver, is relying on two companies to process all food scraps. As the recent challenges at A1 demonstrate, the system is not resilient and system shocks can impede progress toward increased recovery of food scraps.

East Regional Landfill. 8201 Schumaker Road, Bennett, CO, 80102 – Owned and operated by Alpine Waste and Recycling which was recently (June 2018) acquired by Waste Industries. Compost operation is co-located on an active landfill and is currently processing yard waste, mainly from contractors, and commercial pre- and post-consumer food scraps from the Denver metro region. Prior to the litter control issues at A1, Alpine was consolidating organics and sending them to A1 for composting. Alpine has the potential to expand their compost footprint but has no plans to do so. The company expects that Heartland Biogas will be able to re-open and when it does, they will send their food residual loads to the facility for processing.

A1 Organics - Rattler Ridge Site. 12002 Weld County Road, Keansburg, CO, 80643. A1 is the largest compost operator in the Rocky Mountain region. A1 alone is responsible for managing nearly half of the commercial and residential organics composted in the entire state. Additionally, A1 has the potential to double their throughput on their current footprint. Despite their size, strong reputation, and long-standing operations in the state, the company is in the process of dealing with a litter control issue in Weld County¹⁵. Due to this issue, A1 has chosen to not accept additional tons of commercial post-consumer organics (with BPI certified bags, compostable service ware, paper towels, etc.). The action is the result of a requirement to show Weld County that the facility is taking steps to reduce blowing litter. The roots of the problem can be traced back to the February 2017 shut down of Heartland Biogas AD. When the facility shut down, A1 Rattler Ridge began to take the majority of tons of organics previously processed by Heartland. The new tons, combined with high contamination rates in the residential and commercial streams, the windrow composting processing, and an extremely windy winter, resulted in blowing litter. The long-term solution for A1 is two-fold: 1) A1 would like to set up a pre-processing operation at the Rattler Ridge facility to clean

¹⁵ Weld County is taking action against A1 and has filed a complaint on off-site litter. It is the first complaint against the facility in 18 years of operation.

incoming loads of source separated organics with food residuals; the pre-processing operation may cost as much as \$1M and would include a covered area for dropping and cleaning loads, and 2) the re-opening of the Heartland Biogas facility.

Stromo Composting. 21970 Road 30, Hudson, CO, 80642 – This facility is a permitted Class III facility in Weld County, approximately 55 miles northeast of Denver. Stromo Composting processes biosolids, animal waste, blood mix, and compost bulking materials. Stromo has investigated processing food residuals and source separated commercial organics but has decided that the contamination and costs make it prohibitive. The site is also near its maximum capacity and has little potential to expand.

Denver Arapahoe Disposal Site (DADS). 3500 Gun Club Road, Aurora, CO, 80018. Composting operation is operated by WM and co-located at DADS. DADS is owned by the City and County of Denver and operated by WM. The Class III facility is permitted for 100,000 tons or more of capacity but is processing less than 5,000 tons per year with no post-consumer food scraps. It is unclear whether the facility is accepting any pre-consumer food scraps for processing, but it appears to be unlikely. Although the facility would not respond to interview questions or calls, interviews with other stakeholders indicate that WM has very little to no interest in accepting or processing post-consumer source separated organics (either residential or commercial). In fact, the WM routes with commercial organics were acquired by Alpine.

Western Disposal Compost Site. 2655 North 63rd Street, Boulder, CO, 80301. Western Disposal owned and operated a Class III permitted site located within the Boulder city limits. Western was accepting residential and commercial loads of post-consumer source separated organics with food residuals. Due to market issues (challenges in selling finished compost, high rates of contamination, low tip fees, and needed site upgrades) Western chose to let the permit expire in the spring of 2018. The facility no longer processes any compost. All incoming loads are ground to ¼” minus (due to Emerald Ash Borer quarantine), hand cleaned to remove large items of contamination like plastic bags and sent to A1 for composting. Although other regional haulers are allowed to access the facility, the gate fees are 3 to 5 times higher than disposal at a landfill.

Permagreen Product Company. 2663 Weld County Road, Erie, CO, 80514 – This facility is a Class II permitted facility on a 10-acre plot in Weld County, approximately 40 miles north of Denver. The company is primarily a packaging operation that packages finished compost into 30-pound bags for sale to wholesalers and the public. Material is allowed to finish composting and then processed through screens before being packaged.

B.O.S.S. Compost. 16700 Weld County Road 12, Fort Lupton, CO, 80021 – This facility is a Class II permitted facility in Weld County, approximately 35 miles northeast of Denver. The BOSS Compost company was started in 1978. The facility processes agricultural materials, such as cornstalks, straw, wood shavings, animal bedding and manure, in windrows and does not have any potential to accept food residuals for processing.

Organix Supply. 15121 County Road 32, Platteville, CO, 80651 – Organix supply is a Class I permitted facility in Weld County, approximately 41 miles northeast of Denver. Organix Supply processes untreated natural wood only, including pallets and wood from construction and demolition, in windrows.

TV Dairy. 7678 Weld County Road 17, Fort Lupton, CO 80621 – TV Dairy is a permitted Class I facility in Weld County, approximately 32 miles north of Denver. The facility is primarily a dairy cow operation that contracts with Select Materials to manage the compost operation. The facility processes yard waste

and cattle manure in windrows. As of 2012, the facility was permitted to produce 31,000 tons of finished compost. They are not interested in adding food residuals to their process.

Front Range Dairy. 9743 Weld County Road 16, Fort Lupton, CO 80621 – Front Range Dairy is a Class I facility in Weld County, approximately 33 miles north of Denver and near TV Dairy. Like TV Dairy, this facility is also a primarily a dairy cow operation that processes cattle manure. As of 2013, the facility was permitted to produce 22,000 tons of finished compost. They are not interested in adding food residuals to their process.

Mountain View Farm. 6875 North County Road 9, Loveland, CO, 80538 – This facility is a class I permitted facility in Larimer County, approximately 54 miles north of Denver. The facility is primarily a cattle operation that processes cattle manure and wood. As of 2014, the facility was permitted to have 20,000 tons of finished compost on-site. (NOTE: not mapped as it is out of the 50-mile limit).

Potential Facilities

Current Capacity: None.

Potential Capacity: 400,000 to 700,000 tons all organics, 200,000 to 350,000 tons food only¹⁶.

Likelihood of Expanded Capacity: High.

Summary: There are two sites that may be commissioned in the next year; these include the re-opening of the Heartland Biogas AD facility and the development of the Larimer County Regional compost site. If the AD facility does once again become operational in the region, there will be ample capacity to process the food residuals. While Larimer County's facility would be out of the region and not represent an outlet for Denver, it would be the first regionally planned publicly owned site in the front range and would provide a good model for other front range cities to watch. It could also help reduce demand at A1 and open up some of the regional capacity for Denver haulers or generators.

Heartland Biogas. 19179 Weld County Road 49, LaSalle, CO, 80642. Opened in 2016, Heartland is located 44 miles (one way) from downtown Denver and was one of the largest AD facilities in North America, requiring a \$102M investment. The facility was a joint venture between Heartland Renewable Energy and Electricity de France (EDF); A1 was the compost processor at the facility. When it was fully operating, the facility was processing about 2,000 tons of incoming organics per day (as much as 700,000 tons annually). This included manure, industrial food residuals, grease, packaged and expired food (de-packaged using Doda technology), as well as residential and commercial source separated organics. Heartland had an 18-year agreement with Sacramento Municipal Utility District (SMUD) for the off-take of methane as part of a long-term power purchase agreement. When it was operational, Heartland was able to make the costs of processing organics on par with the low landfill tip fees in the state, significantly driving the regional market. In 2016, a series of complaints (filed by only 10 different residents) on odors resulted in a single cited odor violation. In response, EDF and Heartland invested \$1M in odor mitigation and planned to invest \$3M additionally. Despite the resolution of the odor issue (800 additional odor tests identified 0 violations) a technicality on the Certificate of Designations (CD) coupled with toxic local politics resulted in the facility being closed in February 2017. Negotiations are currently underway for the sale of the facility and, if successful, the facility may be running again later in 2018 or early 2019. If the facility gets up and running again, it can more than easily process all the food scraps and organics in the region.

¹⁶ Does not include potential at the Larimer County site.

Larimer County Landfill. 5887 S Taft Hill Rd. Fort Collins, CO. The landfill is a publicly owned and operated facility located south of Fort Collins (62 miles one way from Denver). Although not currently composting, the facility is included in the landscape as a result of the recently conducted Regional Wasteshed Study for the County. The landfill is expected to be at full capacity by 2025, and the cities in the wasteshed have been working cooperatively to determine what they should do for post-closure. Although not yet approved, the plan includes a full-scale Class III compost operation to be built at the landfill site. If approved by the county commissioners, the compost operation may start as early as 2019. The compost operation would be the first publicly owned and operated facility in the front range¹⁷. The site would represent a collaborative process with a wide range of stakeholders to sustainably manage food scraps. Ideally, the compost operation would be supported through regional Intergovernmental Agreement (IGA) for delivery of materials as well as policy to bolster collection and local end markets for finished compost¹⁸.

Transfer Stations

Current Capacity: Not applicable.

Potential Capacity: Not applicable.

Likelihood of Expanded Capacity: Not applicable.

Summary: The nearest compost facility is 21 miles, one way, from central Denver. Thus, the consolidation and transfer of direct loads of organics plays a key role in the processing facility landscape. There are six facilities located less than 20 miles from Denver, three of which transfer organics for processing (Cherry Creek Transfer Station, Altogether Recycling and Monaco St Organic Recycling Facility). However, not all sites are accessible to all haulers, driving a potential need for a transfer operation in the northern portion of the City. Figure 1.3 provides a summary of the transfer stations located in the region.

Figure 1.3: Transfer Stations

Site	Street	City	Distance to Denver	Description
Cherry Creek Transfer Station (Denver)	7352 Cherry Creek S Drive	Denver	7 mi.	Denver-owned transfer station, which consolidates and transfers residential organics out of county for processing
South Metro Transfer Station (Waste Management)	2400 West Union Avenue	Englewood	10 mi.	Privately owned and operated facility accepting MSW for consolidation and disposal
D&R Transfer Station (Waste Management)	6091 Brighton Boulevard	Commerce City	9 mi.	Privately owned and operated facility accepting MSW for consolidation and disposal
Altogether Recycling (Alpine)	7373 Washington Street	Denver	6 mi.	Privately owned and operated facility accepting MSW, recyclables, and organics from commercial customers for transfer to disposal and processing facilities. Recycling drop-off co-located at facility
Jordan Road Transfer Station (Waste Connections)	7120 South Jordan Road	Englewood	19 mi.	Privately owned and operated facility accepting MSW for consolidation and disposal

¹⁷ There are multiple publicly owned and operated sites in the state accepting food residuals including operations in Summit County, Pitkin County, and Mesa County.

¹⁸ More information on the regional wasteshed planning available on line: <https://www.larimer.org/solidwaste/wasteshed>

Site	Street	City	Distance to Denver	Description
Monaco St Organics Recycling Facility (A1 Organics)	9109 Monaco St.	Commerce City	12 mi.	Privately owned drop-off and transfer station. Consolidates and transfers loads of source separated organics for processing, drop-off and grinding for wood, lumber, and brush

Conditionally Exempt Agricultural Composting Operations

Current Capacity: No data available on registered sites.

Potential Capacity: None.

Likelihood of Expanded Capacity: Very low.

Summary: Agricultural sites, including dairy and cattle farms, that compost manure and yard waste are not required to be permitted as commercial compost sites under Section 14 regulations. They must however, register with the Colorado Department of Agriculture (CDA) under the state’s fertilizer management program, a much easier process. Despite requests to CDA, data on registered sites is not publicly available. Interviews indicate that there is significant agricultural composting occurring in Weld County and to a lesser extent, Adams County. It is also technically possible for these agricultural sites to accept a small amount of vegetative food scraps for compost processing. The CDPHE regulations state that Class I facilities (the facilities with the lowest level of regulatory oversight) can accept “Other Compatible Materials,” which means the minimum quantity of materials necessary to achieve proper composting, and that ‘such materials are limited to Type 1 feedstocks, manure and **green wastes**’. Despite this opportunity, interviews with Department of Agriculture staff indicate that none of the farm or agriculture operations appear to be interested in accepting off-site food residuals or organics. The acceptance of these materials would move the sites from registered under CDA rules to permitted under CDPHE. Even if they were designated Class I, the move would require additional adherence to regulations, oversight, and potentially significant investments in site upgrades and equipment.

Wastewater Treatment Plants

Current capacity: None. No WWTPs are accepting outside feeds or trucked loads of food scraps.

Potential Capacity: 15,500 to 49,500 tons per year¹⁹.

Likelihood of expansion: None in near term, Very low in long term.

Summary

The project team identified 10 wastewater treatment plants (WWTPs) with AD in the region, yet no facilities in either the region or state currently accept food scraps for processing. The low tip fees at landfills, high population growth in the region, and the potential multi-million dollar price tag of retrofits and upgrades required to accept food scraps make this an unlikely outlet for significant tons in the near future.

WWTPs were investigated because of their potential to increase diversion of food waste through adding food waste into the facilities with existing anaerobic digesters. For the process to work, food waste must be pre-treated and have liquid added to it before entering the wastewater treatment facility. Food waste is typically added to a dilution tank and turned into a slurry. Some facilities also install machinery to de-package, chop and grind food waste on-site or off-site (similar to the Doda used at the Heartland Biogas facility), prior to adding the food waste

¹⁹ RRS estimates of potential food waste processing capacity were based on case studies of WWTPs with food waste processing and looked at each facilities’ average dry weather flow, flow capacity, and anaerobic digester. The case studies came from this report: EPA, “Food Waste to Energy: How Six Water Resource Recovery Facilities are Boosting Biogas Production and the Bottom Line”, September 2014. https://www.epa.gov/sites/production/files/2016-07/documents/food_waste_to_energy_-_final.pdf

to the stream. Other facilities use manual labor to remove contaminants. The limit on how much of the slurry can be solids before it enters the anaerobic digesters ranges from 3%-35% depending on the facility.

The AD and WWTP process results in biosolids or 'sludge'. Colorado is reported to be above the national average in the use of biosolid application as an agricultural amendment or fertilizer. According to the Colorado State University, 85% of Colorado's biosolids are used in either agricultural uses (60%), reclamation (forests, golf courses, revegetation of mining areas, 20%), or sold to nurseries and private citizens (5%). Only 15% is sent to landfills as opposed to the national average of 50%²⁰²¹.

As stated above, there are no wastewater treatment facilities accepting food waste for co-digestion with wastewater in Colorado, although there is one city that is evaluating the potential to add it (see sidebar). Accepting food waste at WWTPs appears to be technically and legally feasible in the state of Colorado but other barriers to accepting food waste pose significant challenges, including:

- Existing anaerobic digesters and available capacity to process added materials
- Significant financial investment in adding necessary pre-treatment processing equipment
- Available square footage to expand operation
- Source of consistent feedstock in quality and amount
- Ability to process additional energy and biosolids from added organics
- Need for collection infrastructure

Additionally, including food waste in WWTP processing which results in biosolids sent to landfill does not result in that food waste actually being diverted, which may pose a challenge to meeting diversion goals. Due to these challenges, RRS believes there is no potential for WWTPs in the Denver Metro area to accept food waste in the short term. However, if facilities with anaerobic digesters made significant investment in their facilities infrastructure, including addition of pre-treatment equipment, there could be potential for some facilities to accept food waste in the future. It would also be important that the biosolids were used in land application and not landfilled. The 10 facilities below are in the Denver region and have active AD units.

Colorado Springs Utility, Colorado Springs, Colorado

Colorado Springs Utility (CSU) is evaluating the potential to take food waste at their wastewater treatment facility. If implemented, it would be the first such facility in the state to do so. The facility currently processes 30 million gallons of water per day with a permitted capacity of 75 million gallons. Facility staff estimate that during Phase I the facility could take in 40-60 tons of food waste per day and up to 200 tons per day in Phase II. To be able to process the food waste, the facility would need to install pre-treatment station including a receiving area, packaging removal equipment and equipment to grind food into a slurry before it enters the anaerobic digester. The energy output would be biogas that could be added to the existing natural gas pipeline. CSU is considering food waste from commercial and institutional processes but would need policy in place before accepting food waste to ensure consistent quantity of feedstock to make the project economically viable. Other considerations include the addition of a designated driver and truck to haul the food waste to the facility, as well as disposition of the digestate. Cost estimates are being developed to determine the long-term feasibility of the upgrade.

²⁰ <https://www.epa.gov/biosolids/frequent-questions-about-biosolids>

²¹ <http://biosolids.qsuci.colostate.edu/> , <https://spwaterrenewalpartners.org/citizens/land-application-information/>, Cernansky, Rachel "Waste Not". 5280 Magazine, July 2014

Robert W. Hite Wastewater Treatment Facility. 6450 York Street, Denver, CO, 80216 – The plant treats 140 million gallons per day with a peak capacity of 220 mgd. The district serves 1.7 million people including Denver, Arvada, Aurora, Brighton, Lakewood, Wheat Ridge, Thornton, and part of Westminster.

Northern Wastewater Treatment Plant. 51 Baseline Road, Brighton, CO, 80603 – The plant provides service to 300,000 Denver Metro area residents and has the capacity to provide service to 24 million gallons per day (mgd) with potential room for expansion up to 60 mgd.

Littleton/Englewood Wastewater Treatment Plant. 2900 S Platte River Dr., Englewood, CO, 80110 – The plant treats 50 million gallons per day (mgd). The plant has 5 anaerobic digestion units, with a combined volume of 729,000 cubic feet. The plant serves approximately 300,000 residents.

Williams Monaco Wastewater Treatment Plant. 9702 Monaco Street, Henderson, CO, 80640– The plant treats 8 million gallons per day. The plant has and serves over 40,000 residents.

Big Dry Creek Wastewater Treatment Plant. 13150 Huron Street, Westminster, CO, 80031– This plant treats an average of 7 million gallons of wastewater per day and serves over 75,000 residents.

City of Boulder Wastewater Treatment Facility. 4049 75th Street, Boulder, CO, 80301– This plant treats 15 million gallons per day with capacity to treat 25 mgd and serves over 100,000 residents. The potential to add food waste and FOGs in the facility has been previously assessed and was determined that the facility's two anaerobic digesters do not have capacity for additional materials. A third digester would need to be built²².

Broomfield Wastewater Treatment Facility. 2985 W 124th Avenue, Broomfield, CO, 80020– This plant treats 20 million gallons per day and serves over 70,000 people.

City of Longmont Wastewater Treatment Plant. 501 East 1st Avenue, Longmont, CO, 80501. The plant treats 8 million gallons per day with capacity up to 17 million gallons per day and serves over 90,000 residents.

City of Lafayette. 750 East County Line Rd, Lafayette, CO, 80206. The plant can treat over 4.4 million gallons per day and serves over 26,000 residents.

City of Loveland Water and Wastewater. 920 Boise Avenue, Loveland, CO, 80537. This plant can treat 38 million gallons per day and serves residents in a 29-square mile area. The plant treats water for 35,000 residents.

²² Cotton, Matthew from Integrated Waste Management Consulting, LLC. "Boulder County Composting Capacity Analysis", October 2014. https://assets.bouldercounty.org/wp-content/uploads/2017/02/RCD_CompostingCapacityAnalysis.pdf

Backyard Composting, Drop-Offs, and Community Gardens

Current capacity: ~1,500 tons all organics (backyard composting), 100 to 200 tons food only (backyard composting).

Potential Capacity: 5,000 to 7,000 tons all organics (backyard composting), 300 to 800 tons food only (backyard composting).

Likelihood of Expansion: Very low.

Backyard composting: Backyard composting offers a way for food waste to be diverted from landfills with lower transportation costs, hyper-localized finished compost usage, and increased individual and community level food recycling awareness/participation. The volume of material that can be processed in this way is significantly lower than at a conventional facility but is still valuable as a food waste recycling option. For example, if 15% of the single-family households in the City and County of Denver backyard composted, it would divert between 5,000 to 7,000 tons of food waste per year²³. The City has several programs aimed at increasing backyard composting including Master Composter classes, Learn to Compost Classes, direct mailers, and social media engagement.

Drop-offs: There is only one drop-off site accepting food residuals in the City and County of Denver, the city-owned free drop-off located at the Cherry Creek Transfer station. There is little potential to significantly increase recovery at the existing drop-off and no indication that additional drop-offs, either public or privately operated, are planned in the near future.

Community gardens: Denver Urban Gardens (DUG) manages a network of more than 170 community gardens in the metro area. In addition to the DUG network, there are several other community gardens located in the City and County limits. None of the community gardens reported that they currently accept food scraps for composting, either from members or non-members. However, there are models of successful community garden composting in the US that may serve as examples for Denver (such as the DC Community Compost Cooperative Network). The City of Denver is in the initial phases of working with DUG staff to increase backyard compost signage in all gardens so that they are consistent with the detailed signage placed at the Gove Compost Demo Site. DUG's current internal policy on in-garden composting is such that they do not want external food scraps of any kind in their piles. The piles in their gardens are intended to be for the management of garden-generated material only, and not as community drop-offs. Just composting garden-derived wastes is reported to be challenging enough, and there are no plans to add materials at this time.

²³ RRS estimated the potential tons that could be composted in backyards based on an average amount of material that can be composted in a yard, the percentage of that material that is food waste and the number of single family homes in Denver.

Processing Capacity Key Take-Aways

- *Less than two years ago, processing capacity was not an issue. Recently, however, the closure of Heartland Biogas AD facility (2017) and a litter-related issue at A1, both in Weld County, are putting pressure on regional capacity. However, if the A1 issue is resolved, and the Heartland facility is able to re-open in the near future, processing capacity will not be a challenge.*
- *The collection and operational economics combined with the low market demand for finished compost made from food scrap feedstock have resulted in a scenario where available capacity is not being activated by processors. Examples include Waste Management's choice to not fully utilize the permitted compost capacity at the Denver Arapahoe Disposal Site (DADS) and Western Disposal's (Boulder County) decision to not renew their compost permit.*
- *Landfill tip fees are low in the region, and compost processing costs (and tip fees) are comparatively high; as a result, it is hard for private sector actors to economically justify capital investments needed to improve or expand their compost operations.*
- *Contamination in organics streams that include food scraps is a major issue. Compounding the issue is that if processors do choose to invest in more capital to improve their processes and deal with the contamination, the gate fees will need to be raised to cover costs, making composting even less attractive economically.*
- *Although there are two active food scrap compost processors in the region, the market relies primarily on a single private sector operation for the vast majority of processing; this reliance results in a market that is not resilient to disruptions.*
- *Interviews indicate that there is little likelihood that a processor will open a new facility in the region in the short term due to the market economics and NIMBYism.*
- *Although a viable outlet elsewhere in the US, AD at wastewater treatment plants is not being used as a processing solution in the region and it does not seem likely it will be used in the near term. There is still potential that it could be a part of the long-term solution.*

TASK 2: COLLECTION INFRASTRUCTURE ASSESSMENT

This section provides NRDC with an overview of the existing organics collection infrastructure in Denver. The overview includes an evaluation of both the collection system as well as state and local policy directed at food scrap composting.

SUMMARY FINDINGS

Based on the assessment, the three largest barriers in collection infrastructure and compost related policy are:

1. **Residential disincentive:** Denver SMW provides customers with trash and recycling collection services for 'no fee'. Organics collection service (called Denver Composts), although available citywide, requires an additional \$117 / year fee for service. The fee creates a disincentive to participation.
2. **Private sector service cost and demand:** Only 2 out of the 43 licensed private sector haulers in Denver opt to offer organics collection service to their customers. The cost of service is a barrier to generators, and on the other side, the lack of customer demand for service limits the number of haulers offering service.
3. **No local policy to support supply.** There are no local or state policies targeted at food scrap recycling. Participation in any collection program (residential, commercial, multi-family, school) requires a fee and is fully voluntary. Fees are not included in trash rates. Licensed haulers are not impelled to offer service, and generators are not required to source separate organics for composting.

COLLECTION FINDINGS

Trash, recycling, and organics collection in Denver is provided by a mixture of private and public sector actors. Denver Solid Waste Management (SWM) is responsible for providing residential and Denver facility (e.g. libraries, jails, fire stations) services. Denver SWM also provides service to Denver Public Schools (DPS) through an intergovernmental agreement. Private sector haulers are responsible for managing the waste generated by multi-family residents and commercial entities. Descriptions of the services are provided in more detail below.

Residential Service: Denver SWM provides trash, recycling, and organics collection service to over 172,000 residential customers. Residential customers include single family homes, townhomes, and multi-family buildings with seven or fewer units. Trash and recycling service is paid for primarily through the general fund with approximately 10% of the funding coming from property taxes. As a result, customers do not see a bill or pay a direct user fee for service. Trash service is provided as a default to all customers; recycling is provided upon request and participation is estimated to be around 75% of eligible customers. Unlike trash and recycling, organics collection service (called Denver Composts) is *only* available for a voluntary fee of \$9.75 / month or \$117 / year. Collection is provided in 65 gallon carts and includes food scraps, non-recyclable paper, and yard debris. Approximately 16,500 household participate in the fee-based service. Denver plans on expanding Denver Composts service routes in 2019 and is considering options for fee structures designed to create an incentive for both recycling and composting.

Public Schools: Denver SWM has an intergovernmental agreement (IGA) with Denver Public Schools (DPS) to provide collection services to the more than 160 public schools located in the district. The IGA embeds recycling services in the trash costs. Organics collection service is optional for an extra added fee. It is up to each school to determine if they choose to participate in the composting program. In addition to paying the fee for collection (~\$50 / month / school), each participating school, not DPS, is responsible for purchasing compostable bag liners for their program and managing the program. A total of 27 schools have currently opted to participate in the program.

City Facilities: Denver SWM provides services to all city facilities with the exception of Denver International Airport (DEN) and Red Rocks Amphitheater, both of which are serviced by the private sector. Compost service is also provided by the private sector at both DEN and Red Rocks. Organics collection service, including food scraps, is provided by Denver SWM to several libraries and fire stations as well as Denver's largest facilities (by staff population): Wellington Webb Building, Denver Department of Public Health and Environment, and Denver Public Works.

Commercial Sector: Commercial sector generators are serviced by private sector haulers through an open market subscription system. Any business can sign up with any licensed hauler for services. It is up to the businesses to decide what services they choose to pay for. Private sector haulers must be licensed to operate in the City and County. There is a total of 43 licensed haulers servicing Denver. Among these haulers, only two, Waste Management²⁴ and Alpine Waste and Recycling, provide food scrap collection service. Despite the limited number of providers, compost service is available throughout the entire City. In addition to the two licensed haulers, there is one small scale operator (SCRAPS) providing food scrap-only collection to small restaurants in select Denver neighborhoods. SCRAPS has an agreement with Alpine to collect food scraps from generators (for a small fee) and place the food scraps in Alpine service dumpsters for collection.

Multi-Family Sector: Multi-family is considered to be entities with 8 or more units per building, and like the commercial sector is serviced entirely by private haulers operating in an open market. The same two service providers (WM and Alpine) offer multi-family service but both report that there are no participating buildings. SCRAPS and Denver Compost Collective (both small-scale unlicensed haulers) also offer service to the multi-family sector and do report having customers. Although data on the number of participants was not available, it is assumed to be a very small portion of the sector (well less than 5%).

POLICY FINDINGS

A summary of the relevant state and local policies is provided below:

State Level Policies

Diversion Goal: In August of 2017, CDPHE adopted the first ever statewide diversion goal for Colorado. CDPHE set a diversion goal for the 'Front Range'²⁵ of Colorado, including Denver, of 32% in 2021, 39% in 2026, and 51% by 2036. While CDPHE has set goals and dates for achieving goals, the department has

²⁴ WM customers that choose to pay for compost service are collected, through a sub-contractor agreement, by Alpine.

²⁵ CDPHE considers the following counties to be in the 'Front Range': Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, El Paso, Larimer, Pueblo, and Weld.

yet to publish who is responsible for achieving the goals. Denver’s most recently reported city-wide diversion rate was 21% (2017 data). Denver has a city-wide goal of 34% by 2020²⁶.

State Statutes: Colorado revised statutes 30-15-401 outlines the City and County powers as they relate to ordinances, hauler licensing, fees, and rate setting. These are the authorities generally used to collect tonnage data, adopt PAYT rates, hauler service requirements, contracts for haulers, or provide municipal collection. A summarization of the project team’s understanding of what is and is not allowed under the statutes is provided below.

Figure 2.1: County Authorities

Counties or municipalities are allowed to:	Counties or municipalities cannot:
<ul style="list-style-type: none"> • Compel residents to remove and clean up rubbish. • Require residents to have hauler-provided services. • Regulate haulers and require the regulated haulers to obtain a license to operate in the area. • Inspect vehicles collecting rubbish. • Set conditions of the license (i.e. hours of collection, insurance standards, marketing, service requirements). • Charge a fee for the license. • Contract with haulers for the collection of materials. • Set rate differentials for licensed haulers (e.g. volume-based pricing). • Compel residents living in single family homes and multi-family buildings with up to and including 7 units to pay for services. • Require residents in single family homes and multi-family buildings with up to and including 7 units to pay user charges for residential waste services. • Impose a fee for waste services. • Set the user charges and fees for contracted or municipal provided services. 	<ul style="list-style-type: none"> • Charge hauler licensing fees as a revenue generator. The fees can only pay for the administrative costs of the program. • Exclude a hauler from operating in a region even if there is a contracted hauler or municipal service. • Set the rates through a licensing program (they can only set rate structures). • Compel multi-family structures with 8 or more units or commercial properties to pay for municipal or contracted services. (This effectually limits contracting and municipal services to single-family households and multi-families with fewer than 8 units).

Recycling Resources Economic Opportunity (RREO): Through CDPHE, the state offers an annual grant program awarding funding to businesses, local governments, nonprofit groups and schools throughout the state to support recycling infrastructure development, including compost and food scraps processing. Although this is not a policy, it does represent the largest public funding source for advancing food scrap recycling in the state.

State Organics Related Requirements: Other than the permit regulations described in Task 1 of this report, there are no state requirements for compost service, landfill disposal bans, or compost use / procurement in state projects.

Local Policies in Denver

Denver Water Requirement: Denver Water provides service to 1.4 million people in the metro region, including the City of Denver. Denver Water has a model requirement for the use of soil

²⁶ CDPHE reports that the statewide MSW diversion rate for 2017 was 20.5%. Data by region is not currently collected or reported. <https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/411895>

amendment(compost)²⁷. Denver Water requires that property owners must apply 4 cubic yards of soil amendment per 1,000 feet of permeable area prior to installing landscape material. Property owners must provide documentation to Denver Water prior to having the water for the property turned on. The requirement recommends the use of Class I or II compost but does not require it. The requirement is unique to Denver Water.

Denver Hauler Licensing: Beginning in 2016, Denver requires all haulers operating in the city to obtain a license. The hauler license sets forth minimum standards that all haulers must adhere to in order to operate in the city. The statute includes minimum standards for safety, inspections, and insurance requirements as well as annual tonnage data reporting to the City. The hauler licensing requirement is an important tool if the city decides to adopt policy that encourages multi-family or commercial diversion. For example, Denver could mandate that all haulers offer organics collection to their restaurant customers as part of the license requirements, if they did not offer the service they license could be suspended or revoked.

Other Policies: There are no local policies in Denver requiring haulers to offer recycling or compost service or to include recycling or compost services to customers. Likewise, there are no requirements for any generator types (residential, commercial, multi-family) compelling participation in compost programs, pay for service, source separation of organics, or other requirements that have been demonstrated in other communities to successfully drive diversion.

Local Policies Elsewhere

A brief review of relevant requirements adopted in other Colorado municipalities:

Boulder Universal Recycling: The City of Boulder 2016 Universal Zero Waste Ordinance requires that all property managers provide adequate composting service to their tenants and occupants. The ordinance also requires that all businesses source separate organics for compost collection and post signs in their business. Lastly, the ordinance requires organics collection services for all special event permit holders in the City²⁸.

Vail Universal Recycling: The Town of Vail passed the Communitywide Recycling Regulation in 2014. Although the regulations do not address organics, they do leverage the town's hauler licensing ordinance to require that all private sector haulers provide recycling service to the commercial sector. At the same time, the ordinance also requires restaurants, retail stores, and hotels to offer recycling service to their guests anywhere that trash service is offered²⁹.

PAYT in Residential Sector: Adopting pay-as-you-throw or variable rates for trash collection with embedded compost service has been adopted by multiple Colorado communities to successfully increase the diversion of organics. Example communities include Loveland (municipal collection), Longmont (municipal collection), Boulder (open hauler), Louisville (contracted hauler), and Lafayette (contracted hauler).

²⁷ The Denver Water operating rules state ' 14.02.4 Soil Amendment for Irrigation of Turf at Newly Licensed Premises. Proof of proper soil preparation is required before installation of plant material. Penalties may apply if soil amendment is not completed prior to the installation of plant material. Proper soil amendment is the equivalent of adding approved compost at a rate of four cubic yards per 1,000 square feet of permeable area, incorporated (roto-tilled) to a depth of six inches.' Denver Water recommends the use of a Class I or II compost product, but it is not required.

²⁸ Link: <https://bouldercolorado.gov/zero-waste/universal-zero-waste-ordinance>

²⁹ Link: <https://lovevail.org/programs/recycling/recycling-requirements/>

Collection and Policy Key Take-Aways

- *The three main policy and collection related barriers to food scrap recycling are; 1) Residential disincentive – Denver SWM charges a fee for organics collection while trash and recycling service does not charge a user fee, 2) Private sector service cost and demand - The cost of service is a barrier to generators, and on the other side, the lack of customer demand for service limits the number of haulers offering service, and 3) No local policy to support supply – There are no policies in Denver that encourage diversion of organics including food scraps.*
- *There are no regional or state policies aimed at supporting or increasing market demand for finished compost product; the lack of strong demand makes it harder for compost processors to operate in an economically sustainable model.*
- *Denver Water has a model soil amendment use policy in place to help increase demand for compost products locally; however, other Denver agencies and nearby municipalities lack policies requiring use of compost in landscaping or construction, which, if adopted, could help drive the compost products market. Additionally, the existing policy does not require the use of Class I or II compost.*
- *While Denver staff has invested significantly in residential, school, and facility organics collection program growth, there is not a sustained commitment or dedicated staff person in the City focused on commercial or multi-family organics or recycling.*
- *Property managers generally control multi-family material management service decisions, making it hard for individual residents to opt for organics collection service.*

TASK 3: FEEDSTOCK ANALYSIS

The aim of Task 3 is to provide NRDC with a detailed map of potential food waste feedstock availability in the City of Denver. The map can be used to identify potential large generators and create a map of clusters of food scrap recovery potential that could be targeted for new commercial or multi-family routes.

- **Feedstock Mapping:** Using a dataset developed by NRDC on food waste produced by generator type, RRS created a map of estimated total food waste generated annually in the City of Denver by zip code. The map includes food waste estimated to be produced by the following large generators: universities, food manufacturers, food wholesalers, grocery stores, hospitals / nursing care facilities, hotels, K-12 schools, and restaurants.

SUMMARY FINDINGS

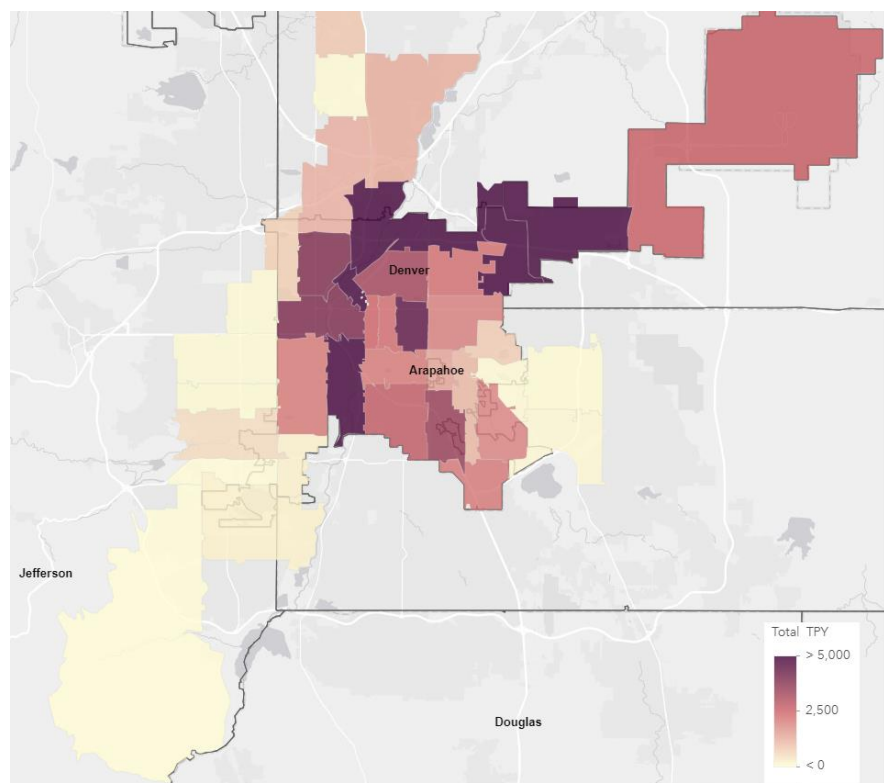
NRDC estimates that 108,530 tons of food waste are generated by large commercial businesses in the City and County of Denver.³⁰ Using the NRDC-developed estimations for food waste generation, the project team created an on-line ArcGIS map of food waste generation in Denver. The map is based on NAICS business type and detailed business location and is designed to allow users to identify clusters of feedstock availability. The online map can be accessed by following the link

<https://arcg.is/1XbCSa>.

A total of 45 zip codes were mapped with estimated food waste generation totals from 9 types of businesses (see Figure 3.1). Overall, the largest amount of food waste estimated to be generated in the City is located in the northernmost part of the city, around central business districts and major highways. The least amount generated is in the southeast and southwest parts of the city.

The top three zip codes in terms of total estimated food waste generated, 80216, 80202, 80239, account for approximately one-third of the total estimated food waste generated in the City. 80216 is an industrial area on

Screenshot of on-line Feedstock Generator Map



³⁰ NRDC, "Estimating Quantities and Types of Food Waste at the City Level", October 2017. Food waste generation estimates were based on different formulas depending on the type of facility. For example, estimates for hospitals were based on number of beds and estimates for hotels, grocery stores, and restaurants were based on number of employees.

the northern side of the city where two major interstates converge. The area has a large number of food manufacturers, food wholesalers, and grocery stores, and covers the neighborhoods of Globeville, Elyria Swansea, and Five Points. 80202, which has the second largest total generation, is a central business district with a chief transportation center and a high density of restaurants and includes Union Station and Central Business District (CBD) neighborhoods as well as the 16th Street Mall and the Denver Convention Center. The Pepsi Center, Mile High Stadium, Coors Field, Elitch Gardens, and Metropolitan State University are just on the outskirts of the 80202 zip code. Lastly, 80239 is a mixed-use area with residential and heavy industrial use. The bulk of the commercial food waste estimated to be generated in 80239 is driven by food manufacturers, food wholesalers and restaurants.

The top 10 zip codes by food waste tons per year, shown in Figure 3.2, account for 65% of the total generation in the City. The top facility types are listed for each zip code. Food wholesalers, food manufacturers, and grocery stores all heavily influence the food generation in their zip codes because the facilities are typically larger businesses that deal directly with food products. Restaurants waste less food per unit than these large food-related businesses, but the zip codes with restaurants as a top generator are due to having a larger concentration of restaurants. The zip codes in Figure 3.2 could be ideal candidates for increasing organics recycling through targeted education and recruitment for commercial collection.

Figure 3.2: Top 10 Zip Codes by Total Food Waste Generated

Zip Code	Total Food Waste Generated (Tons/Year)	Top Generators	Denver Neighborhood
80216	12,931	Food Manufacturers, Food Wholesalers, Grocers	Globeville, Elyria Swansea, Five Points
80202	10,849	Restaurants, Hotels	Union Station, CBD
80239	7,219	Food Manufacturers, Food Wholesalers, Restaurants	Montbello, Stapleton, Green Valley Ranch
80223	6,598	Food Manufacturers, Grocers	Athmar Park, Ruby Hill, Baker
80238	5,859	Food Wholesalers, Restaurants	Stapleton
80206	4,558	Restaurants, Grocers	Cheesman Park, Congress Park
80204	4,004	Restaurants, Food Wholesalers	West Colfax, Sun Valley, Villa Park, Lincoln Park
80211	3,959	Restaurants, Food Wholesalers	Highland, Sunnyside, Berkeley
80222	3,514	Grocers, Restaurants	Virginia Village, University Hills
80205	3,327	Food Manufacturers, Restaurants	Cole, Whittier, Curtis Park, Skyland

TASK 4: STAKEHOLDER MEETINGS

Over a period of two months, the RRS project team conducted a series of targeted interviews and meetings with a variety of food scrap composting stakeholders. The stakeholders were identified based on their ability and experience driving positive changes for sustainability in Denver and the region. The 14 total interviews provided in-depth input on the barriers, gaps, and opportunities to improve the landscape for food scrap recycling. The input was combined with the results of the other project activities to shape the final recommendations. Stakeholders included city and county staff, haulers, non-profits, state regulators, local thought and trend leaders, and regional organics processors.

SUMMARY FINDINGS

The implications of the interviews are summarized below.

Processing Capacity

Processing capacity is not the major barrier today, but capacity is at risk. All the interviewees reported that while food scrap processing capacity at the time of the interview was neither the limiting factor for composting nor the major barrier, they all expressed concern that recent changes in the market have put the regional capacity at risk. The issues raised include political challenges for the state's largest processor that may limit its ability to take food scraps and the lack of diversification in the market. There is little indication that any private sector actors plan to enter the processing market in the near term if something were to happen that shocks the market. Of course, if the large AD facility in Weld County were to be re-opened, processing capacity would be ample.

Available capacity is not being utilized due to market challenges. There is excess permitted capacity available in the region, but processors are choosing not to activate it. One interviewee described the issue as a 'voluntary capacity limit', meaning that processors could accept more organics or even grow their facilities based on their permit allowance, but have made the business decision not to do so³¹.

Barriers and Gaps

Contamination is one of the most significant barriers. Nearly all interviewees reported that contamination, particularly in the post-consumer commercial stream and the residential curbside stream, is one of the most challenging issues to processing in the region. The contamination issue is exacerbated by the compostable plastics which are both hard to distinguish from non-compostables and difficult to fully compost (or break down as quickly as other organics) in Colorado's arid and windy climate. The contamination hurts the final product and makes it difficult to produce high value and marketable finished compost.

The market for finished compost needs support. At least as significant as the issue with contamination is the weak regional market for finished compost. Market demand is generally low, and it can be difficult for processors to sell their compost for a reasonable margin. This in turn hurts the overall profitability of

³¹ For example, one processor chose to allow their permit to lapse instead of renewing it; they had composted food scraps for years, but the system economics and contamination made it more favorable to close their facility and send their materials elsewhere for processing.

processing and has forced processors to leave the market, not accept food scraps, or charge gate fees that are significantly higher than the landfill disposal rates. Additionally, it was mentioned that local governments that are driving new collection programs are not willing to purchase compost to help producers close the loop.

Regional economics limit private investment in compost processing. Combined, the issues with contamination and marketability are hindering private investment in expanding or improving existing facilities or the development of new compost facilities. One interviewee reported that although they would like to develop a pre-treatment area at their site to reduce contamination and litter issues, the cost of the improvements combined with the low landfill tip fees and lack of consistent feedstock and market make the investment risky. Interviewees also reported that there is little indication that a new actor is willing to come into the region and develop a new site. The political climate in Weld County is not helping either. However, many stakeholders were anticipating that the AD facility in Weld County would be able to be purchased and re-opened.

Distance, geography, and transportation are barriers for Denver. Transporting residential materials for processing is costly for the City of Denver as well as for private haulers servicing commercial generators in the City and County. This was noted to be a problem especially in the northern part of Denver that, while closer to the processors, is further from the city-owned consolidation and transfer operation in the SE part of the city.

Multi-family and commercial sectors in Denver. Although multi-family housing makes up more than 35% of the housing in Denver³², there is a minimal amount of staff effort aimed at addressing the sector. Likewise, City staff does not have a sustained approach targeting increased food scrap composting by commercial generators. Additionally, it is hard for individual multi-family residents, as opposed to entire buildings, to sign up for service. A property manager can decide to not allow any of their residents to participate although there may be residents that are willing to participate in a program.

Needs

Political support for compost facilities in the region. Nearly all the composting capacity in the region is in Weld or Adams County. Assistance from NRDC and other entities to build support among elected officials in those counties would help to reduce some of the current market risk.

Market support to drive demand and value for finished compost. Local, regional, or state policies designed to bolster the market for end-product were mentioned by many stakeholders. In addition, both processors and haulers felt that municipalities that enact universal organics recycling programs (residential or commercial) should be committed to buying back the finished compost. This would help to close the loop and would improve the overall economics of the system.

Education for both generators and elected officials. A need for education was reported for the following reasons: 1) reduce contamination; 2) educate on the true costs of processing and collection to increase generator willingness to pay for services; 3) support the market for finished products; 4) expand demand for collection services and increase participation; and 5) inform elected officials on the benefits of composting.

³² US Census Bureau 2012 – 2016 data - 35.1% of Denver housing units are in structures with 10 or more units. Denver Solid Waste Management considers multi-family to be structures with 8 or more units.

Infrastructure for the transfer of composting in Denver and processing in the region. Physical infrastructure was identified as a future need in the city. The needed infrastructure identified included a transfer station, most likely publicly owned and operated, that can pre-treat organics to reduce contamination and consolidate and transfer loads for processing out of County. The transfer station would help to reduce the system costs in the long term. Other stakeholders identified the need for a publicly owned compost facility in the region. Currently, there are no publicly owned compost operations within 50 miles of Denver.

Policy at the state or local level to drive increased recovery and more robust markets. Variable rates for residential trash, requirements for the purchase of locally sourced compost, state policy to require soil amendment in CDOT, or tax incentives for utilization of compost were mentioned as potential policy drivers. Additionally, although no specifics were discussed, the consideration of policies directed at commercial and multi-family generators was mentioned as a potential need in Denver.

DETAILED FINDINGS

The project team interviewed 14 regional food scrap processing stakeholders between May 15 and July 15, 2018. Interviews ranged from brief 10 to 15-minute phone conversations to in-depth in-person interviews lasting over an hour. Information on the sectors and organizations represented by the interviewees is included in Figure 4.1.

Figure 4.1: Interviewed Stakeholders

Sector	Interviewees
Processors and / or Haulers	<ul style="list-style-type: none"> • A1 Organics • Alpine Waste and Recycling • Organix Supply • SCRAPS • Stromo Composting LLC • T.V. Dairy • Waste Management • Western Disposal
Governments	<ul style="list-style-type: none"> • State of Colorado (2 interviews) • City and County of Denver (3 interviews) • City of Fort Collins • Boulder County
Others	<ul style="list-style-type: none"> • Denver Urban Garden • Urban Farm Stapleton • Colorado Association for Recycling • Ecoproducts

The remainder of this memorandum provides a selection of interview details for seven of the in-depth interviews. Responses have been slightly modified to remove identifying or proprietary information. The summary implications represent the opinions of the interviewees and do *not* necessarily reflect the opinions or recommendations of the project team.

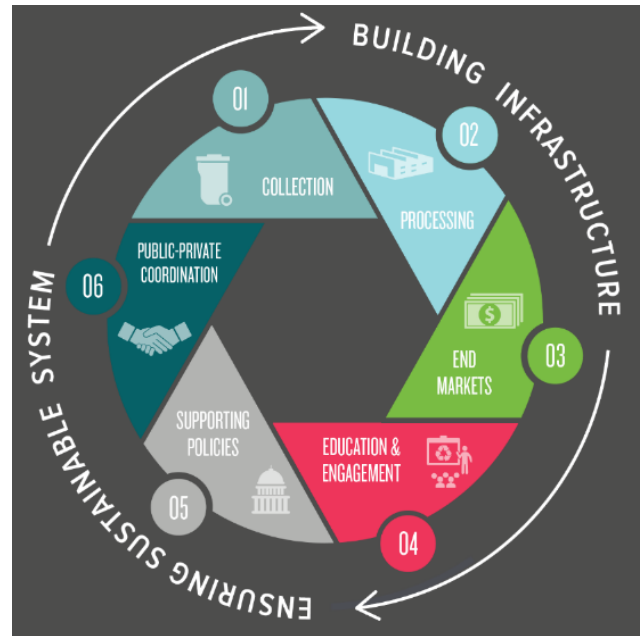
Stakeholder Meetings Key Take-Aways

- *Contamination, particularly in the post-consumer commercial and the residential curbside streams, is one of the most challenging issues for processors in the region. There is also a high level of contamination in the food scraps generated at Denver International Airport (DEN), a city owned and managed facility.*
- *Although multi-family housing makes up more than 35% of the housing in Denver, there is a minimal amount of Denver staff effort aimed at addressing the sector. Likewise, city staff does not have a sustained approach targeting increased food scrap composting by commercial generators.*
- *Assistance and engagement to build support among elected officials in Weld, Adams, and Denver County has the potential to reduce some of the current market risk related to processing capacity.*
- *Education and engagement to help reduce contamination, support the market for finished products, and expand demand for collection service was prioritized by stakeholders. Although there are organizations and non-profits working to increase composting access and messaging there is a lack of coordination with these groups and the City, and within the City, across departments.*
- *Transporting residential materials for processing at out of county facilities is costly for the City of Denver as well as for private haulers servicing commercial generators in the City and County. This is especially true in the northern portion of the city.*
- *Physical infrastructure including a transfer station that can pre-treat organics to reduce contamination and a publicly owned compost facility in the region were identified as key regional needs. Currently, there are no publicly owned compost operations within 50 miles of Denver.*
- *Adoption of local, regional, or state policies designed to bolster the market for end-products were mentioned by many stakeholders as a significant regional need. Examples include requirements for the purchase of locally sourced compost, state policy to require soil amendment in CDOT, or tax incentives for utilization of compost were mentioned as potential policy drivers. Additionally, policy at the state or local level to drive increased recovery such as variable rates for residential trash or multi-family targeted policies were mentioned as important tools for consideration.*

TASK 5: RECOMMENDATIONS

The project team’s philosophy is that there is no single solution for responsibly managing materials, including food scraps. Instead, there are a series of interconnected strategies and stakeholders that must work together to achieve a high-functioning and responsible materials management system to increase the recovery of food scraps in Denver. Using this systems-based approach, the project team evaluated the entire system and developed recommendations using the lens of the six key areas described below:

- **Collection:** Community access to effective and convenient collection systems.
- **Processing:** Regional processing to meet current and future demands.
- **End Markets:** Robust end markets for the processed organics to keep the system economically viable and ecologically optimal.
- **Education and Engagement:** Engagement to support on-going programs, collection, and market demand.
- **Supporting Policies:** Local policy that complements private and public-sector activities to make food scrap composting the standard.
- **Public/Private Coordination:** Potential partnerships with private companies, shared owner/operator agreements, marketing and educational campaigns, and everything in between.



The recommended action steps for NRDC (working in conjunction with local stakeholders) for each of the six key areas are included in Figure 5.1 below; these are followed by detailed rationale, descriptions, and estimated impacts presented by key area. Recommendations considered to be high priority by the project team are in **bold** font. High priority recommendations are those that the project team believes should be considered for action in the near term as they are either low hanging fruit or are recommendations that can have a large impact on the region.

Figure 5.1: Recommended Action Steps (high priority recommendations are in **Bold**)

Area of Engagement	Action Steps
Collection	<ul style="list-style-type: none"> • Support expansion of Denver SWM residential collection programs. • Support Denver’s plans to build a new transfer station.
Processing	<ul style="list-style-type: none"> • Encourage the full use of permitted compost operations at Denver Arapahoe Disposal Site (DADS) through a third part operator. • Encourage Denver SWM to enter into longer term contracts with organics processors. • Send elected officials, and publicly release, letters of support for compost operations in Weld, Adams, and Denver counties. • Facilitate discussions with wastewater treatment plants to investigate AD processing for targeted streams of food scraps.
End Markets	<ul style="list-style-type: none"> • Examine local policies to support market demand in the region. • Organize stakeholder group(s) to examine state requirements for compost use.

Area of Engagement	Action Steps
	<ul style="list-style-type: none"> Support the adoption of agreements between processors / haulers and municipalities / counties to buy back compost products made from local feedstock. Coordinate joint a marketing campaign to drive demand for finished compost.
Education and Engagement	<ul style="list-style-type: none"> Conduct targeted commercial education to increase participation for select generators and decrease contamination. Enact an employee engagement campaign at Denver International Airport to decrease contamination and increase diversion. Support internal city operations for education and outreach in all sectors.
Supporting Policies	<ul style="list-style-type: none"> Investigate city and county level policies to drive supply of food scraps for processing. Support Denver SWM pay-as-you-throw efforts.
Public / Private Coordination	<ul style="list-style-type: none"> Establish local partnerships with like-minded non-profit entities to expand reach of marketing and build support for reduced food waste. Activate Denver cross departmental coordination. Explore coordination with the state recycling non-profit (Colorado Association For Recycling (CAFR)).

COLLECTION

Recommendations to improve the landscape for the collection of food scraps in the City and County of Denver are provided in the following table.

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<ul style="list-style-type: none"> Although residential organics collection is now available City-wide, less than 10% of eligible customers choose to participate in the program. 	Support expansion of Denver SWM residential organics collection programs.	Denver SWM aims to expand compost service to all of their customers as an embedded rate in a user fee for trash or potentially have some or all of the service covered by the general fund. NRDC should work with Denver SWM, Denver Department of Public Health and the Environment (DDPHE), and other entities to support SWM's efforts. Embedded or reduced fees will help drive participation. NRDC should coordinate with SWM and DDPHE on education and outreach efforts for Denver customers to reduce contamination in the stream.	None	High	Medium	High
<ul style="list-style-type: none"> The Cherry Creek transfer station is located on the southern end of Denver (the opposite direction of the contracted processor). Distance to the processors limits direct hauls of organics. Consolidation and transfer increases costs. Contamination in the stream (plastics, glass) poses a major challenge to processors. 	Support Denver's plans to build a new transfer station.	Work alongside Denver SWM to encourage expanded support for the development of a city owned transfer station in N. Denver. The transfer station should include an area for the pre-treatment of organics to reduce contamination prior to transfer to processors. Additionally, the City should consider the option to eventually open the transfer station to private haulers servicing commercial generators in Denver or residential generators in other municipalities.	Medium	Medium	Low	High

PROCESSING

Recommendations aimed at improving the processing infrastructure in the region are described below.

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<ul style="list-style-type: none"> The region relies primarily on one private sector operation for all processing; this reliance results in a market that is not resilient to disruptions. Landfill tip fees are low in the region, and compost processing costs (and tip fees) are comparatively high; as a result, it is hard for many actors to economically justify capital investments in compost operations. Recent political activities are threatening the region's largest processor; similar political headwinds previously shuttered one of North America's largest AD facilities located in the region. Political support is needed to prevent future disruptions and to potentially re-open the AD facility. 	Encourage the full use of permitted compost operations at Denver Arapahoe Disposal Site (DADS) through a third part operator.	Explore options for Denver to contract with a 3rd party to run a food scrap composting operation at DADS. Under this option the contractor would subcontract to Waste Management (WM) to operate the facility and market the finished compost. Requires negotiations between Denver and WM, and potentially a Denver procurement process.	High	Medium	Low	Low to High depending on contract
	Encourage Denver SWM to enter into longer term contracts with organics processors.	To promote private investments in capital expenditures, Denver should consider entering into longer term (5 years plus potential renewals) with contracted processors for organics. Longer term deals would help guarantee revenue for processors, allowing for longer amortization of capital expenditures required to upgrade site.	Medium	None	Very low	Depends on contract
	Send elected officials, and publicly release, letters of support for compost operations in Weld, Adams, and Denver county.	Write official letter(s) of support for development of new, and support of existing, organics recycling infrastructure in Weld, Adams, Boulder, and Denver counties. NRDC should deliver letters to county commissioners and elected officials in all four counties. Consider following letters with direct outreach to commissioners and elected officials to help educate them on the benefits of organics recycling with an emphasis on job creation.	Medium	None	Very Low	None
	Facilitate discussions with wastewater treatment plants to investigate AD processing for targeted streams of food scraps.	Reach out to WWTP in the region, starting with Metro Wastewater Reclamation District, to initiate a stakeholder discussion around the potential to send food scraps and residual to facilities for processing. At the same time, monitor progress at the Las Vegas Treatment Plant in Colorado Springs to determine if the facility is able to successfully launch their program. Goal of	Low to Medium	Low to Medium	Low	None

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
		activity is to lay the groundwork for a potential pilot program in the Denver metro area.				

END MARKETS

The ability to sell finished compost for a reasonable price is integral to the success of a complete system for managing food scraps. Recommendations to improve end markets in the region are provided below.

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<ul style="list-style-type: none"> Low market demand for compost made with post-consumer food scraps, coupled with high processing costs, result in economics that are unfavorable for private or public investment in processing. Creating market demand is challenging at a City or County level. Denver Water has a strong policy in place for Denver; similar policies are not required in other nearby municipalities. Permitted compost sites compete with less regulated on-site agricultural compost for market share. Colorado Department of Transportation does 	<p>Examine local policies to support market demand in the region.</p>	<p>Consider working with Denver Water to examine existing policy to determine if the policy can be amended to require the application of approved Class I or II compost, alternatively. Consider a requirement in Denver to use at least a portion of soil amendment that is derived from compost with local food waste feedstock. Additionally, NRDC should work in the region to provide education to other municipalities encouraging them to follow Denver Water's lead on required soil amendment application to build the regional market. Coordinate with Denver Parks and Recreation Department to explore options of increased buy back of compost made from Denver feedstock.</p>	Low to Medium	Low	Low to Medium	Low
	<p>Organize stakeholder groups to examine state requirements for compost use.</p>	<p>Work with CDPHE, CDOT, and processors to identify procurement standards or requirements at the state level, particularly in CDOT construction projects, to use certified compost products. Additional state level policies to explore include a reduced tax or other incentives for end-users of compost (farmers, large scale landscape or development companies, fire or disaster remediation) as well as end market development grants and assistance (through CDPHE).</p>	Medium	Low	Medium	Low

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
not require the use of certified compost in their remediation projects.	Support the adoption of agreements between processors / haulers and municipalities / counties to buy back compost made from local feedstock.	Regional processors and haulers desire that local governments that require compost collection help close the loop by buying back some or all of the finished compost. NRDC staff can coordinate with processors and haulers to examine the potential for these programs to succeed in Denver as well as other metro communities. Spreading beyond Denver's borders to the metro region will help drive the regional market demand.	Medium	Low	Low	Low to Medium
	Coordinate a joint a marketing campaign to drive demand for finished compost.	Coordinated marketing campaign with NRDC, Denver and other local partners (consider A1 Organics, CAFR, DUG, CDPHE, etc.) targeting landscape and home contractors to educate end users on benefits of compost and types of compost (Class I and II versus farm manure). Includes direct marketing to Denver SWM compost customers on benefits of compost and closing the loop.	Low	Low	Medium	Low to Medium

EDUCATION AND ENGAGEMENT

Recommendations aimed at increasing awareness and participation as well as reducing contamination are included in the final section.

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<ul style="list-style-type: none"> Contamination, especially in commercial post-consumer streams, is one of the most significant barriers to processing in the region. There is not a sustained commitment or dedicated staff person in the City focused on commercial organics or recycling. There is not a sustained commitment 	Conduct targeted commercial education to increase participation for select generators and decrease contamination.	Conduct direct intervention with large grocery store generators. Intervention includes promotion of service providers, evaluation of 'right sizing' trash service to reduce costs, staff training, or posters and signage for both front and back of house. Promotion can build on the existing DDPHE 'Certifiably Green' program. Prior to expanding to restaurants and other harder to target generators, the outreach aim should be to gain high level of participation from grocery with clean streams. Grocery stores were identified by haulers and processors as good sources of clean feedstock and have the potential to reduce trash service levels through composting.	Low	Low to Medium	Medium to High	Medium to High

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<ul style="list-style-type: none"> or dedicated staff person in the City focused on multi-family organics or recycling. Contamination of pre-consumer organics from vendors at DEN was reported to be a major concern by the processor. 	Enact an employee engagement campaign at Denver International Airport to decrease contamination and increase diversion.	Work with Denver SWM, DDPHE, and Alpine to enact a campaign at DEN to engage employees (third party vendors) on food scrap compost basics with the aim of reducing contamination. Include efforts to reduce food waste and evaluate potential to expand food donation. DEN has the opportunity to become a model of success for other large cities to follow.	None	Low	Medium	Medium
	Support internal city operations for education and outreach in all sectors.	Denver does not have a history of focusing efforts on commercial or multi-family (MFU) generators. Under this program NRDC staff would work closely with Denver to develop a marketing message and approach targeting MFUs and commercial generators (beyond grocery). Recommendation includes targeting high profile restaurants for front of house that while individually may not divert significant amounts, are seen as local leaders and can influence their customers and peers. Similar strategy recommended for a small selection of MFUs.	None	Low	Low	Medium
<ul style="list-style-type: none"> Denver Recycles staff is fully occupied maintaining and improving the residential programs. DDPHE and SWM have little official cross-coordination on program development / support. 						

SUPPORTING POLICIES

Policy, if strategically crafted and implemented, can be one of the largest drivers of increased diversion. Recommendations on potential policy options are described below.

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<ul style="list-style-type: none"> There is no policy in the City and County of Denver aimed at increasing the supply of recycled food or yard waste; this includes both residential and commercial generators. Property managers generally control multi-family material 	Investigate City and County level policies to drive supply of food scraps for processing.	Work with DDPHE, Denver SWM, and Mayor's Office of Sustainability staff to explore policy options for increased food scraps recovery. Policy options in the near term should be aimed primarily at commercial generators. Options may include required service for certain generator types (e.g. large grocery, convention, or sports arena), source separation requirements for commercial generators, hauler requirements to offer collection for certain generators, policies aimed at multi-family property managers, or	None	Medium to High	Low to Medium	Low

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<p>management service decisions, making it hard for individual residents to opt for organics collection service.</p> <ul style="list-style-type: none"> Denver SWM charges residents a user fee to sign up for compost, while trash service is paid for through general fund; the structure creates a disincentive to sign up for compost service. 		incentive programs. NRDC roles could include supporting stakeholder groups, providing research into policy options, and educating stakeholders and / or elected officials.				
	Support Denver SWM pay-as-you-throw efforts.	Work with Denver staff to help support the adoption of a citywide pay-as-you-throw or volume-based fee structure for residential services. Under the fee structure, residents would be charged a fee for trash service based on the subscribed volume of trash service, and compost service, along with recycling service, would be included for a flat or embedded fee. The variable rates provide an economic incentive for all residents to compost food scraps. In the long term, policy could be supported by source separation requirements or eventually every other week trash service with weekly organics (like Portland, OR).	None	High	Low to Medium	Medium to High

PUBLIC / PRIVATE PARTNERSHIPS

Opportunities for increased public private partnerships are provided below.

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<ul style="list-style-type: none"> Staff and resources at both NRDC and Denver SWM are limited by time and budget and cannot address the entire city. There are numerous organizations and non-profits working to reduce food waste 	Establish local partnerships with like-minded non-profit entities to expand reach of marketing and build support for reduced food waste.	Reach out to Denver Urban Gardens (DUG) to explore partnership for a) pilot study of community composting for vegetative food scraps generated off site b) education and outreach with DUG's 13,000+ community gardeners on food waste reduction, food donation, and composting.	Low	Low	Low to Medium	Low

Rationale / Barriers	Action Steps	Description	Impact (Facilities)	Impact (Diversion)	Cost (NRDC)	Cost (Gov't)
<p>and increase composting in the City; they are not always coordinated in their efforts or messages.</p> <ul style="list-style-type: none"> DDPHE and SWM have little official cross-coordination on program development / support. 	<p>Activate Denver cross-departmental coordination.</p>	<p>Work alongside Denver SWM, DDPHE, and Mayor's Office of Sustainability to help coordinate activities. NRDC can facilitate standing meetings / committee to ensure that all Denver internal departments and staff are pulling in the same direction as well as to identify underserved markets / areas (e.g. multifamily generators).</p>	Low	Low	Low	Low
	<p>Explore coordination with the state recycling non-profit.</p>	<p>CAFR is the largest organization in CO dedicated to increasing waste diversion and supporting markets. CAFR regularly works to support local end markets, implement actions that increase diversion in CO, and help to pass bills at the statehouse. Although CAFR staff is maxed with workload, NRDC may wish to discuss options with the organization to embed a temporary staff person (.25 - .5 FTE) in the organization that focuses on increasing diversion of food scraps and bolstering composting programs in CO. The staff person would have access to CAFR resources and could benefit from existing committee work at the organization.</p>	Low to Medium	Low to Medium	Medium	None