Colorado Circular Communities (C3) Enterprise

Fort Collins Infrastructure Study Full Report
7-31-2025

Photo courtesy of the City of Fort Collins

Strategic Technical Expertise for the Public Sector (STEPS)

Final Report

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Executive Summary

Fort Collins has an ambitious goal to achieve zero waste by 2030 per the Road to Zero Waste Plan, with interim goals of 75% diversion by 2020, 90% diversion by 2025, and per capita waste generation less than 2.8 pounds per day by 2025.[1] As of 2023, Fort Collins has achieved an overall waste diversion rate of 62.9%. Industrial waste achieved an 82.9% diversion rate in 2023, largely driven by the City's construction and demolition (C&D) recycling requirements. Municipal Solid Waste (MSW), which includes both residential and commercial waste, had a 33.0% diversion rate in 2023, and organics (consisting of food scraps and yard trimmings) achieved a 23.5% diversion rate in 2023.

These figures reflect the combined success of Fort Collins' waste reduction efforts to date, including ordinances, policies, and infrastructure improvements aimed at reducing waste sent to landfills. However, additional steps are needed, especially in municipal solid waste, to reach the City's zero waste goals.

The Colorado Circular Communities (C3) Enterprise is a statewide program dedicated to supporting Colorado's communities, businesses, nonprofits, schools, institutions of higher learning, and tribes to advance the state's transition to a circular economy. The C3 Enterprise provides financial and technical assistance to enhance circularity across the state, and helps organizations achieve their waste aversion and diversion goals. The Strategic Technical Expertise for the Public Sector (STEPS) program is the primary mechanism for communities in Colorado to access C3-funded technical assistance for circularity planning.[2] STEPS assists local governments, tribes, and public K-12 school districts with efforts to enhance circularity, including averting and diverting waste, by implementing sustainable, long-term solutions that meet the unique needs of each community. The STEPS program offers a range of support from resources and workshops to multi-month direct consulting support. Technical support is provided by the C3 Outreach and Technical Assistance staff and a team of contracted subject matter experts led by Resource Recycling Systems (RRS).

In its 2013 Road to Zero Waste Plan, the City of Fort Collins identified opportunities to reduce waste through composting and C&D recycling infrastructure.[i] The STEPS project team completed a comprehensive assessment and analysis of Fort Collins' existing systems and infrastructure, compared pathways to organic waste composting and C&D recycling infrastructure, culminating into a feasibility level cost model for two different size compost facilities.

[1] Zero waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing zero waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health.

[2] The STEPS program has replaced the Front Range Waste Diversion (FRWD) Technical Assistance Service Provider (TASP) program.

This Final Report consists of nine distinct but complementary sections:

- Baseline Assessment
- Stakeholder Research
- Tonnage Projections: Food Scraps, Yard Trimmings and C&D
- Processing Infrastructure Analysis
- Comparative Assessment
- Supportive Policy Options
- Compost Facility Feasibility Study
- Site Parameters Analysis

Construction and Demolition

The City of Fort Collins' building code requires the recycling of C&D waste, and several facilities in Fort Collins currently accept various types of C&D materials. Projections for C&D waste in Fort Collins developed from this project indicate 263,289 tons being generated in 2035, with 230,785 tons being diverted (an 87.7% diversion rate). This projection highlights the accessibility of C&D recycling sites and the City's mandates for recycling.

Organics

In 2023, Fort Collins achieved an estimated 23.5% diversion rate for organic materials, as calculated through tonnage reports provided by the City's haulers. Yard trimmings consistently accounted for 83-93% of the total organics diverted from 2019-2023. Beginning in 2023, the City entered a five-year contract with Republic Services to provide bundled recycling, trash, and seasonal yard trimmings collection services to residential customers. Although the program does not accept food waste, it is expected to increase organic waste diversion from yard waste. Fort Collins mandates composting at grocery stores that generate more than 96 gallons of food waste per week through the Community Recycling Ordinance of 2016 but has no ordinances in place for residential recycling of food scraps. Residents may subscribe to drop-off or curbside collection services for food scraps from third-party haulers. In 2023, approximately 292 tons of residential food scraps were collected. Projections developed from this project indicate 28,516 tons of food scraps will be generated by residents and commercial businesses in 2035, with 2,424 tons being diverted (an 8.5% diversion rate). This projection reflects the limited policies and infrastructure currently in place to support higher diversion rates of food scraps.

Processing Infrastructure

The STEPS project team's analyses of processing infrastructure for organic and C&D waste for both the City of Fort Collins and the region (Fort Collins, Loveland, and Estes Park) were based on the exploration of multiple scenarios that include composting sites, co-digestion facilities, C&D recycling sites, and transfer stations, with variations in their capacity and locations. Capital and operating costs, diversion potential, and key facility development

factors were also examined for each scenario. Based on the Comparative Assessment, Processing Infrastructure Analysis, and Stakeholder Research the STEPS project team conducted, it was recommended for the City of Fort Collins to pursue a feasibility-level cost analysis for a compost facility. This recommendation is based on the need for expanded organics processing capacity, the potential economic and environmental benefits of local composting, and the opportunity for regional collaboration to maximize efficiency and cost-effectiveness. Development of a compost facility supports Fort Collins' Road to Zero Waste by 2030, creates local jobs, circularity within the compost stream, and expands the market for finished compost.

Feasibility Level Cost Model

An aerated static pile (ASP) composting system is recommended due to its ability to manage high volumes of food scraps and yard trimmings while offering odor control, fast processing times compared to other composting methods, and reduced land footprint compared to other composting systems. Two facility configurations were modeled: a city-scale facility designed to process 25,000 tons per year (TPY) of food scraps and yard trimmings, and a regional-scale facility designed for 50,000 TPY capacity. A detailed examination of facility site development and operations parameters, equipment and rolling stock needs, staffing requirements, total operating and capital costs, and supportive policy needs were included in analysis.

The city-scale facility would divert 7,200 TPY of food scraps and 17,800 TPY of yard trimmings. The regional-scale facility would increase these volumes to 10,400 TPY of food scraps and 39,600 TPY of yard trimmings. Estimated upfront capital costs, excluding cost of land, are $11.7 million and $17.8 million for the city and regional facilities, respectively.

Implementation

A timeline for the implementation of either a city-scale or regional-scale composting facility was developed, with a conservative estimate of up to six years for completion. Potential variability in the timeline is presented, particularly due to unknown factors in the site selection and permitting processes. The timeline is divided into three phases: Planning and Pre-Development, Site Construction and Engagement, and Operational Launch and Expansion. Key recommendations are provided for addressing critical considerations throughout the process, including land acquisition, state and local permitting, securing funding, facility design and construction, stakeholder and community engagement, outreach and education, and commissioning and start-up activities.

To support waste diversion goals and maximize the success of a facility, several policy recommendations were explored for City consideration and imbedded into the timeline. For the purposes of this report, feedstock (the pre-processed organic waste) is anticipated to be primarily derived from commercial generators.

The recommended policies and actions the City should take to secure feedstock and increase organics diversion include:

- Expanding the commercial waste ordinance to include organics.
- Requiring organics diversion and reducing food scraps at City buildings.
- Buying and using local compost and mulch.
- Incentivizing the private sector to subscribe to organics collection services.
- Passing a flow control ordinance.

Several key assumptions are made, and outstanding questions remain that must be addressed, including regional partnerships, decisions regarding a city-scale or regional-scale approach, allocation of funds, the selection of the site for the facility, and the establishment of necessary partnerships. With these considerations in mind, this research represents comprehensive assessments and viable pathways for Fort Collins to develop new policies and implement a large-scale aerated-static pile (ASP) composting facility that can support the City or region in diverting food scraps and yard trimmings from the landfill, while supporting beneficial end use. With supportive policies and strategic partnerships in place, approaches explored here can achieve high diversion rates and help meet Fort Collins' zero waste goals.

Baseline Assessment

The purpose of the baseline assessment is to understand the current conditions of material processing systems, policies, and infrastructure in the City of Fort Collins. As part of this effort, the Strategic Technical Expertise for the Public Sector (STEPS) project team reviewed past waste studies and existing diversion policies, identified current waste collection and processing infrastructure and practices, analyzed waste and diversion tonnages, and conducted a regional policy comparison.

Tonnage reports provided by Fort Collins show significant progress in achieving high diversion of solid waste, with 2023 reaching an overall waste diversion rate of 62.9%. This success is driven by supportive programs and ordinances, particularly in managing construction & demolition (C&D) waste. However, an estimated 23.5% diversion rate for organic materials in 2023 (including food scraps and yard trimmings) highlights opportunities to increase diversion. Table 1 summarizes notable framework highlights for Fort Collins.

Table 1: Fort Collins Framework Highlights

Category	Fort Collins
Area (square miles)	57.21
Population	170,000
County	Larimer County
Residential Waste Collections Structure	Single hauler for single family curbside (Republic Services)
Commercial & Multi-family Unit Collection Structure	Open market with hauler licensing
Recycling Policy	Universal Curbside Recycling
Pay Structure for Curbside Collections	Pay-As-You-Throw (PAYT) model
Sustainability Plans	Our Climate Future and Road to Zero Waste Plan
Citizen Action Groups	Fort Collins Sustainability Group, Sustainable Living Association, Sierra Clubs, and others

Waste Collection Options

Waste collection encompasses both the hauling done by waste and recycling companies as well as community access to recycling, composting, and landfilling through drop-off networks. Table 2 summarizes the waste collection options identified in Fort Collins.

Table 2: Waste Collection Options

Waste Item	Recycling & Disposal Options
Trash	• Curbside collection offered to single-unit households by Republic Services through a single-hauler agreement. • Curbside collection for multi-family units, commercial businesses, and HOAs with contracts prior to 2023 by licensed haulers in an open market.
Recyclables	• Curbside collection offered to single-unit households by Republic Services through a single-hauler agreement. • Curbside collection for multi-family units, commercial businesses, and HOAs with contracts prior to 2023 by licensed haulers in an open market. • Drop off at Larimer County Recycling Center or City of Fort Collins' Timberline Recycling Center.
Yard trimmings	• Curbside collection offered to single-unit households by Republic Services through a single-hauler agreement. • Curbside collection for multi-family units, commercial businesses, and HOAs with contracts prior to 2023 by licensed haulers in an open market.
Food scraps	• Opt-in curbside collection service provided through open market, currently provided by Compost Queen & Common Good Compost.
Hard-to-recycle material and household hazardous waste (HHW)	• Annual collection event organized by the City of Fort Collins. • Year-round drop-off at the Larimer County HHW Center. • Drop-off of hard to recycle materials, including antifreeze, batteries, oil and paint, at the Timberline Recycling Center.
Construction & Demolition (C&D)	• Drop off at City of Fort Collins' Timberline Recycling Center and Hoffman Mill Crushing Facility, or at multiple private facilities.

Curbside Collection Services

In accordance with Sec. 15-412 of the Fort Collins Municipal Code[ii], all haulers operating in Fort Collins are required to obtain a collection license. This licensing agreement requires all haulers to provide appropriate containers, adhere to collection schedules, and report their annual tonnage data recorded by waste category to the City.

Fort Collins adopted residential contracted collections in 2023, with service in effect since September 30, 2024. In this "single hauler" model, also referred to as contracted collection service, a community contracts with one hauler to provide collection services to all single-family residents. Residential customers, including single-family homes and buildings with seven or fewer housing units, received bundled recycling, trash, and seasonal yard trimmings collection. Multi-family units, or households with eight or greater housing units, commercial businesses, and homeowner associations (HOAs) with contracts for waste service signed before April 28, 2023, acquire services through licensed haulers.

Material Drop-Off and Processing Infrastructure

The City of Fort Collins is supported by various solid waste infrastructure in the region, including recycling drop-offs, organics processing facilities and drop-offs, municipal solid waste (MSW) infrastructure composed of landfills and transfer stations, and miscellaneous recycling infrastructure. Table 3 provides an overview of the disposal infrastructure systems servicing Fort Collins, with cells labeled with "Yes" indicating availability in Fort Collins.

Table 3: Solid Waste Infrastructure Types and Accepted Items

Infrastructure Type	Trash	Recycling	Food Scraps/ Yard Trimmings
Recycling Drop-Off Centers: Drop-off centers accepting recyclable materials		**Yes**	
Organics Facility: A facility that composts, mulches, or anaerobically digests organics (food scraps and/or yard trimmings)			**Yes**
Organics Drop-Off Sites: Drop-off sites accepting organics (food scraps and/or yard trimmings)			**Yes**
Municipal Solid Waste (MSW) Landfills: A site for the disposal of waste materials (trash)	**Yes**		
MSW Transfer Stations: Facilities where MSW is temporarily held and ultimately aggregated to a disposal facility	**Yes**		

Recyclable Material

Fort Collins and the surrounding area have no local material recovery facilities (MRFs). Recyclables from single-stream curbside collection are first taken to the Larimer County Recycling Center, where large, corrugated cardboard is processed, and the remaining materials are transferred to a MRF in Denver for further processing. Recyclable materials may also be taken to the Timberline Recycling Center.

Food Scraps

There are several facilities that process food scraps, including Compost Queen and Colorado State University in Fort Collins, and multiple haulers operating in the region. Organics processors serving and accessible to Fort Collins are listed alphabetically:

- **A1 Organics** services commercial generators and haulers and is the largest organics recycler for the Front Range of Colorado. Facilities in Eaton and Keenesburg process and compost both food scraps and yard waste. Facilities in Commerce City and Englewood process yard waste for recycling and transfer any food scraps to Keenesburg.
- **Colorado State University** has two composting sites, an in-vessel unit, and a windrow, which are not open to the public and are used for university organics only. The Oscar, an in-vessel composting system with a 30-yard capacity, diverts roughly 300,000 pounds of pre-consumer food waste annually. The windrow system is a large-scale windrow composting facility that composts food waste, animal bedding, animal manure, green waste, and paper towels, and composts over 396 tons of organic material annually.
- **Common Good Compost** was founded in 2014 and offers residential curbside food scraps collection and free home composting kits in Fort Collins and the surrounding areas. Collected material are hauled to A1 Organics in Keenesburg to be processed, and finished compost is provided for free to customers every spring.
- **Compost Queen** offers curbside food scraps collection and processes at their facilities in Fort Collins. Compost Queen has a food scrap composting facility in Fort Collins utilizing covered aerated static piles. Finished compost is available for purchase through their website.
- **Eco-Cycle CHaRM** is located in Boulder, Colorado and offers food scrap drop-off services, which are hauled to A1 Organics.

Yard Trimmings

Yard trimmings from Fort Collins are composted and mulched at several facilities in the region, including A1 Organics, Ewing Landscape Materials, Hageman's Earth Cycle Inc, Doug Weitzel Inc, and several local dairy farms.

Republic Services collects residential yard trimmings under the City's curbside collection contract, which requires delivery to either A-1 Organics or Ewing Landscape Materials unless written approval is obtained from the City to use a different facility. Additionally, Ram Waste and WM continue to collect yard trimmings for HOAs with contracts developed before 2023.

Municipal Solid Waste (MSW)

Over half of Fort Collins' waste is hauled to the Larimer County Landfill, which is jointly owned by the City of Fort Collins and Larimer County and operated by the County, and the

remainder is hauled to North Weld Landfill in Ault and Front Range Landfill in Erie. Opened in 1963, the landfill is expected to reach capacity and close in early 2026. However, construction of the Larimer County North Landfill is underway and expected to open in early 2026. Fort Collins' waste is also hauled to the WM North Weld landfill in Ault.

Construction & Demolition (C&D)

The City of Fort Collins Building Code requires the diversion of concrete, wood, metals and cardboard from all new residential and nonresidential construction projects, demolitions, and remodels over 2,500 square feet. However, it is estimated that 90% of the reported industrial waste going to the landfill was construction & demolition (C&D) materials, based on a review of City of Fort Collins data.

There are several facilities in Fort Collins accepting C&D materials including concrete, asphalt, aggregates, and cardboard for recycling:

- **Barker Construction** accepts bricks, pavers, concrete, asphalt, rock, and gravel for recycling.
- **Bivens** accepts bricks, pavers, concrete, asphalt, rock, and gravel for recycling.
- **The City of Fort Collins Hoffman Mill Crushing Facility** accepts pit run (dirt and rock mixture), asphalt, concrete, dirt, and soil.
- **The City of Loveland Recycling Center** accepts untreated wood, wood waste, wood pallets, scrap metal, concrete, cardboard and more for recycling.
- **Connell Resources** accepts asphalt, concrete, and aggregates for crushing and aggregate production.
- **The Timberline Recycling Center – Hard to Recycle Materials Yard** accepts concrete, scrap metal, clean lumber, and cardboard for recycling.

Miscellaneous Recycling

Residents can divert electronics, scrap metal, household hazardous waste, and other hard-to-recycle items through designated permanent drop-off sites in and around Fort Collins, which are offered for free or charged a per-pound fee. Additional material recovery options include municipal events, private drop-off sites, and specialized collection services.

Hard-to-Recycle

Hard-to-recycle items are those not commonly accepted by most MRFs and may include electronic waste, batteries, motor oil, paint, appliances, and automobile parts. Fort Collins' website lists specific centers such as the Timberline Recycling Center, Larimer County Recycling Drop-Off Center, Eco-Cycle CHaRM (Center for Hard-to-Recycle Materials) in Boulder, and the City of Loveland Recycling Center. The following locations around Fort Collins accept various hard-to-recycle items:

- **Batteries Plus** accepts batteries and charges by the pound.
- **The City of Loveland Recycling Center** accepts metal, small appliances, electronics, mattresses, and more, with costs varying per item.
- **Eco-Cycle's CHaRM (Center for Hard-to-Recycle Materials) facility** in Boulder accepts electronics, scrap metal, freon appliances, and more, with costs varying per pound and per item.
- **Colorado Iron & Metal** accepts all types of metals and lead acid batteries and pays cash for metal.
- **Houska Automotive Services** accepts scrap metal, batteries, and auto parts.
- **Interstate All Battery Center** accepts lead-acid batteries and recycles them for free.
- **I.T. Refresh** accepts appliances and electronics, provides pickup services, and charges per item.
- **The Larimer County Electronic Recycling Center** accepts certain appliances and electronics with costs varying per pound.
- **The Rocky Mountain Battery Center** accepts batteries, metals, and pallets for recycling, with costs varying per item.
- **The Timberline Recycling Center - Hard to Recycle Materials Yard** accepts electronics, batteries, motor oil, wood waste, paint, concrete, and more, and charges a $5 entry fee plus additional fees for certain items.

Household Hazardous Waste (HHW)

Household hazardous waste (HHW) are products that are corrosive or toxic and generally not accepted in curbside collection. The Larimer County Household Hazardous Waste Facility provides a free HHW drop-off service for residents and has a Drop n' Swap program where Larimer County residents can pick up HHW products they have received. The Larimer County HHW Center is a year-round permanent facility open Mondays, Tuesdays, Thursdays, Fridays, and Saturdays from 8:00 a.m. to 4:30 p.m. Paint, lawn chemicals, automotive fluids, batteries under 300-Watt hours, cleaners, fluorescent bulbs, sharps, and additional household hazardous items are accepted.

Figure 1: Drop N Swap reuse area in the Larimer County Household Hazardous Waste Facility, Courtesy of Larimer County

Existing Diversion Policies and Ordinances

The City of Fort Collins is a leader in Colorado waste diversion, and its numerous policies and ordinances work to make a comprehensive solid waste management system. The City's waste policies address different materials and aspects of the City's waste streams. Given the focus on organic waste and construction and demolition waste, only policies relevant to these waste streams were explored in depth.

Existing policies and initiatives in effect in Fort Collins include:

- Sustainability Plans
- City Waste Goals
- Organized Hauler Contract
- Hauler Licensing
- Pay-As-You-Throw (PAYT)
- Universal Recycling
- Commercial Recycling
- Mandatory Organics for Large Grocers
- Construction & Demolition (C&D) Ordinance
- Disposable Bag Ordinance
- Equal Space Ordinance
- Landfill Bans for Electronics & Cardboard

Sustainability Plan

The "Our Climate Future Plan" is a comprehensive community-driven plan adopted by the Fort Collins City Council in 2021. It aims to guide Fort Collins toward a more sustainable future while recognizing the need to enhance equity and inclusion and centering on the needs of its people. Three main goals to reach by 2030 are identified: carbon neutrality, renewable electricity, and zero waste.

Fort Collins has set forth a Road to Zero Waste Plan to help achieve their 2030 zero waste target, with interim goals of 75% diversion by 2020, 90% diversion by 2025, and per capita waste generation of 2.8 pounds/day by 2025.[iii] The plan identifies four priorities to get there: incentivizing culture change, promoting reduce and reuse structures, keeping compostable organics out of landfills, and implementing construction, deconstruction, and demolition policies.

North Front Range Solid Waste Infrastructure Master Plan

The North Front Range Solid Waste Infrastructure Master Plan, adopted in 2018, provides a regional strategy for addressing solid waste needs in Larimer County, including Fort Collins, Loveland, and Estes Park. The plan was developed in response to the expected closure of the Larimer County Landfill and outlines the development of a new landfill, a central transfer station, a construction and demolition (C&D) waste processing facility, and an organics

composting facility. The primary goals include increasing landfill diversion to 40% and laying the foundation for future zero waste objectives. The plan also identifies infrastructure, operational, and policy recommendations to support long-term waste management needs. Regional collaboration and financial sustainability are emphasized as key components for implementation.

Contracted Residential Trash, Recycling, & Yard Waste Collection

In 2022, the City conducted a residential trash bills analysis and found significant cost disparities, with some residents paying up to 71% more for waste services than others.

In May 2023, the Fort Collins City Council approved Ordinance No. 054, 2023, updating the Municipal Code to establish a single-hauler system and require residents in single-unit homes and multi-unit buildings with seven or fewer units to use or pay for municipal waste services.[iv] The City entered a single hauler contract with Republic Services in 2023, requiring all single-family households receive bundled trash, recycling, and seasonal yard trimmings collection at standardized rates, with annual price increases capped at 3%. The City of Fort Collins has cited reduced collection truck traffic, reduced road damage, increased recycling and composting opportunities, improved air quality and neighborhood safety, and fair and transparent pricing as key benefits of a residential collection contract.

While the program does not accept food waste, the contract with Republic Services is expected to increase organic waste diversion. According to the SB23-191 Colorado Organic Diversion Study developed by the Colorado Department of Public Health & the Environment, yard trimmings make up, on average, 20% of the waste sent to landfills by weight in the Front Range.[v]

Homeowner associations (HOAs) with contracts established before the City's April 2023 agreement may be exempt from participating. HOAs entering contracts after that date are required to join the City's program with Republic Services. Households choosing not to participate are subject to a $11.10 monthly opt-out fee.

Pay-As-You-Throw (PAYT)

Service rates under the contract follow a Pay-As-You-Throw (PAYT) model with recycling included, which Fort Collins has used since 1998. This volume-based pricing system encourages waste reduction by allowing residents to choose between 35, 65, or 95-gallon carts for trash collection. Residents may opt out of yard trimmings service for a $5 monthly discount but must still pay a minimum service fee of $11.10 (total).

Table 4 shows the monthly cost breakdowns of the PAYT system in Fort Collins as of April 2025.

Table 4: Fort Collins PAYT Fees

Service Level (for trash, recycling & yard trimmings bundled collection)*	Monthly Fee
XL (weekly collection) 2x 95-gallon trash cart	$109.10
L (weekly collection) 95-gallon trash cart	$55.10
M (weekly collection) 65-gallon trash cart	$37.10
S (weekly collection) 35-gallon trash cart	$19.10
XS (bi-weekly collection) 35-gallon trash cart	$11.10
Opt-out No carts, choose your own hauler	$11.10

*All levels receive 95-gallon carts for both recycling and yard trimmings

Hauler Licensing and Reporting

The Fort Collins Municipal Code, Sec. 12-18(a) requires "the occupant and the owner of any premises wherein any refuse or rubbish is produced or accumulated" to use a solid waste collector licensed by the City.[vi] The City lists licensed haulers with their contact information on their website.[vii]

The City's waste hauler licensing requirement is in Sec. 15-412 of Ordinance No. 054, 2023.[viii] It includes exemptions, a residential requirement for PAYT trash pricing with embedded recycling service, internal recordkeeping requirements, and a provision allowing haulers to issue a service surcharge to residents to cover fluctuating operational costs. It also includes the commercial and multi-unit residential recycling requirements, residential yard trimmings collection requirements, and education requirements.

The City of Fort Collins' hauler licensing and reporting webpage includes a link to apply for a license and two forms for haulers to report the tonnage they collected in Fort Collins twice per year.[ix]

Community Recycling Ordinance

Fort Collins City Council unanimously adopted its Community Recycling Ordinance (CRO) in 2016, which includes a 2021 compliance date.[x] This ordinance follows other Universal Recycling Ordinance (URO) policy models (e.g., the City of Longmont, the City of Boulder, and the City and County of Denver) in how it requires recycling and, in some cases, composting access at businesses and multi-unit residential properties.

Notably, the ordinance was updated in 2016 to include requirements for residential waste haulers to offer seasonal yard trimming collection at single-family homes and require composting at grocery stores if they generate more than 96 gallons of food waste per week. According to the City's webpage, the compost requirement for grocers went into effect at the end of 2017. Between the time the CRO was updated and the rollout of the contracted residential hauler program, Fort Collins residents could subscribe to curbside yard waste collection no matter which hauler they used.

The City's webpage includes extensive resources to assist with CRO compliance, including a service level estimator tool, estimated climate impacts of the policy components, exemption instructions, the reasoning behind the updated CRO language, case studies, and City Council documents.[xi]

Construction & Demolition Recycling Ordinance

The City of Fort Collins building code was updated in 2012 to require construction and demolition (C&D) waste to be recycled.[xii] The C&D recycling requirement can also be found in Sec. 12-22, "Required Recycling" of the City's municipal code.[xiii]

The building code requires that builders submit a Construction Waste and Recycling Management Declaration of Responsibility when applying for a building permit for new residential and commercial buildings and remodels or additions larger than 2,500 square feet.[xiv] Projects are mandated to recycle all concrete, asphalt, masonry, untreated wood, metals, and cardboard. Demolition sites larger than 1,000 square feet are required to recycle the same materials listed above and salvage materials such as doors, windows, cabinets, and fixtures. Once the project is completed, builders must submit a Construction Waste Management Report[xv] to be approved for the closure of the building permit.

The City checks for compliance by reviewing the reports, hauler receipts, and signed affidavits. The City lists extensive compliance resources on its website, including a C&D Recycling handout that provides an overview of the policy requirements and contact information for C&D recycling companies, frequently asked questions, and a video. [xvi]

Other Waste-Related Policies

The City of Fort Collins has adopted several other waste-related policies beyond the management of organic waste and C&D waste. Although the policies listed below do not impact food scraps, yard trimmings, or C&D waste streams that this project focuses on, they are included as part of a comprehensive waste policy baseline assessment.

Disposable Bag Ordinance

Fort Collins voters approved Ordinance No. 26 in 2021, which phases out single-use plastic carryout bags from large retail stores and requires a 10-cent fee on paper carryout bags, with

exceptions for people using income-qualified assistance programs.[xvii] The ordinance was later amended to align with the statewide Plastic Pollution Reduction Act, HB21-1162.[xviii]

Larimer County Wasteshed Intergovernmental Agreement

In 2019, the City of Fort Collins, the City of Loveland, and the Town of Estes Park entered an intergovernmental agreement (IGA) with Larimer County to coordinate and address regional waste issues, which was especially timely considering the Larimer County landfill is near capacity. One directive of the IGA was to implement the recommendations in the 2018 Solid Waste Infrastructure Master Plan. This was a notable effort for regional collaboration and useful for reference, but the IGA is no longer in place, highlighting the need for additional and ongoing collaboration.

Trash and Recycling Enclosure Requirements

In 2004, the City of Fort Collins adopted Ordinance No. 198 to amend the Land Use Code and set requirements to ensure new commercial and multi-family buildings have sufficient space for recycling bins,[xix] a common barrier to recycling for these properties.

Cardboard and E-waste Ordinances

In 2007, the City passed an ordinance banning electronic waste from landfill disposal.[xx] Similarly, an ordinance banning cardboard from landfill disposal was adopted in 2013 and requires all cardboard, except food-contaminated cardboard, to be recycled.[xxi] These policies are sometimes referred to as "landfill bans," which can be a confusing term; the policy does not ban landfills but rather bans certain materials from being disposed of at landfills. The cardboard and e-waste landfill bans are part of Section 12-22, "Required Recycling," in the City's municipal code, along with the C&D waste recycling requirement.[xxii]

Regional Policy Comparison Chart

The City of Fort Collins has adopted similar waste policies to the City of Boulder, such as PAYT and C&D recycling, but is distinguished for its municipal contract. Table 5, below, compares the City of Fort Collins' waste policies with the City of Boulder, Larimer County, and Weld County.

Table 5: Regional Policy Comparison Chart

Policy	City of Fort Collins	City of Boulder	Larimer County	Weld County
Pay-As-You-Throw	In effect since 1996.[xxiii]	In effect since 1998.	None.	None.
Organic Waste Recycling	Composting is required at grocery stores, and seasonal yard trimmings collection is required through the residential hauling contract.[xxiv]	The Universal Zero Waste Ordinance requires composting at all properties, including businesses, multifamily housing, and single-family homes. [xxv]	None.	None.
Hauler Licensing	Requires waste haulers to be licensed.[xxvi]	Requires waste haulers to submit annual tonnage reports.[xxvii]	Requires waste haulers to be licensed.[xxviii]	None.
Construction and Demolition Recycling	Requires recycling of C&D materials and to submit reports.[xxix]	Requires deconstruction and C&D recycling.[xxx]	None.	None.
Residential Collection System	Municipal contract.[xxxi]	Open market.	Open market.	Open market.

Review of Past Studies

As part of the analysis of existing policies and infrastructure in the City of Fort Collins, the STEPS project team reviewed past studies and provided key takeaways for organics and C&D processing.

2011 Boulder County Construction and Demolition Infrastructure Study

Link: Visit the Boulder County webpage for the full report.

C&D: The report finds that construction & demolition (C&D) waste represents 20-40% of the total generated waste stream in Boulder County, or about 120,000 tons of material generated per year. It suggests that Boulder County should create a transfer station for C&D materials and not compete with the private market. Cost estimates for constructing a transfer station that could receive 19-to 65 tons of C&D material per day ranged from $7,000,000 to $15,000,000.

2016 Regional Wasteshed Planning Study

Link: Visit the Fort Collins webpage for the full report.

Organics: The report recognized the Drake Water Reclamation Facility's role in processing approximately 37 tons of food scraps per day and suggested that it has additional food scraps capacity. A new compost processing facility designed to handle the projected 80,000 to 106,000 tons of organic material annually by 2040 is estimated to require an initial capital investment of $4,000,000 and nearly $5,000,000 in annual operating costs.

C&D: The report highlighted the need to expand solid waste infrastructure to manage a 20% increase in waste following the Larimer County landfill's closure around 2025. A 2016 Waste Composition Study showed that 10% of the landfilled material, primarily C&D waste, could have been recycled. Funding options for a new facility include fees, taxes, public-private partnerships, and a regional solid waste agency. A proposed C&D processing facility near the current Larimer County Landfill, designed to handle over 14,000 tons of C&D material annually by 2040, would require an initial capital investment of nearly $4,000,000 and annual operating costs of about $1,000,000.

2017 City of Fort Collins Air Quality, Climate and Recycling Survey

Link: Visit the Fort Collins webpage for the full report.

Organics: Fort Collins conducted a survey and found that while nearly all residents recycle, few engage in composting. Specifically, when asked about their recycling habits, almost all residents (88%) reported using the curbside recycling program. Three-quarters of participants disposed of food scraps in a kitchen sink garbage disposal at least once a month. Additionally, half or more of respondents were familiar with Christmas tree recycling (81%), leaf exchange programs (50%), and the City's climate action goals (54%).

2017 City of Fort Collins Drake Water Reclamation Facility Food Scraps Evaluation

Link: Not publicly available.

Organics: The report presents initial calculations for the sizing and design of a food scraps receiving station, aimed at enhancing biogas production at the Drake Water Reclamation Facility (DWRF) in Fort Collins. It recommends locating the facility north of the primary sedimentation basins. It was designed to process 98,000 pounds per day of food scraps and create up to 117,600 computational fluid dynamics (CFD) of additional digester gas production.

2018 Understanding Food Waste in Fort Collins, Colorado

Link: Not publicly available.

Organics: The report outlined a Material Flow Analysis conducted in 2014 and estimated that Fort Collins generated a total of 32,616 tons of food scraps, with approximately 55% of that organic material stemming from residential sources.

2019 Life Cycle Analysis of Food Scraps Disposal Options

Link: Visit the Fort Collins webpage for the report.

Organics: The two season waste composition study found that food scraps account for 34.3% of residential organic waste and 43.4% of commercial organic waste. A life cycle analysis of food scraps was conducted to compare greenhouse gas (GHG) emissions for two different food scraps diversion strategies. The commercial scenario (adding food scraps directly to an anaerobic digester) was found to have a smaller carbon footprint than the residential scenario (garbage disposal) and resulted in net negative GHG emissions. In addition, the commercial scenario resulted in 10 times less water consumption than the residential scenario.

2022 Open Market System Trash Bill Analysis

Link: Visit the Fort Collins webpage for the report.

Organics: The report examined trash rates in the open market and found significant variation in residential pricing, even within the same neighborhoods, and for services provided by the same company. Some customers with medium and large carts were paying a similar price (e.g., $26 and $31 per month), indicating that some haulers were not charging the total cost for medium and large carts that the City's PAYT code language would require. Pricing increased between late 2022 and early 2023, with rises ranging from 2% to 41%, and an average increase of 15%.

Fort Collins Tonnage Data

In accordance with Sec 15.420 of the Fort Collins Municipal Code, licensed haulers operating in Fort Collins are required to collect data on the total tons of solid waste collected, recyclable materials, food scraps, and yard trimmings separated by customer category (residential, multi-family, and commercial), and report this every six months to the City.[xxxii] These tonnage reports were developed to help Fort Collins track progress in goals established in its Road to Zero Waste Plan, including 75% diversion by 2020, 90% diversion by 2025, and per capita waste generation of 2.8 pounds/day by 2025 and used to synthesize current diversion rates.[xxxiii]

Overall Diversion

As of 2023, Fort Collins has an overall waste diversion rate of 62.9%. This figure reflects the combined impact of the City's efforts and the existing infrastructure mentioned previously. This section provides a more detailed review of the diversion data for C&D and organic materials from the city's residential, commercial and industrial waste streams.

Diverting more organic materials from the municipal solid waste stream and more C&D material from the industrial waste stream are potential pathways the city can pursue to achieve its zero waste goals.

Organics Diversion

Fort Collins has demonstrated steady diversion of food scraps and yard trimmings by the residential and commercial sectors between 2019 and 2023, as shown in Table 6. Total tons of organics diverted range between 9,972 and 16,343 tons within this timeframe, and the City achieved a 23.5% diversion rate for organics in 2023. Food scraps diversion remained relatively stable throughout this period, consistently hovering between 1,500 and 2,000 tons annually. The highest food scraps diversion occurred in 2023, reaching 1,983 tons due to both residential and commercial collection efforts. Yard trimmings, which constitute a more significant portion of the organics stream, experienced substantial increases in 2020 and 2021, peaking at over 14,000 tons, largely influenced by weather events that caused many branches to break that were then mulched or composted.

Table 6: Tons of Residential & Commercial Yard Trimmings and Food Scraps Diverted Between 2019-2023

	2019	2020	2021	2022	2023
Food Scraps Diverted (TPY)	1,545	1,499	1,178	1,780	1,983
Yard Trimmings Diverted (TPY)	10,053	14,844	14,840	8,192	9,750
Total Organics Diverted (TPY)	11,598	16,343	16,018	9,972	11,733
Total Organics Landfilled (TPY)	33,029	34,256	35,334	33,369	38,175
Total Organics Diversion Rate	25.99%	32.30%	31.19%	23.01%	23.51%

Figure 2 demonstrates that yard trimmings continue to be the primary organic material diverted, making up approximately 83-93% of total organics composted or mulched.

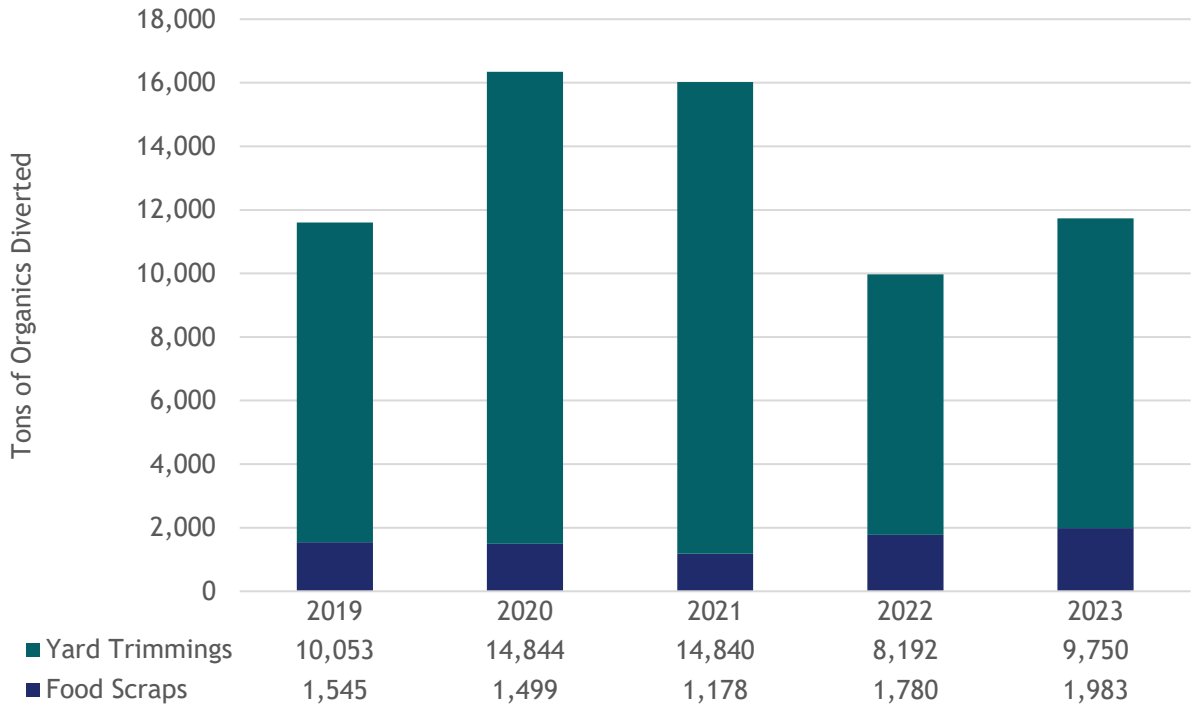


Figure 2: Yard Trimmings & Food Scraps Diverted from Residential and Commercial Sources (2019-2023)

C&D Diversion

Fort Collins has experienced significant growth in C&D waste diversion, increasing from 68% in 2019 to 83% in 2023. Notably, the total amount of recycled C&D material rose from 118,892 tons in 2021 to 184,520 tons in 2023, with significant variability depending on the number and type of large C&D projects each year. Meanwhile, landfilled materials decreased consistently, from 63,535.5 tons in 2019 to just 38,251.8 tons in 2023. Table 7 and Figure 3 show total diversion of C&D materials from 2019 to 2023 in tabular and graphical formats.

Table 7: C&D Recycled and Landfilled (2019-2023)

	2019	2020	2021	2022	2023
Recycled	136,014	129,817	118,892	141,349	184,520
Landfilled	63,536	68,262	61,443	44,729	38,252
Diversion Rate	68%	66%	66%	76%	83%

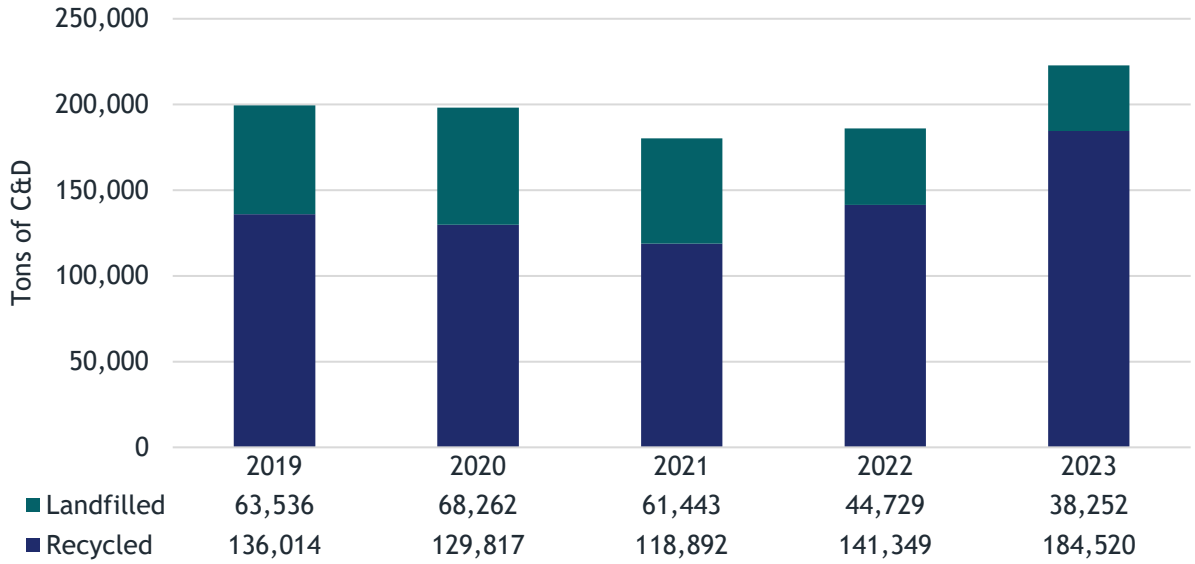


Figure 3: C&D Recycled & Landfilled (2019-2023)

Between 2019 and 2023, scrap metal, concrete, and asphalt were the largest components of recycled materials in C&D, as shown in Figure 4. Scrap metal consistently represents a large portion, while asphalt recycling has increased notably in recent years. Concrete's contribution has remained relatively stable across all five years. Other materials, such as wood waste and cardboard, make up smaller portions of diverted materials. Only 90% of landfilled industrial waste is counted towards C&D, as the remaining 10% is considered municipal C&D waste. This data highlights Fort Collins' ongoing success in diverting substantial quantities of bulk materials, such as asphalt and concrete, from landfills, contributing to increased diversion rates over time.

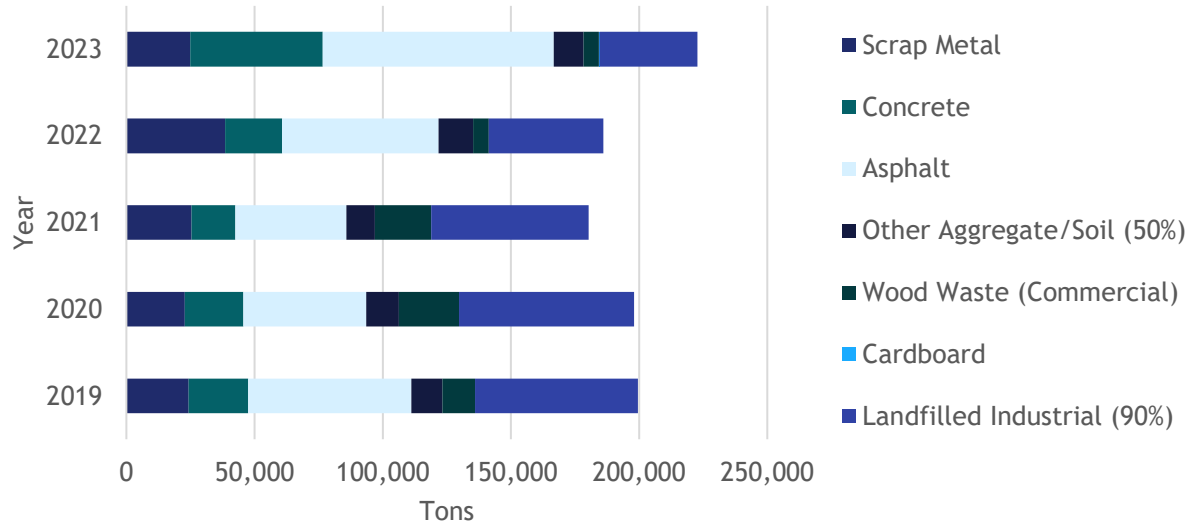


Figure 4: C&D Composition (2019-2023)

Stakeholder Research

The STEPS project team contacted and conducted interviews with 13 stakeholder groups to gather information on waste collection systems and processes. Stakeholders included municipal agencies within Larimer County, food waste haulers serving Fort Collins, organics processors, construction & demolition (C&D) material haulers and processors, and local municipalities in the greater region.

A total of 16 stakeholder groups were identified; the STEPS project team was able to meet with 13. The three entities that could not be met with were Larimer County's Solid Waste and Community Planning, Organix Recycling, and Republic Services. Stakeholder groups were asked to share key opportunities and challenges related to organics recycling or C&D material recycling, as well as the factors that would contribute to successful waste diversion. Table 8 lists all the groups and representatives that were interviewed, as well as key takeaways of each. Complete notes and information on each interview can be found in Appendix B: Stakeholder Interviews.

Table 8: Stakeholder Meetings

Stakeholder	Category	Representatives	Key Takeaways
Larimer County - Sustainability and Climate	Municipalities in Larimer County	Heidi Preuss, CEP & Sustainability Climate Manager	Larimer County is preparing to close its existing landfill and open a new one in 2026, aligned with the Climate Smart and Future Ready Plan. Diversion initiatives for C&D, yard, and food waste remain scheduled for 2026.
City of Fort Collins - Environmental and Code Compliance	Municipalities in Larimer County	Linda Hardin, Senior Specialist of Environmental Compliance; and Monty Atkinson, Inspector of Code Compliance	C&D recycling faces compliance issues, often due to lack of awareness or neglect. Reducing deconstruction costs and simplifying recycling could improve outcomes. A dedicated C&D transfer station is seen as a cost-effective improvement.
City of Fort Collins - Anaerobic Digestion (AD)	Municipalities in Larimer County	Christina Schroeder, Director of Water Treatment Plant Operations; and Jeremy Woolf, Senior Director	The AD system is unable to increase capacity nor process food waste. A food waste collection trial at Colorado State University was unsuccessful due to contamination, resulting in landfilling.

Stakeholder	Category	Representatives	Key Takeaways
		of Water Operations	
Compost Queen	Food Waste Haulers Serving Fort Collins	Jamie Blanchard-Poling, Founder	Compost Queen has the infrastructure to double its composting capacity and plans to launch a new potential Class 1 site. They are open to forming partnerships with Fort Collins.
Common Good	Food Waste Haulers Serving Fort Collins	Geoff Schmidt, Owner	Common Good currently transports organics to A1 Organics but would prefer a closer facility. They serve 954 households but believe they could quadruple their customer base through strategic onboarding.
Ewing Outdoor Supply	Organics Processors Serving the Region	Karen Horner, Branch Manager	Ewing specializes in wood waste processing and sends yard trimmings to A1 Organics. They are interested in expanding wood waste services but not yard waste.
A1 Organics	Organics Processors Serving the Region	Clinton Sander, Marketing Manager; and Travis Bahnsen, President and Chief Financial Officer	A1 Organics has capacity to accept more material but struggles with contamination and limited demand for finished compost. They are open to partnering on a new facility but would require substantial investment.
Custom Disposal	C&D Material Haulers & Processors	Tanner & Brian Slatten, Owners	Custom Disposal recycles materials through their rented containers but faces challenges with illegal dumping, which leads to landfilling. They believe financial incentives, rather than regulation, would drive recovery.
National Center for Craftsmanship (NCC)	C&D Material Haulers & Processors	Robb Sommerfeld, Executive Director	NCC reports that building deconstruction is increasingly expensive and recommends incentives over penalties to promote material recovery.
West Highland Management Group (WHMG)	C&D Material Haulers & Processors	Nick Wilson, President	WHMG plans to develop an 80-acre site to host a Class 1 compost facility, a household hazardous waste (HHW) center, and a materials recovery facility (MRF).
City of Longmont	Municipalities in the Region	Charlie Kamenides,	Longmont offers optional curbside collection for organics and currently

Stakeholder	Category	Representatives	Key Takeaways
		Waste Services Manager	supports a regional composting facility with multi-agency funding. Further engagement depends on Boulder County's ongoing feasibility study.
City of Loveland	Municipalities in the Region	Tyler Bandemer, Solid Waste Division Superintendent	Loveland has completed a transfer station feasibility study and is exploring service expansion. The city acquired adjacent land for composting expansion, but environmental remediation costs remain a barrier without external funding. They are interested in regional partnerships.
Boulder County	Municipalities in the Region	Meghan Weibe, Zero Waste Strategic Advisor	Boulder County has commissioned a compost facility feasibility study (due 2025) and is open to public-private partnerships that align with the county's goals.

Tonnage Projections: Food Scraps, Yard Trimmings and C&D

To understand the greatest waste diversion potential for the City of Fort Collins, the STEPS project team developed projections using current and historical tonnage data, including tonnage reports provided to the City by waste haulers per hauler reporting requirements, to estimate future trends in food scraps, yard trimmings, and construction and demolition (C&D) diversion and landfilling in Fort Collins and Larimer County. The projections serve as a baseline for future program adjustments and facility planning.

These estimates do not account for new processing facilities and assume the continuation of current diversion practices. The averaged annual growth rates utilized to generate projections aimed to mitigate the impact of outliers, such as the COVID-19 pandemic and weather events that caused variability in diversion and landfilling.

It is projected that the combined generation of food scraps and yard trimmings will be 51,375 tons per year (TPY) in 2025, and 57,732 TPY in 2035, and the generation of C&D will be 239,070 TPY in 2025 and 258,395 TPY in 2035. Given the current policies and programs in place, the total diversion is projected to be higher of C&D material than organics. This information is presented in Table 9.

Table 9: Baseline Projections

Materials	2025			2035		
	Total Generation (TPY)	Total Diversion (TPY)	Total Diversion (%)	Total Generation (TPY)	Total Diversion (TPY)	Total Diversion (%)
Food Scraps	25,168	2,124	8.4%	28,516	2,424	8.5%
Yard Trimmings	26,207	10,241	39.1%	29,216	11,689	40.0%
Organics (combined)	51,375	12,365	24.1%	57,732	14,113	24.4%
C&D	239,070	201,842	84.4%	258,395	224,996	87.1%

Assumptions and Influencing Factors

The projections assume consistent participation rates and stable market demand for composted materials for the years projected out. Data for organics recycling is categorized by residential (single-family homes with up to 7 units), multi-family units (of 8 units or more), and commercial businesses. Certain data limitations for multi-family units (MFU) are reflected in the data tables, due to material from multi-family units being collected with commercial waste. Therefore, it is difficult to determine if waste is derived from multi-family units or commercial properties. There are a variety of factors that have the potential to influence and impact future tonnage, but these projections have not been incorporated into calculations for

the purposes of this study. Key factors with the potential to influence these outcomes include:

- **EPR (Extended Producer Responsibility) policies**, including Colorado's Producer Responsibility Program for Statewide Recycling Act, which could shape recycling incentives and infrastructure investments, indirectly impacting organics diversion and C&D.
- **Housing market dynamics**, as shifts in housing construction can alter yard trimmings and C&D volumes. Specifically, interest rate reductions may spur new construction, increasing both yard trimmings generation and C&D materials.
- **Significant weather events**, such as droughts or heavy storms, heavily impact yard trimmings volumes and influence both generation and diversion rates.
- **Economic conditions**, which could affect municipal and resident investments in organic waste collection and processing.

Organics (Food Scraps & Yard Trimmings)

Food Scraps Projections

Table 10 provides a summary of food scraps recovery and landfill estimates in Fort Collins. This data reflects both historical recovery rates and projected future trends. The table estimates the total tons of food scraps diverted through local composting programs alongside anticipated volumes likely to still reach the landfill.

Annual increases in food scraps diversion have been modest, likely due to limited-service options, low awareness, and the long distances to commercial food scraps composting facilities. The absence of local policy around food scraps recycling (other than for grocers) also impacts the slow growth in food scraps composting.

Table 10: City of Fort Collins Food Scraps Diverted and Estimated Landfilled (Tons/Year)

Year	Diversion		Landfill			Total Generation
	Residential	Commercial	Residential	MFU*	Commercial	
2019	57	1,488	8,915	811	9,979	21,250
2020	104	1,395	10,697	813	8,331	21,340
2021	261	917	10,975	1,101	8,391	21,645
2022	208	1,572	9,863	1,000	8,676	21,319
2023	292	1,691	10,943	1,146	10,404	24,476
2024	321	1,772	10,988	1,178	10,599	24,858
2025	326	1,798	11,034	1,211	10,799	25,168
2026	331	1,823	11,079	1,244	11,002	25,479
2027	335	1,849	11,125	1,278	11,208	25,795
2028	340	1,874	11,170	1,313	11,419	26,116

Year	Diversion		Landfill			Total Generation
	Residential	Commercial	Residential	MFU*	Commercial	
2029	344	1,899	11,216	1,349	11,633	26,441
2030	349	1,925	11,262	1,387	11,852	26,775
2031	354	1,950	11,309	1,425	12,075	27,113
2032	358	1,976	11,355	1,464	12,302	27,455
2033	363	2,001	11,402	1,504	12,533	27,803
2034	367	2,026	11,449	1,546	12,768	28,156
2035	372	2,052	11,496	1,588	13,008	28,516

*MFU = Multi-family Units
Note = There are no estimations for MFU diverted food scraps. 2024-2035 are projected tonnages.

Methodology

Anticipated annual growth rates for diverted and generated food scraps were generated for 2024 to 2035. For diverted materials, an average annual growth rate was calculated using historical data. Between 2019 and 2023, the amount of food scraps composted was variable, presumably due to external factors such as the COVID-19 pandemic, and strategically omitted as an outlier to reduce variability. For food scraps landfilled, it is standard practice to utilize population growth as the estimated growth rate. Data from the Larimer County 2016 Waste Composition and Characterization Analysis was utilized to generate food scraps tonnage based on a percentage of landfilled tons of material.

- **Residential Diverted Food Scraps**: Averaged annual rate of change for 2021 and 2023 was 10%. The 10% increase was projected for 2024. To remain conservative in projections, estimated changes in population (1.3% to 1.5%) were used as an escalator from 2024 to 2035.
- **Commercial Diverted Food Scraps**: Averaged annual rate of change from 2019 to 2023 was 9.6%. To remain conservative in projections, half of the 9.6% (4.8%) was used as an escalator for 2024 and estimated changes in population (1.3% to 1.5%) were used as an escalator from 2024 to 2035.
- **Residential Landfilled Food Scraps**: Utilizing historical landfill tonnage data, an average annual growth rate from 2022 to 2023 (0.4%) was generated using a multiplier from past waste characterization studies.
- **Multi-family Landfilled Food Scraps**: Utilizing historical landfill tonnage data, an average annual growth rate from 2022 to 2023 (2.8%) was generated using a multiplier from past waste characterization studies.
- **Commercial Landfilled Food Scraps**: Utilizing historical landfill tonnage data, an average annual growth rate from 2020 to 2023 (1.9%) was generated using a multiplier from past waste characterization studies.

Yard Trimmings Projections

Prior to the City's contract with Republic Services in 2023, seasonal residential yard trimmings collection has been offered as an opt-in program for an additional fee, with 14% of residents subscribing and steady yard trimming generation. The new contract with Republic Services includes seasonal yard trimmings collection in the baseline service for single-family households. While households have the option to opt out of yard trimmings collection service, this program is nonetheless expected to increase the amount of residential yard trimmings composted.

Table 11 shows past and projected Fort Collins yard trimmings tons landfilled and diverted. This data provides insights into both historical diversion volumes and anticipated increases, largely influenced by Republic Services' expanded yard trimmings collection program. With yard trimmings comprising a significant portion of organic materials, these projections are crucial for understanding and enhancing Fort Collins' overall waste diversion strategy. The table reflects expected recovery improvements and estimates for yard trimmings still projected to be landfilled.

Table 11: City of Fort Collins Yard Trimmings Diversion and Estimated Landfilled

Year	Diversion		Landfill			Total Generation
	Residential	Commercial	Residential	MFU*	Commercial	
2019	4,740	5,313	8,818	431	4,075	23,377
2020	7,796	7,048	10,581	432	3,402	29,259
2021	7,575	7,265	10,856	585	3,426	29,707
2022	5,187	3,005	9,756	531	3,543	22,022
2023	5,523	4,227	10,825	609	4,248	25,432
2024	5,776	4,321	10,869	626	4,328	25,920
2025	5,858	4,383	10,914	643	4,409	26,207
2026	5,941	4,445	10,959	661	4,492	26,498
2027	6,024	4,507	11,004	679	4,577	26,791
2028	6,107	4,569	11,049	698	4,663	27,086
2029	6,190	4,631	11,095	717	4,750	27,383
2030	6,273	4,693	11,140	737	4,840	27,683
2031	6,355	4,755	11,186	757	4,931	27,984
2032	6,438	4,817	11,232	778	5,023	28,288
2033	6,521	4,878	11,278	799	5,118	28,594
2034	6,604	4,940	11,325	821	5,214	28,904
2035	6,687	5,002	11,371	844	5,312	29,216

*MFU = Multi-family Units
Note = There are no estimations for MFU diverted yard trimmings. 2024-2035 are projected tonnages.

Methodology

Similarly to food scraps projections, anticipated annual growth rates for diverted and generated yard trimmings were generated for 2024 to 2035. For diverted materials, an average annual growth rate was calculated using historical data. Between 2019 and 2023, the amount of yard trimmings composted or mulched was variable, presumably due to external factors such as the COVID-19 pandemic and snow events that generated more yard trimmings than usual and was strategically omitted as an outlier to reduce variability. For yard trimmings landfilled, it is standard practice to utilize population growth as the growth rate. Data from the Larimer County 2016 Waste Composition and Characterization Analysis was utilized to generate yard trimmings tonnage based on a percentage of landfilled tons of material.

- **Residential Diverted Yard Trimmings**: Averaged annual rate of change from 2019 to 2023 was 4.6%. For 2024, the 4.6% was escalated from 2023 tonnages. To remain conservative in projections, estimated changes in population (1.3% to 1.5%) were used as an escalator from 2024 to 2035.
- **Commercial Diverted Yard Trimmings**: Averaged annual rate of change from 2019 to 2023 was 2.2%. The 2.2% increase was projected for 2024. To remain conservative in projections, estimated changes in population (1.3% to 1.5%) were used as an escalator from 2024 to 2035.
- **Residential Landfilled Yard Trimmings**: Utilizing historical landfill tonnage data, an average annual growth rate from 2022 to 2023 (0.4%) was generated using a multiplier from past waste characterization studies.
- **Multi-family Landfilled Yard Trimmings**: Utilizing historical landfill tonnage data, an average annual growth rate from 2022 to 2023 (2.8%) was generated using a multiplier from past waste characterization studies.
- **Commercial Landfilled Yard Trimmings**: Utilizing historical landfill tonnage data, an average annual growth rate from 2020 to 2023 (1.9%) was generated using a multiplier from past waste characterization studies.

Organics (Food Scraps and Yard Trimmings) Projections

Table 12 combines projections for both food scraps and yard trimmings, offering a comprehensive view of Fort Collins' organics management. This summary captures historical and anticipated diversion rates, showing progress towards reducing landfill reliance for organic materials.

Table 12: Overall City of Fort Collins Organics Diverted and Estimated Landfilled Tons

Year	Diverted Food Scraps	Landfilled Food Scraps	Diverted Yard Trimmings	Landfilled Yard Trimmings	Total Organics Generation
2019	1,545	19,705	10,053	13,324	44,627
2020	1,499	19,841	14,844	14,415	50,599

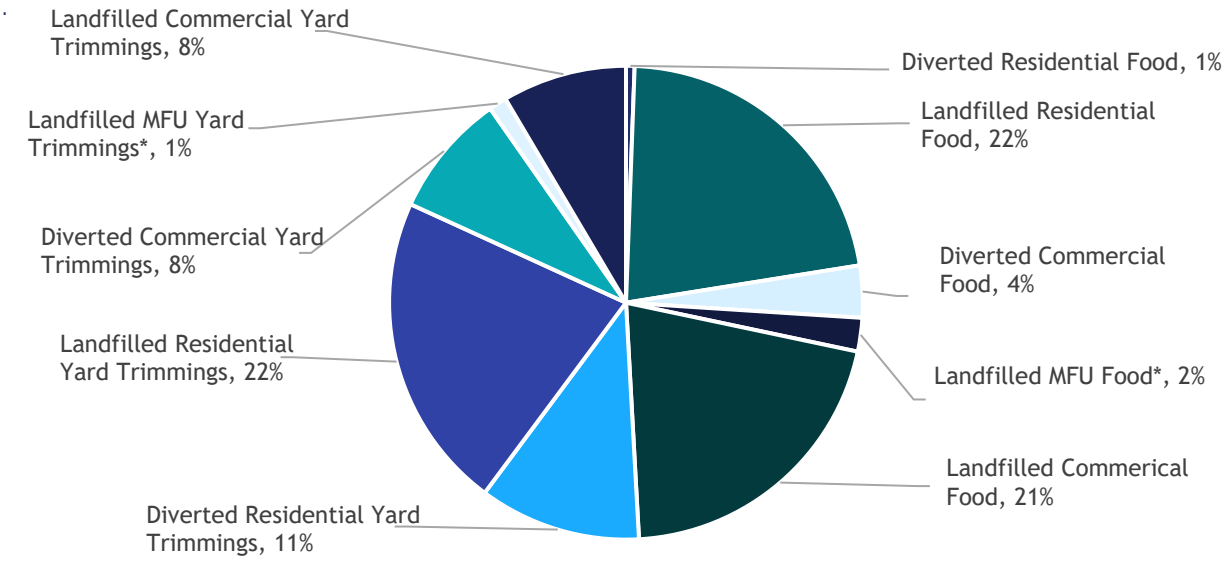
Year	Diverted Food Scraps	Landfilled Food Scraps	Diverted Yard Trimmings	Landfilled Yard Trimmings	Total Organics Generation
2021	1,178	20,467	14,840	14,867	51,352
2022	1,780	19,539	8,192	13,830	43,341
2023	1,983	22,493	9,750	15,682	49,908
2024	2,093	22,765	10,097	15,823	50,778
2025	2,124	23,044	10,241	15,966	51,375
2026	2,154	23,325	10,386	16,112	51,977
2027	2,184	23,611	10,531	16,260	52,586
2028	2,214	23,902	10,676	16,410	53,202
2029	2,243	24,198	10,821	16,562	53,824
2030	2,274	24,501	10,966	16,717	54,458
2031	2,304	24,809	11,110	16,874	55,097
2032	2,334	25,121	11,255	17,033	55,743
2033	2,364	25,439	11,399	17,195	56,397
2034	2,393	25,763	11,544	17,360	57,060
2035	2,424	26,092	11,689	17,527	57,732

*MFU = Multi-family units
Note = There are no estimations for MFU diverted food scraps. 2024-2035 are projected tonnages.

In 2023, Fort Collins achieved an approximate 23.5% diversion rate for organic materials. Yard trimmings consistently comprised 83-93% of total organics diverted from 2019 to 2023. Food scraps represent a smaller portion of organics diverted, but the amount of food scraps residents and businesses have separated for composting has been steady.

*MFU = Multi-family units
Note = There are no estimations for MFU diverted food scraps. 2024-2035 are projected tonnages.

Figure 5 shows food scraps and yard trimmings from the residential and commercial sectors in Fort Collins in 2023 by percentage and whether the material was diverted or sent to the landfill. Residential and commercial diversion each comprise approximately 12% of all organic waste disposal. This information was gleaned from the Larimer County 2016 Waste Composition Study and Fort Collins available tonnage data.



*MFU = Multi-family units
Note = There are no estimations for MFU diverted food scraps. 2024-2035 are projected tonnages.

Figure 5: 2023 City of Fort Collins Estimated Breakdown of Food Scraps and Yard Trimmings

Anticipated City Diversion of Organics

Between 2019 and 2023, the amount of food scraps and yard trimmings composted or mulched was variable, presumably due to external factors such as the COVID-19 pandemic and snow events that generated more yard trimmings than usual. Utilizing an average of these tonnages and omitting outliers, an estimated annual growth percentage was generated for commercial and residential food scraps and yard trimmings, as shown in Figure 6. These values do not include multi-family units, which the STEPS project team did not have access to.

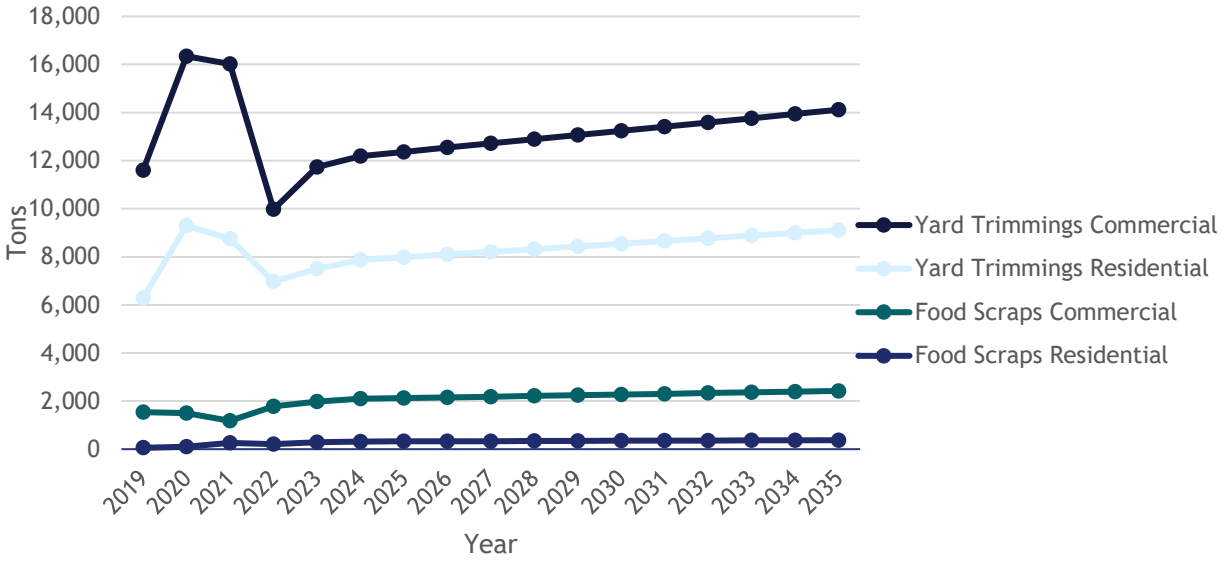
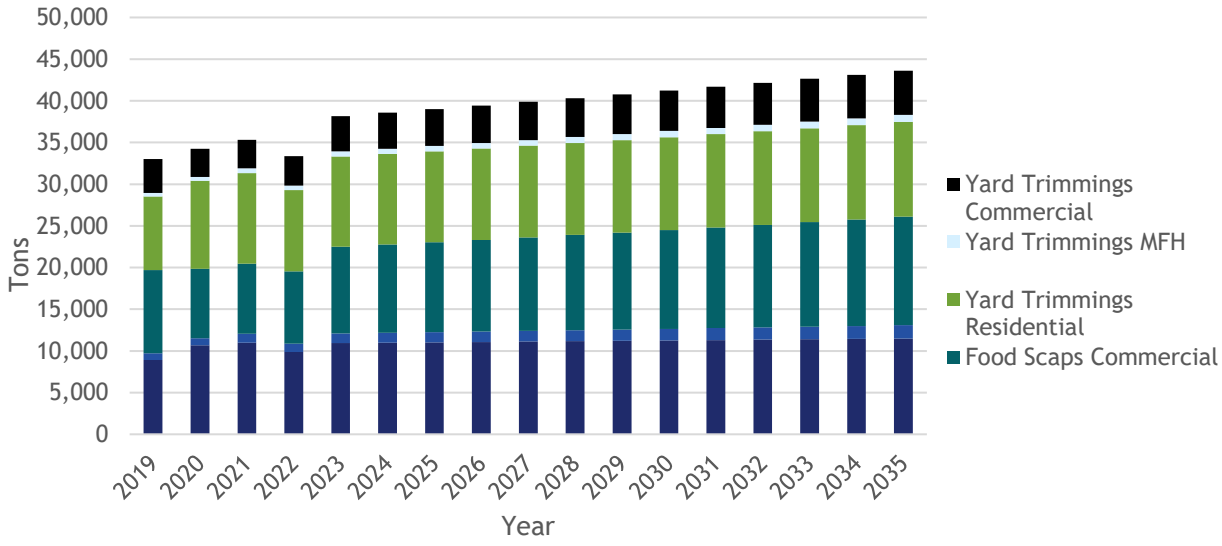


Figure 6: City of Fort Collins Food Scraps and Yard Trimmings Diversion Projections

Anticipated City Landfilled Organics

Despite ongoing improvements in diversion, a substantial portion of food scraps and yard trimmings is anticipated to remain landfilled under current operations unless there is a change in policy or programs. Factors such as program accessibility, awareness, population growth, and weather events affect the volume of landfilled organics. For instance, severe weather leading to increased yard trimmings generation could influence annual landfill contributions, even with higher diversion rates. Projections for total food scraps and yard trimmings landfilled in Fort Collins are shown in Figure 7.



*MFH = Multi-family housing, which is interchangeable with MFU

Figure 7: City of Fort Collins Food Scraps and Yard Trimmings Landfill Projections

Anticipated County Landfilled Organics

The STEPS team generated tonnage estimates for Larimer County and the neighboring Weld and Boulder Counties. Table 13 shows estimated tonnages for 2024 and 2035 based on population growth. Due to the varying factors that could influence material generation such as permitting processes, population changes, and markets for materials, estimates were based solely on anticipated changes in population.

Table 13: Larimer County Estimated Food Scraps and Yard Trimmings Landfilled Tons

Year	Fort Collins		Larimer County Minus Fort Collins		Larimer County		
	Landfilled Food Scraps	Landfilled Yard Trimmings	Landfilled Food Scraps	Landfilled Yard Trimmings	Landfilled Food Scraps	Landfilled Yard Trimmings	Total Organics Generation
2019	13,324	19,705	24,053	1,859	37,377	21,564	58,941
2020	14,415	19,841	24,727	2,741	39,142	22,582	61,723
2021	14,867	20,467	25,763	2,974	40,630	23,441	64,071
2022	13,830	19,539	24,894	2,802	38,724	22,341	61,065
2023	15,682	22,493	29,015	3,294	44,697	25,787	70,483
2024	15,823	22,765	29,313	3,275	45,136	26,040	71,177
2025	15,966	23,044	29,886	3,409	45,852	26,453	72,305
2026	16,112	23,325	30,529	3,583	46,641	26,908	73,549
2027	16,260	23,611	31,425	3,900	47,685	27,511	75,196
2028	16,410	23,902	32,218	4,153	48,628	28,055	76,683
2029	16,562	24,198	32,938	4,360	49,500	28,558	78,058
2030	16,717	24,501	33,661	4,563	50,378	29,064	79,442
2031	16,874	24,809	34,382	4,762	51,256	29,571	80,827
2032	17,033	25,121	35,099	4,955	52,132	30,076	82,208
2033	17,195	25,439	35,824	5,149	53,019	30,588	83,606
2034	17,360	25,763	36,547	5,337	53,907	31,100	85,008
2035	17,527	26,092	37,272	5,523	54,799	31,615	86,413

Fort Collins' total tons of organics landfilled are projected to increase from 21,587 tons of food scraps and 13,174 tons of yard trimmings in 2023 to an estimated 17,527 tons and 26,092 tons, respectively, in 2035. Larimer County's population is expected to increase at an annual rate of 1.9%, thus increasing tons of landfilled organic material.

Construction & Demolition

The C&D waste projections leverage historical data and variables, such as large demolition projects and population growth, to estimate changes in C&D waste processing without assuming any new facilities. The projection covers materials diverted, the anticipated landfill contributions, and factors influencing C&D waste generation and diversion.

Current & Historical Diversion of C&D

Large demolition projects, such as the recent K-Mart demolition in 2023, have happened every five to seven years and have resulted in spikes in C&D waste generation. These projects generate significant volumes of C&D materials (e.g., concrete, metal), which positively impact annual diversion rates. The following projections assume one project every five years will sustain high diversion volumes. Additionally, changes in residential and commercial real estate demand, often tied to broader economic conditions, could influence the frequency of large-scale demolitions, impacting annual projections.

C&D Projections

C&D diversion rates are projected to increase gradually as compliance with the City's recycling ordinances grows and population increases, with an anticipated 6% increase in C&D diversion from 2023 to 2035. This consistent increase reflects Fort Collins' growing emphasis on C&D recycling, with a gradual decrease in landfilled materials expected alongside these gains. For the purpose of projections in this assessment, these tonnage changes are included in the averages used to project year 2024. The methodology below will show escalations based on anticipated population changes because the tons already include the average of past tonnages.

Table 14: City of Fort Collins C&D Diverted and Estimated Landfilled

Year	Diversion				Total Diversion	Total Landfill	Total Generation
	Scrap Metal	Concrete	Asphalt	Other Aggregate / Soil			
2014	24,846	31,447	133,256	26,081	215,630	47,109	262,738
2015	24,163	39,038	65,310	9,141	137,652	54,428	192,079
2016	24,061	26,438	42,129	13,694	106,322	56,396	162,718
2017	24,113	17,204	61,458	18,848	121,623	53,108	174,731
2018	25,061	40,838	61,517	37,063	164,479	57,165	221,644
2019	24,297	23,155	63,703	12,055	123,210	63,536	186,746
2020	22,835	22,779	47,991	12,725	106,330	68,262	174,592
2021	25,376	17,095	43,347	11,089	96,907	61,443	158,350
2022	38,545	22,200	61,024	13,511	135,280	44,729	180,009
2023	24,918	51,629	90,115	11,693	178,355	38,252	216,606
2024	25,614	62,130	97,791	13,413	198,948	37,736	236,684
2025	25,986	63,034	99,214	13,608	201,842	37,228	239,070
2026	26,359	63,938	100,637	13,803	204,736	36,726	241,463
2027	26,731	64,842	102,059	13,998	207,631	36,231	243,862
2028	27,104	65,746	103,482	14,193	210,525	35,743	246,268
2029	27,477	66,650	104,905	14,388	213,419	35,261	248,681
2030	27,849	67,554	106,327	14,584	216,313	34,786	251,100
2031	28,222	68,457	107,750	14,779	219,208	34,317	253,525
2032	28,594	69,361	109,172	14,974	222,102	33,855	255,957
2033	28,967	70,265	110,595	15,169	224,996	33,399	258,395
2034	29,340	71,169	112,018	15,364	227,890	32,949	260,839
2035	29,712	72,073	113,440	15,559	230,785	32,505	263,289

Methodology

- **Scrap Metal**: Averaged rate of changed from 2016 to 2023 was 2.8%. This 2.8% rate of change was applied to estimate 2024 tonnages. To remain conservative in projections, and because building trends and therefore C&D materials generation tend to follow population trends, the rate of anticipated population growth (1.3% to 1.5%) was applied to estimate tonnages from 2025 to 2035 estimated rate of population.
- **Concrete**: Averaged rate of change from 2016 to 2023 was 20.3%. This 20.3% rate of change was applied to estimate 2024 tonnages. To remain conservative in projections, and because building trends and therefore C&D materials generation tend to follow population trends, the rate of anticipated population growth (1.3% to 1.5%) was applied to estimate tonnages from 2025 to 2035 estimated rate of population.
- **Asphalt**: Averaged rate of change from 2016 to 2023 was 8.5%. This 8.5% rate of change was applied to estimate 2024 tonnages. To remain conservative in projections, and because building trends and therefore C&D materials generation tend to follow

population trends, the rate of anticipated population growth (1.3% to 1.5%) was applied to estimate tonnages from 2025 to 2035 estimated rate of population.

- **Other Aggregate/Soil**: Averaged rate of change from 2016 to 2023 was 14.7%. For 2024, the 14.7% was escalated off of 2023 tonnages. To remain conservative in projections, and because building trends and therefore C&D materials generation tend to follow population trends, the rate of anticipated population growth (1.3% to 1.5%) was applied to estimate tonnages from 2025 to 2035 rate of population.
- **Landfilled C&D**: Averaged rate of change from 2025 to 2023 was -1.3%. The 1.3% was used as an escalator for 2024 to 2035.

Anticipated City Diversion of C&D

Fort Collins has various C&D recycling ordinances in place that contribute to a high C&D recycling rate. Based on historical data from 2019 to 2023, tonnage by material was projected through 2035, as shown in Figure 8.

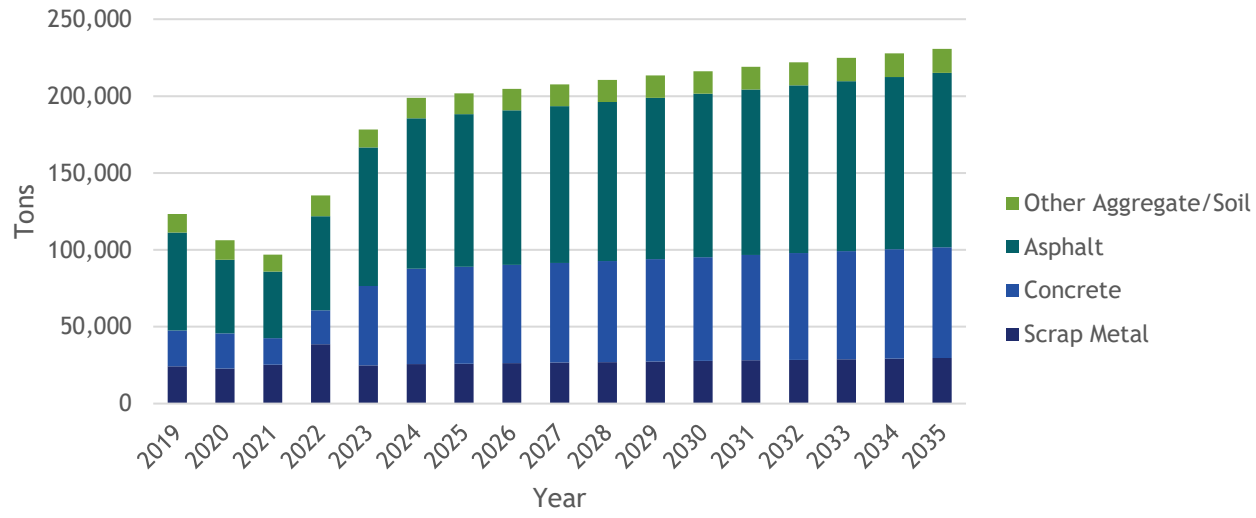


Figure 8: City of Fort Collins C&D Materials Diversion Projections

Anticipated Diversion & Landfill of C&D

As shown in Figure 9, the anticipated C&D diversion rate by 2035 is 88%, assuming no change in facilities within Fort Collins that currently accept and recycle these materials.

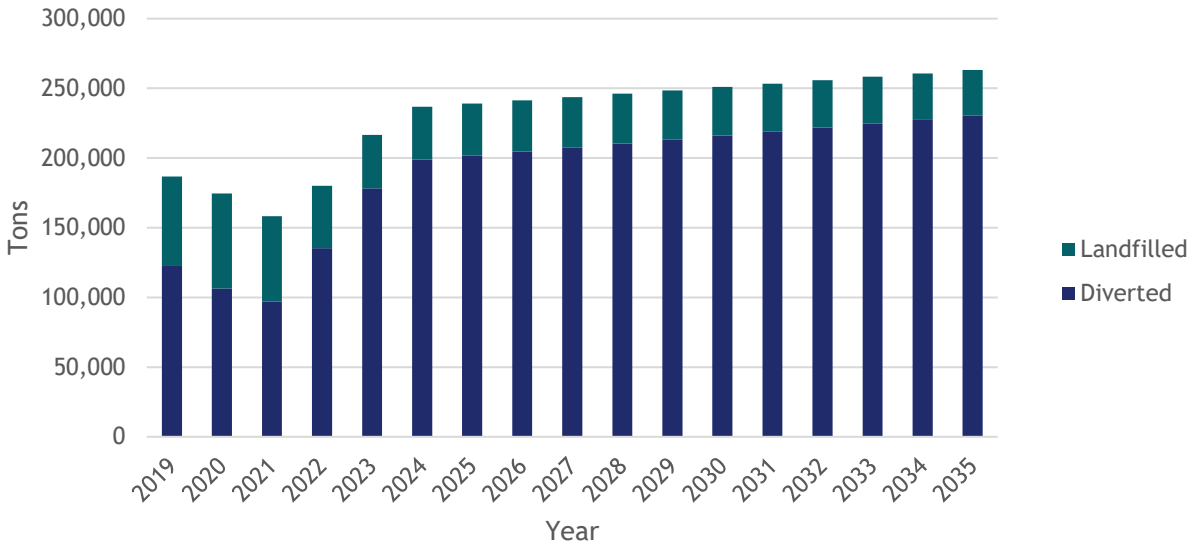


Figure 9: City of Fort Collins C&D Diversion and Landfill Projections

County Diverted and Recycled C&D Projections

The STEPS project team generated tonnage estimates for Larimer County and the neighboring Weld and Boulder Counties. Table 15 shows estimate tonnages for 2024 and 2035 based on population growth. Due to the varying factors that could influence material generation such as permitting processes, population changes, and markets for materials, estimates were based on anticipated change in population.

Table 15: County Projected C&D Landfilled Tons

Year	Larimer County	Weld County	Boulder County
2024	208,353	374,917	205,550
2035	232,485	470,249	257,817

Processing Infrastructure Analysis

To assess opportunities to maximize diversion, the STEPS Project Team completed a processing infrastructure analysis of operational options for the City of Fort Collins, focusing on food scraps, yard trimmings, and construction and demolition (C&D) materials.

STEPS conducted a cost analysis of various infrastructure options, including a compost facility, pre-processing of food scraps for co-digestion, C&D facility, and transfer station. The analysis includes an assessment of the recovery potential from materials collected within Fort Collins as well as from other municipalities in Larimer County and the region. Each scenario factors in regional population growth and includes evaluations of low, medium, and high recovery potential. Additional details include capital and operating costs, preferred operating volumes, a site parameter checklist, and identification of fatal flaws in site selections across infrastructure options. For this report, Regional is defined as including the Cities of Fort Collins, Estes Park, and Loveland. Based on the in-depth analysis conducted, a comparative assessment of the different scenarios is provided in the subsequent report.

In total, the Infrastructure Analysis provides 11 scenarios for organics or C&D material management:

- Compost Site
- Regional Compost Site – 25 Miles from City Center
- Food Scraps for Co-digestion
- C&D Site (Scenario 1) - 40,000 TPY
- C&D Site (Scenario 2) - 60,000 TPY
- Regional C&D Site (Scenario 3) - 120,000 TPY
- Larimer, Boulder, and Weld Counties C&D Site (Scenario 4) - 250,000 TPY
- Transfer Station (Compost) - 25 Miles from City Center
- Transfer Station (Compost) - 60 Miles from City Center
- Transfer Station (C&D) - 25 Miles from City Center
- Transfer Station (C&D) - 60 Miles from City Center

Organic Waste Recovery Potential

Based on the baseline analysis, it is projected that the combined generation of food scraps and yard trimmings will be 51,374 tons per year (TPY) in 2025, and 57,735 TPY in 2035. With current policies and practices, it is projected that the organics diversion rate will be maintained at 24%, with 12,365 tons diverted in 2025 and 14,113 tons diverted in 2035. This information is presented in Table 16.

Table 16: Baseline Projections with 24% Organics Diversion

Materials (TPY)	2025		2035	
	Total Generation	Diversion	Total Generation	Diversion
Food Scraps	25,166	2,124	28,516	2,424
Yard Trimmings	26,208	10,241	29,219	11,689
Organics (combined)	51,374	12,365	57,735	14,113

Community Comparison

Table 17 and Table 18 show data from several U.S. food waste collection programs, including those in Minneapolis, MN; Portland, OR; Seattle, WA; San Francisco, CA; and the state of California. Each were selected for their high organics diversion rates and recognized food waste collections programs.

Table 17: Comparison with Other Communities for Food and Yard Waste Programs

Minneapolis[xxxiv]
• Program started: 2015-2016 (8 years) • Opt-in program, 52% participation (2022) • 17% food waste recovered • 25% organics capture goal by 2033 • 87% yard waste recovered separately • 43% total organics recovered
Portland, OR[xxxv]
• Program started: 2011 (14 years) • Opt-in program, 85% participation (2024) • 33% food waste recovered • 95% yard waste recovered • 80% total organics recovered
Seattle[xxxvi]
• Program started: 2005 (20 years) • Mandatory program, 90+% participation • 67% recovered residential • 72% recovered commercial
San Francisco[xxxvii]
• Program started: 2000 (25 years) • Mandatory, 99+% participation • 70% recovered residential
California (CalRecycle[xxxviii] 2014 and 2021 data as available)
• SB 1383 (statewide food waste diversion) program started: 2022 (3 years) • Multifamily recovered:

    - 2% food waste
    - 2% yard waste
    - 2% total organics
- Commercial recovered:
    - 25% food waste (51% in 2021)
    - 71% yard waste
    - 41% total organics
- Institutional recovered:
    - 3% food waste (38% in 2021)
    - 6% yard waste
    - 4% total organics
- Weighted average:
    - 23% food waste (48% in 2021)
    - 69% yard waste
    - 39% total organics

Table 18: Population Density per Square Mile[xxxix]

City/County	Population	Population Compared to Fort Collins (ratio)	Population Density (people per square mile)	Population Density Compared to Fort Collins (ratio)
Fort Collins	170,376	---	2,986	---
Portland, OR	630,498	3.7	4,890	1.6
Minneapolis	425,115	2.5	7,962	2.7
Seattle	755,078	4.4	8,792	2.9
San Francisco	808,988	4.7	18,629	6.2

These four programs serve as realistic program models for organics diversion. Each program has extensive experience with food and yard waste initiatives and provides valuable insights into what has been effective. For instance, Seattle and San Francisco have mandatory participation programs, resulting in very high recovery rates of 67% and 70% for food scraps. On the other hand, Portland and Minneapolis operate opt-in programs with strong participation, showing what can be achieved when residents choose to join.

The State of California was also referenced to highlight CA Senate Bill 1383 (SB 1383), which requires the diversion of organic waste from landfills across all jurisdictions and went into effect in January 2022. According to CalRecycle reports, commercial recovery rates rose from 24% in 2014 to 48% in 2021. While SB 1383 officially took effect in 2022, its implementation may have influenced this increase, as programs were being established in anticipation of the mandate.

Fort Collins Potential Recovery

To develop the low, medium, and high scenarios for organics recovery in Fort Collins, the team built on the studied communities' diversion rates, CalRecycle's comprehensive reports, and the Fort Collins 2035 baseline projections. Table 19 shows the recovery rates for the 3 scenarios (low, medium, and high) and the associated tonnage based on the 2035 generation projections for the City of Fort Collins scenarios. The scenarios show a breakdown for the recovery projections of food scraps, yard trimmings, and combined to propose a design goal. These values combine residential and commercial estimates. The facility design goal measured in TPY on the table is the tonnage throughput that is used on the conceptual processing infrastructure and cost analysis.

Table 19: Recovery Rates for 3 Scenarios & Associated 2035 Projected City Tonnage

Scenarios	2035 Baseline	Low	Medium	High
Food scraps recovered (%)	8%	15%	25%	70%
Food scraps recovered (TPY)	2,281	4,277	7,129	19,961
Yard trimmings recovered (%)	40%	50%	60%	90%
Yard trimmings recovered (TPY)	11,686	14,608	17,529	26,294
Total organics recovered (%)	24%	33%	43%	80%
Total organics recovered (TPY)	13,968	18,885	24,658	46,256
Facility design goal (TPY)	15,000	20,000	25,000	50,000

Fort Collins Food Scraps Projections Methodology

The high scenario is based on the mandatory programs from Seattle and San Francisco, which divert approximately 70% of the residential sector's food scraps. Given these reference points and the recommendation that Fort Collins consider mandatory policies (such as the grocery store composting requirement), it is feasible that Fort Collins can reach 70% recovery by 2035 in the high scenario. The medium scenario was based on the current progress from the opt-in programs in Minneapolis and Portland, which have food scraps diversion rates of 43% and 33% respectively. The low scenario was chosen as a center step between the baseline and medium recovery rates.

Fort Collins Yard Trimmings Projection Methodology

The high scenario for yard trimmings diversion was based on the current rates from mandatory programs in Minneapolis and Portland, which have yard trimming diversion rates of 87% and 95% respectively. The medium and low scenarios were chosen as gradual steps from the baseline to the high scenario.

Regional Potential Recovery

To evaluate the recovery potential from other municipalities in Larimer County, the geographic areas and population sizes were analyzed. It was determined for this preliminary

analysis that only Loveland and Estes Park would be included along with Fort Collins, because these three municipalities make up two-thirds of the county population. This is a reasonable estimate at this preliminary level for the purpose of estimating conceptual facility sizing and costs.

It was assumed that the food scraps generation per capita is the same across the three municipalities. However, the yard trimmings generation per capita was assumed to be the same only for Fort Collins and Estes Park (0.15 tons per capita per year), but not for Loveland, since Loveland's diversion rate (0.34 tons per capita per year) is more than double the Fort Collins generation based on actual data. These generation estimates were used to prepare scenarios for a facility with regional use.

Table 20 shows the population sizes and recovery rates for the different municipalities and collective region (Fort Collins, Loveland, and Estes Park) for different materials and scenarios. The weighted averages for the regional scenarios take into account the population percentage relative to each other, not relative to the County.

Table 20: Recovery Rates for Food Scraps and Yard Trimmings for the Region

Location	Population	Population % relative to each other	Recovery Rates Scenarios							
			Food Scraps				Yard Trimmings			
			Baseline	Low	Medium	High	Baseline	Low	Medium	High
Fort Collins	170,507	67%	8%	15%	25%	70%	40%	50%	60%	90%
Loveland	79,352	31%	0%	15%	25%	70%	90%	92%	94%	96%
Estes Park	5,804	2%	0%	15%	25%	70%	40%	50%	60%	90%
Region	255,663	Weighted Average	5%	15%	25%	70%	56%	63%	71%	92%
Recovery Rates			6%	15%	25%	70%	56%	65%	70%	95%

Based on the Baseline Report, in 2023 the Fort Collins food scraps generation rate is estimated to be about 0.14 TPY per person and yard trimmings is 0.15 TPY per person. Given that Loveland diverted 24,000 tons of yard trimmings in 2023 and has a population of 79,352, the per capita rate of yard trimmings for Loveland is estimated at 0.30 TPY. To estimate the Region's generation of food scraps and yard trimmings, it is assumed that the food scraps generation rate for Loveland and Estes Park is the same as Fort Collins, and the yard trimmings generation rate for Estes Park is the same as Fort Collins, with Loveland's being much higher. Based on data available, Loveland collects over 24,000 tons of yard waste annually through their curbside yard waste collection and yard waste drop-offs, along with partnerships from landscape.

Table 21 shows the food scraps projects for the region. Table 22 and Table 23 show the yard trimmings projections and the combined organics projections.

Table 21: Food Scraps Projections for the Region (Fort Collins, Loveland, & Estes Park)

Year	Fort Collins		Loveland		Estes Park		Region
	Population	TPY	Population	TPY	Population	TPY	TPY
2019	169,810	21,250	83,168	10,408	6,558	821	32,478
2020	168,538	21,340	76,622	9,702	5,921	750	31,792
2021	169,249	21,644	77,194	9,872	5,880	752	32,268
2022	170,376	21,320	77,858	9,743	5,858	733	31,795
2023	170,507	24,477	79,352	11,391	5,824	836	36,704
2024	172,988	24,860	79,820	11,471	5,858	842	37,172
2025	175,468	25,166	80,291	11,516	5,893	845	37,527
2026	177,949	25,478	80,765	11,564	5,928	849	37,891
2027	180,429	25,795	81,242	11,615	5,963	852	38,262
2028	182,910	26,116	81,721	11,668	5,998	856	38,641
2029	185,390	26,443	82,203	11,725	6,033	861	39,029
2030	187,871	26,775	82,688	11,785	6,069	865	39,424
2031	190,351	27,112	83,176	11,847	6,105	870	39,829
2032	192,832	27,455	83,667	11,912	6,141	874	40,241
2033	195,312	27,803	84,161	11,980	6,177	879	40,663
2034	197,793	28,157	84,657	12,051	6,213	885	41,093
2035	200,273	28,516	85,157	12,125	6,250	890	41,532

Table 22: Yard Trimmings Projections for the Region (Fort Collins, Loveland, & Estes Park)

Year	Fort Collins		Loveland		Estes Park		Region
	Population	TPY	Population	TPY	Population	TPY	TPY
2019	169,810	23,377	83,168	24,950	6,558	903	49,230
2020	168,538	29,259	76,622	22,987	5,921	1,028	53,273
2021	169,249	29,707	77,194	23,158	5,880	1,032	53,897
2022	170,376	22,022	77,858	23,357	5,858	757	46,137
2023	170,507	25,432	79,352	23,806	5,824	869	50,106
2024	172,988	25,920	79,820	23,946	5,858	878	50,744
2025	175,468	26,208	80,291	24,087	5,893	880	51,175
2026	177,949	26,498	80,765	24,229	5,928	883	51,610
2027	180,429	26,790	81,242	24,372	5,963	885	52,048
2028	182,910	27,085	81,721	24,516	5,998	888	52,490
2029	185,390	27,382	82,203	24,661	6,033	891	52,934

Year	Fort Collins		Loveland		Estes Park		Region
	Population	TPY	Population	TPY	Population	TPY	TPY
2030	187,871	27,682	82,688	24,806	6,069	894	53,382
2031	190,351	27,983	83,176	24,953	6,105	897	53,834
2032	192,832	28,288	83,667	25,100	6,141	901	54,288
2033	195,312	28,594	84,161	25,248	6,177	904	54,747
2034	197,793	28,904	84,657	25,397	6,213	908	55,209
2035	200,273	29,216	85,157	25,547	6,250	912	55,674

Table 23: Combined Organics Projections for the Region

Year	Fort Collins	Loveland	Estes Park	Region
	TPY	TPY	TPY	TPY
2019	44,627	35,358	1,723	81,708
2020	50,599	32,689	1,778	85,065
2021	51,351	33,030	1,784	86,165
2022	43,342	33,100	1,490	77,932
2023	49,909	35,197	1,705	86,811
2024	50,779	35,417	1,720	87,916
2025	51,374	35,603	1,725	88,703
2026	51,976	35,793	1,731	89,501
2027	52,585	35,987	1,738	90,310
2028	53,201	36,185	1,745	91,131
2029	53,825	36,386	1,752	91,963
2030	54,456	36,591	1,759	92,807
2031	55,095	36,800	1,767	93,662
2032	55,742	37,012	1,775	94,530
2033	56,397	37,229	1,784	95,410
2034	57,061	37,449	1,792	96,302
2035	57,732	37,672	1,802	97,206

Table 24 shows the recovery rates for the three scenarios (low, medium, and high) and the associated tonnage based on the 2035 generation projections for the regional scenarios. The facility design goal measured on the table is the tonnage throughput that is used on the conceptual processing infrastructure and cost analysis.

Table 24: Recovery Rates for 3 Scenarios & Associated 2035 Projected Region Tonnage

Scenarios	2035 Baseline	Low	Medium	High
Food scraps recovered (%)	5%	15%	25%	70%
Food scraps recovered (TPY)	2,281	6,230	10,383	29,072
Yard trimmings recovered (%)	54%	65%	70%	95%
Yard trimmings recovered (TPY)	30,054	36,188	38,972	52,891
Total organics recovered (%)	34%	42%	51%	83%
Total organics recovered (TPY)	32,354	42,418	49,355	81,963
Facility design goal (TPY)	35,000	45,000	50,000	85,000

Regional Food Scraps Projection Methodology

The rationale for the scenarios is the same as the rationale for Fort Collins food scraps projections alone, with the high scenario based on the programs from Seattle and San Francisco, the medium scenario based on the programs from Minneapolis and Portland, and the low scenario chosen as a center step between the baseline and medium recovery rates.

Regional Yard Trimmings Projection Methodology

The high scenario diversion target is relatively higher than Fort Collins alone because it assumes that Loveland is diverting 24,000 TPY of yard trimmings (as reported for 2023). Fort Collins and Loveland could collaborate to manage the yard trimmings generated from each community. Given this information, it is assumed that Loveland's diversion rate (recovery rate) is high and assumed to be similar to Minneapolis and Portland's rates. The medium and low scenarios were chosen as gradual steps from the baseline to the high scenario.

Compost Facility

Two infrastructure options were evaluated to process organic waste for the City of Fort Collins: aerated static pile (ASP) composting and co-digestion. This scenario explores an initial cost study of developing an ASP composting facility.

Composting uses aerobic microorganisms to convert organic waste into a versatile soil amendment. These composting microorganisms use oxygen as they decompose the material, and as they work, they create heat which in turn further decomposes the organic waste. The final product is a stable material and soil amendment that can be utilized to grow crops, stabilize highway slopes, improve sports turf fields, and for other applications. Compost facilities typically resemble a large open parking lot with mulch and compost piles and some structures. A typical process flow diagram is described in Figure 10.

Figure 10: Typical Composting Process Flow Diagram

A directional cost analysis was developed to evaluate conceptual facility sizes ranging from 20,000 to 85,000 TPY based on the projected recovery scenarios. The aerated static pile (ASP) composting method was chosen for this evaluation due to its smaller footprint and improved ability to control the composting process and reduce odors when compared with windrow composting. The ASP composting model, ideal for larger scale operations, would include forced airflow in the pile and would not require turning.

Assumptions

The general assumptions for this conceptual evaluation include four months of yard waste storage, steady food scraps inbound, two-phase ASP (up to three weeks on air in each phase), four months of curing, and up to six months of compost storage.

Spacing & Site

A composting facility consists of several operational spaces for processes including tipping, contamination removal, mixing, ASP composting (where the ASP system is located), curing, overs storage (larger pieces of compost material that require additional processing), and compost storage. The area where material is stored prior to composting can occupy 20 to 25% of the total site or production area, while the composting system itself requires 15 to 20%. The space needed after the composting process accounts for 30 - 35% of the total area. Additional spaces required include an entrance and exit, scales, scale house, office, maintenance shed, stormwater features and pond, and a perimeter road. For general purposes, it is recommended to look for parcels at least twice the size of the site area, unless co-located at an existing industrial parcel that has already taken the required setbacks into account.

Fort Collins would need a site ranging between 13 to 22 acres (a parcel of approximately 26 to 44 acres, unless co-located at an existing industrial parcel) to manage 20,000 to 50,000 TPY. The region would need a site ranging between 20 to 32 acres (a parcel of approximately 40 to 64 acres, unless co-located at an existing industrial parcel) to manage 45,000 to 85,000 TPY.

Given that this is a conceptual design and land costs can range widely, no cost for land was added in the analysis.

Equipment & Staffing

While evaluating the costs, various factors were considered, such as quantity of equipment and staffing needs depending on facility size. Equipment costs were obtained from Ecoverse, Viably, and Caterpillar. The staff needs range from 8 to 20 full-time employees, depending on the throughput of the site and dedicated operators, and include a site manager, scale house operators, heavy equipment operators, and laborers. Their hourly wages range from $20-60 per hour depending on the role and an assumed 40% labor burden.

This conceptual operation would need to manage contamination and have a dedicated sorting station. The proposed sorting line consists of a shredder, trommel screen, picking station, and a grinder.

For this analysis, the estimated cost ranges are as follows: shredders at $750,000 to $950,000, grinders at $450,000 to $750,000, trommel screens at $300,000 to $475,000, contamination removal systems at $50,000 to $400,000, picking stations at $300,000, and loaders at $320,000. Additionally, the cost to build an ASP system ranges from $45 to $100 per TPY depending on the vendor and quality of materials (e.g., pad, pipes, controls, and software). Once a facility size is chosen, it is recommended that a design analysis is done to ensure that all the equipment will be appropriate for the type of feedstock and amount in the chosen design basis.

Operating and Capital Costs

Table 25 shows the estimated compost facility operating and capital costs, pulled from research and assumptions made. The operating costs per ton decrease as the facility capacity is increased. The operational cost per ton assumes finished compost would be sold for $20/cubic yard. This operational cost per ton can also represent the minimum tipping fee that is needed to cover the operational expenses.

Table 25: Estimated Compost Facility Operating and Capital Costs

Population Served	Fort Collins			Regional (Fort Collins, Loveland, Estes Park)		
Scenario	Low	Medium	High	Low	Medium	High
Food Scraps Recovery (%)	15%	25%	70%	15%	25%	70%
Yard Trimmings Recovery (%)	50%	60%	90%	63%	71%	92%
Total Organics Recovery (%)	33%	43%	80%	42%	51%	83%
Throughput (TPY)	20,000	25,000	50,000	45,000	50,000	85,000
Equipment ($)	$ 2.7 M	$ 2.8 M	$ 3.7 M	$ 3.5 M	$ 3.7 M	$ 4.8 M
Site Development ($)	$ 3.0 M	$ 3.3 M	$ 4.6 M	$ 4.4 M	$ 4.6 M	$ 6.5 M

Population Served	Fort Collins			Regional (Fort Collins, Loveland, Estes Park)		
Scenario	Low	Medium	High	Low	Medium	High
Annual Operating Expenses ($)	$ 0.9 M	$ 1.0 M	$ 1.5 M	$ 1.4 M	$ 1.5 M	$ 2.2 M
Operating Cost per Ton (Minimum tip fee)*	$ 48.46	$ 46.96	$ 39.46	$ 40.96	$ 39.46	$ 28.96
Estimated land area required for operations (acres)	13	14	22	20	22	32
Estimated land area required, including setbacks (acres)	26	28	44	40	44	64
Cost of Land	$ 0, cost was not included as part of this analysis					
Assumed selling price of compost (Included in operating costs)	$ 20 per cubic yard, bulk price					

*Operating cost per ton considers compost sales revenue but it does not consider tipping fees. This cost can also be what the minimum tipping fee must be to cover the rest of the operational expenses.

Considerations for Facility Development

If the City of Fort Collins were to pursue developing an ASP Compost Facility, permitting and site evaluation factors should be considered. A brief overview of each is provided below. However, an extensive insight is further explored in the Site Parameters Analysis Report.

State and Local Permitting

The various scenarios range from 20,000 to 85,000 TPY and require between 13 to 32 acres, more than the 2-acre limitation to operate a Class I operation. Based on these characteristics, including that food scraps and yard trimmings would be processed, the facility would likely be classified as Class III operations by the state of Colorado. A Certified of Designation (COD) by the local governing body, which encompasses a local land use agreement separate from the zoning process, will need to be acquired. Depending on the location, the facility may require a special use zoning designation. The local governing body may add additional requirements beyond what the state requires in the Engineering Design and Operations Plan (EDOP).

It is important to compare the varying local requirements for these types of operations as well as the different zoning designations to attempt and find a suitable site.

Site Evaluation

If the City were to pursue a composting facility, a site parameter checklist could be developed with careful attention to the following:

1. Permitting and regulatory compliance.
2. Environmental feature considerations, such as floodplain or wetland presence, proximity to surface water and groundwater, soil types and stability, and topography.
3. Operation requirements, including access to utilities, stormwater management, and transportation and proximity to organic waste sources and end markets.
4. Community and social factors, particularly distance from sensitive receptors, odor, noise, and visual mitigation.
5. Economic feasibility with development of a specific site, including the environmental features previously mentioned.

Co-Digestion Facility

Two infrastructure options were evaluated to process organic waste for the City of Fort Collins: aerated static pile (ASP) composting and co-digestion. This scenario explores a cost study of co-digesting organic waste.

Co-digestion is a process that involves adding food waste to existing infrastructure at water resource recovery facilities (WRRF), also known as wastewater treatment plants (WWTP). WRRF and WWTP are used interchangeably. These WRRFs would have anaerobic digester tanks already digesting sewage residuals into biogas and sludge. They use anaerobic digestion (AD), a process that uses microorganisms that do not use oxygen to process organic waste. These anaerobic microorganisms generate methane that is refined to produce usable biogas. This biogas is commonly turned into electricity to use on-site, placed into the electricity grid, channeled into a natural gas pipeline, or transformed into vehicle fuel. The biogas can also be flared if the infrastructure does not exist to reuse it. This AD process at WRRFs also generates a solids residual, typically called sludge or Class B biosolids. This is typically applied to agricultural soils or processed at a composting facility to produce Class A EQ compost. Figure 11 shows the key processes required for food waste co-digestion at a WRRF.

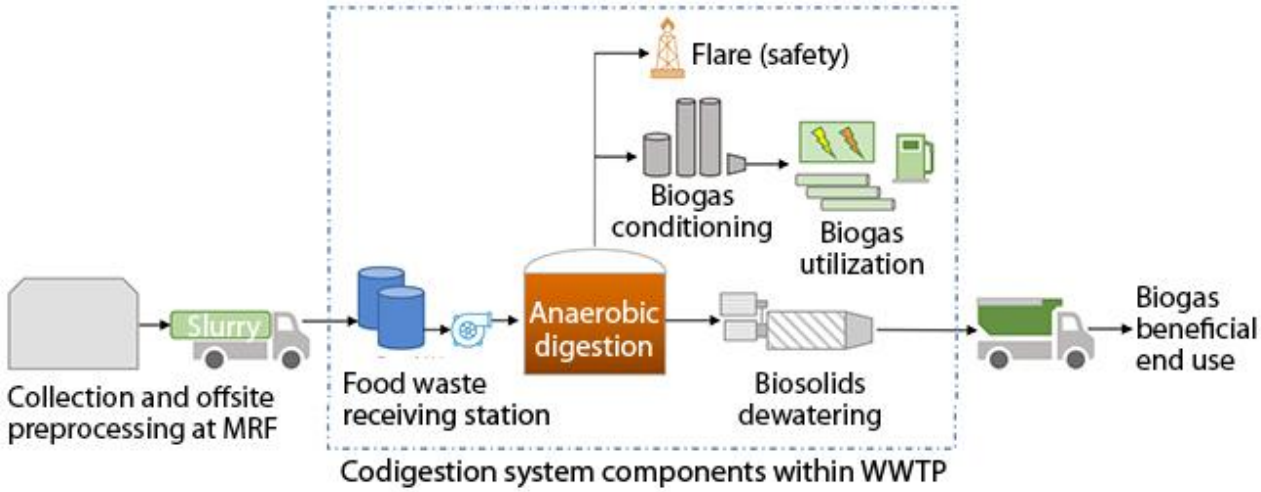


Figure 11: Key processes required for food waste co-digestion at a WWTP (or WRRF)[xl]

Feasibility of Co-Digestion

When the STEPS project team interviewed the City of Fort Collins water treatment staff in September 2024, the suggestion of integrating food scraps into their anaerobic digestion systems did not seem feasible for economic and operational reasons. City staff cited old infrastructure (two tanks were built in the 1960s and the other two in the 1990s) that would ideally be replaced and built underground and an old biogas system, both of which would be very costly to upgrade. Additionally, adding food scraps to their system would downgrade the quality of biogas classification and introduce more corrosive gases into the system. While anaerobic digestion is a promising complementary technology to manage food scraps, the STEPS project team does not recommend investing in upgrading the Drake Water Reclamation Facility.

Although co-digesting food waste is a possibility, it is not common practice for water resource recovery facilities (WRRFs) to accept post-consumer food waste. In 2020 and 2021, the US EPA[xli] surveyed 130 WRRFs with co-digestion systems and received 26 responses. In both years surveyed, the top two categories that were processed at WRRF digesters were "food processing industry waste" and "fats, oils, and grease (FOGs)." Source-separated organics made up a very small part of this in 2020 and it did not show in the chart for 2021. This information shows that it is not yet common for WRRFs to co-digest post-consumer food waste. Additionally, no WRRFs are co-digesting yard trimmings.

National Case Study Analysis of Co-Digestion

The STEPS project team explored the feasibility of incorporating co-digestion for municipal food-scrap processing through reviewing three case studies and reports in Fort Collins, Larimer County, and Los Angeles County.

Report: Drake Water Reclamation Facility Food Waste Evaluation

A 2017 report by Carollo, titled "City of Fort Collins Drake Water Reclamation Facility Food Waste Evaluation Report," includes preliminary sizing and design calculations regarding the installation of a food waste receiving facility to enhance biogas production.[xlii] The Drake Co-Digestion Report recommended equipment, detailed a conceptual layout, and provided a conceptual cost estimate. The proposed project would allow 29 wet tons per day to be processed. Assuming a 365-day operation, the project would process 11,585 TPY. This amount of material would come from the commercial sector at a 90% participation rate. It also assumed that 19.7% of residents would participate in the program by using garbage disposals to grind food waste at homes, and the material would then be delivered to the DWRF through the sewer. The estimated cost of this project was $7 million in 2017. Using the Bureau of Labor Statistics Consumer Price Index (CPI) calculator, that cost would be $9.1 million in 2024, or $785 per TPY.

Report: Larimer County Solid Waste Infrastructure Master Plan

A 2018 report by HDR titled "Partnering for Change – Larimer County – Solid Waste Infrastructure Master Plan,"[xliii] is intended to be a guide for the responsible management of solid waste to achieve the goals and objectives by the North Front Range Regional Wasteshed Coalition (Larimer County, City of Fort Collins, City of Loveland, and Town of Estes Park) through the year 2050. The plan evaluated various infrastructure options, including sending source-separated organics (SSO, or food scraps) to the Drake WRF for co-digestion. In it, they point out that "economics of scale of the equipment become significant when the facilities reach 40,000 TPY or greater." The Master Plan evaluated two sizes for co-digestion: an Initial Phase of 14,000 TPY and a Total Build-Out of 47,000 TPY. For the Initial Phase, the construction estimate was $3.2 million (2017 dollars[xliv]). Using the BLS CPI calculator, that cost in 2024 dollars would be $4.1 million, or $293 per TPY. The Total Build-Out construction estimate was $7.7 million (2017 dollars). Using the BLS CPI calculator, that cost in 2024 would be $9.9 million, or $211 per TPY. The average of these two costs is $252 per TPY. This unit cost is significantly less than the $785 per TPY in the Co-Digestion report. However, it is important to note that the Master Plan does take into account the building of additional tanks that are assumed in the Drake Co-Digestion Report. Additionally, the Drake Co-Digestion Report was very detailed, specific to that site, and took into account existing infrastructure.

On the operating costs, the Master Plan provides a range between $77 and $82 per ton for costs related to hauling, operating the digester, and hauling and disposing of the residuals. The Master Plan did not show revenues for the additional gas generated, though it did assume a tip fee of $50 per ton at the facility to cover operational expenses. The Drake Co-Digestion Report did not include operating costs, tipping, nor disposal costs.

Report: Los Angeles County Sanitation District Co-Digestion

The last set of information that was evaluated for this section is from a July 2024 presentation by Los Angeles County Sanitation Districts (LACSD). LACSD ran a co-digestion full-scale demonstration from 2014 through 2017. Beginning 2018, they started building infrastructure to allow them to process up to 480 TPD (or approximately 150,000 TPY given a 6-day week operation). The capital costs total $49 million; however, the infrastructure is far beyond what is considered by the Drake Co-Digestion Report or the Master Plan. The capital cost for the infrastructure currently constructed by LACSD is $167 per TPY.

Comparison

Figure 12 provides a visual comparison of the various unit costs. The range of size that is being evaluated in this report is 10,000 to 100,000 TPY. It is important to keep in mind economies of scale, like LACSD, but also that two estimates in the same range (approximately 20,000 TPY) could have very different unit economics and it could be because the Master Plan was more theoretical while the Drake co-digestion report had more detailed information on what was needed to be done to accomplish the project. Therefore, it is important to further refine cost estimates when more information is obtained to ensure that the unit economics would still work under various conditions.

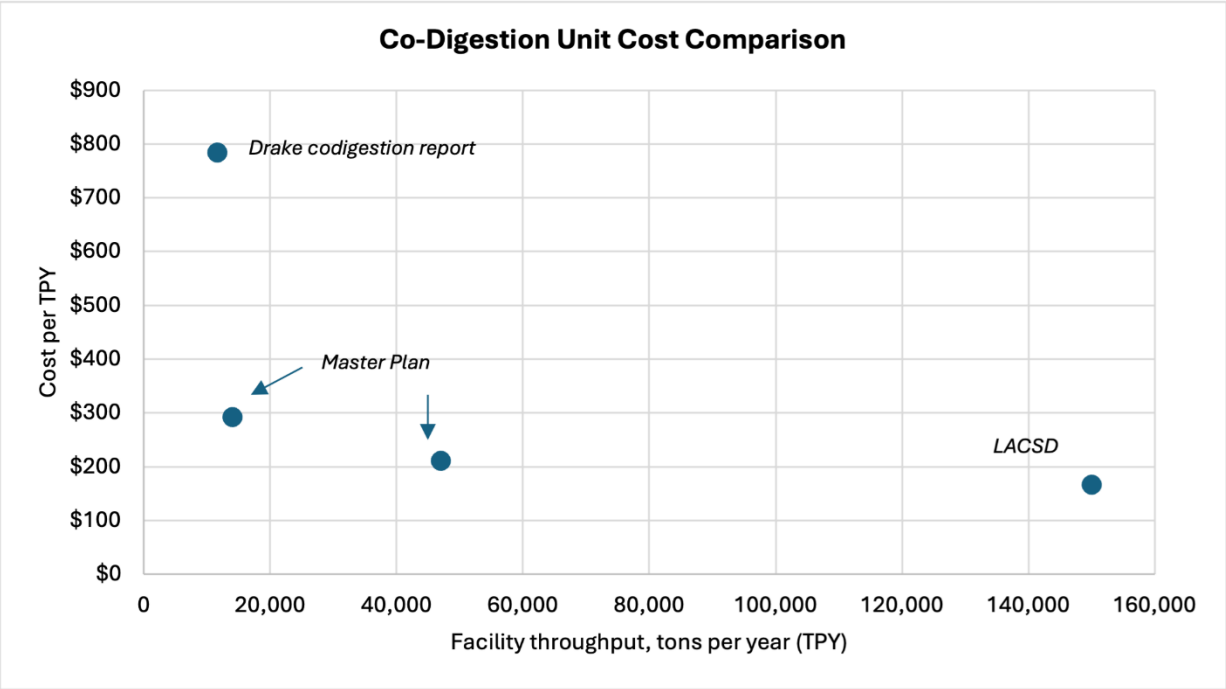


Figure 12: Co-Digestion Unit Cost Comparison

Conclusion

The benefits of co-digestion are that existing infrastructure could be utilized to divert a portion of the food waste from the landfill waste stream. In turn, this food waste can generate additional biogas. The biogas could be utilized on site or sold if there are financial incentives. Depending on the biosolids market, the increased amount of biosolids could be a cost center or a revenue for the facility.

Some of the barriers to a co-digestion system include planning, funding, contamination, and end-product use. Planning must be very robust and include diverse stakeholders since there are many programmatic areas that need to be coordinated between the solid waste and wastewater sectors. Detailed analysis must be done at the wastewater treatment plant to understand what would need to be upgraded and how that affects any long-term planning that is already in place. Lastly, contamination of non-organic waste material in the stream can cause issues in the pumps, pipes, digesters, and other components. From a California Water Boards report entitled “Co-Digestion Capacity Analysis” by Carollo, June 2019, grit and glass were identified at East Bay Municipal Utilities District and LACSD, which accumulated in the digesters and were challenging contaminants that increased operational costs.

An important limitation of co-digestion is that it tends to be limited to pre-consumer food waste streams with high moisture and low contamination rates. This would not allow residential food waste to be added into this system unless the food waste comes through sink

garbage disposals. If only food waste from the commercial sector were to be managed through a co-digestion system, then based on the Fort Collins Baseline Assessment, the commercial sector is projected to generate 15,060 tons of food waste per year in 2035. If 90% of this were to be recovered for co-digestion, then the upgraded design at the plant would need to accept 13,554 TPY. Given that the ranges for the lower throughput sites are $293 and $785 per TPY, the total capital cost range is $4 to $10.6 million.

Co-digestion would likely be better suited to processing pre-consumer industrial and commercial food scraps. If Fort Collins pursues this option, further analysis to build on the Carrollo study would be a recommended next step.

Construction and Demolition (C&D) Processing Facility

C&D Composition

Construction and demolition (C&D) debris usually consists of various materials, including metal, concrete, asphalt, treated and untreated wood, mixed aggregates, and materials from walls and roofs (such as gypsum and shingles). It may also contain polystyrene, glass, plastics, cardboard, organic waste, and large items such as furniture and electronics.

C&D Fines

Construction and demolition “fines”, or small pieces of debris, comprise approximately 33% of the volume of outbound waste in a processing facility. Fines are created during the sorting process when pieces of concrete, drywall, shingles, wood, metal, and other mixed debris are crushed into small pieces that are screened out of the C&D processing system. Fines are difficult to find end markets for since they are a small mixed material product. The current primary end market is for use as alternative daily cover for landfills. However, areas with high levels of moisture are increasingly moving away from this because when the fines encounter moisture, they create hydrogen sulfide, a highly flammable gas. Colorado has a dryer climate and has no regulation against using fines as alternative daily cover in landfills. However, potential alternative end markets for fines could be researched in case legislation prohibiting using fines for alternative daily cover is created in the future. Potential end markets for fines include the use as a soil amendment, or as pavement fill for base layers in roadways. Other end markets are still in the process of being developed for this material. If more end markets become available, it may increase diversion and avoid landfill fees not accounted for in the modeling below.

C&D Recyclables

Recyclables compose approximately 25% of the volume of outbound material in a processing facility. Recyclable materials may include wood, aggregates and dirt, cardboard, organics, scrap metal, and other materials. Local markets are an important element to a successful C&D facility. Additionally, the quality of the processed material that is being recovered will dictate the revenue generated from local end markets.

In August 2024, Resource Recycling Systems, High Country Conservation Center (HC3) and VERT Sites conducted a two-day C&D waste audit at the Summit County Resource Allocation Park (SCRAP). The team sampled 68 waste loads from various project types, including new construction, demolition, and remodeling of residential and commercial properties. The incoming loads were visually characterized across 11 material types, as shown in Table 26. These categories represent the most common materials found within the C&D waste stream.

Table 26: Materials and sub-categories in Summit County Colorado C&D Waste Stream

High-Level Category	Sorted Category	Materials Examples
Cardboard/Paper	Corrugated Cardboard	*Cardboard containers/boxes, uncoated*
	Remainder/Composite Paper	*Office paper, newspaper*
Plastic	Non-Bag Film	*Film bubble wrap, furniture wrap*
	Expanded Polystyrene Packaging & Insulation	*Expanded polystyrene packaging blocks & insulation*
	Rigid Plastics	*Buckets, bottles, containers, vinyl window frames*
	Remainder/Composite Plastic	*Plastic bags, astroturf*
Metal	Major Appliances	*Furnaces, heating & cooling equipment, stoves*
	HVAC Ducting	*Sheet metal tubing and ducting*
	Other Ferrous & Non-ferrous	*Aluminum cans & foil, brass pipes, dry paint cans, tin cans*
	Remainder/Composite Metal	*Insulated and coated wire*
Organics	Pruning, Trimmings, Branches, and Stumps	*Roots, shrubs, tree trunks*
	Remainder/Composite Organics	
Carpet	Carpet	*Indoor/outdoor carpet*
	Carpet Padding	*Felt, foam, plastic, and other carpet padding*
	Remainder/Composite Carpet	
Aggregates & Dirt	Dirt, Sand, Soil	*Sod*
	Concrete	*Cinder blocks, concrete with re-bar*
	Asphalt Paving	
	Brick, Ceramic, Porcelain	*Ceramic tile, masonry tile*
	Rock & Gravel	*Paving stones*

High-Level Category	Sorted Category	Materials Examples
	Remainder/Composite Aggregates & Dirt	
Roofing	Roofing	*Asphalt shingles, tar paper/building paper*
	Remainder/Composite Roofing	
Insulation	Insulation	*Cellulose blown-insulation, fiberglass insulation*
	Remainder/Composite Insulation	
Wood	Clean Recyclable Lumber, Pallets, Crates	*Crates, dimensional lumber, pallets*
	Other Untreated/Recyclable Wood	*Furniture or cabinets, particle board, plywood, sheet board*
	Painted/Stained/Treated Wood	*Finished wood flooring and finished wood furniture.*
	Remainder/Composite Wood	*Hay, wood chips*
Gypsum	Clean Gypsum Board	*Clean drywall, wallboard, etc.*
	Painted Gypsum Board	*Painted drywall, plasterboard, etc.*
	Remainder/Composite Gypsum	
Other	Miscellaneous C&D	*Mirrors, sealants, fiberglass tubs and sinks*
	Bagged	*Unknown bagged materials*
	Glass	*All glass*
	Electronics	*Microwaves, televisions*
	Household Hazardous Waste	*Paint, motor oil, pesticides*
	Special (ash, tires, etc.)	*Mattresses, ash, non-wood furniture, tires*

Of the 261,820 pounds of materials examined across the two sample days, 33% (86,140 pounds) was divertible in existing local programs. Table 27 summarizes the C&D diversion findings from this study, as well as outlines the diversion potential of common materials found in the construction and demolition waste stream.

Table 27: Materials in Summit County Colorado Construction and Demolition Waste Stream

Material	Percent of Waste Stream	Diversion Potential
Wood	39%	Partially Divertible
Gypsum	20%	Not Divertible
Other C&D	14%	Partially Divertible
Roofing	6%	Not Divertible
Cardboard	5%	Divertible
Aggregates & Dirt	4%	Divertible
Organics	3%	Divertible
Plastic	3%	Partially Divertible
Metal	2%	Divertible
Insulation	2%	Not Divertible
Carpet	1%	Partially Divertible

These materials are categorized as “divertible,” “partially divertible,” or “not divertible.” Divertible refers to materials that can currently easily be diverted at the point of generation (that is, the construction site) and for which end markets currently exist locally. They include cardboard, aggregates & dirt, organics, and metal. Partially divertible is used for broad material categories where some individual materials are divertible, and others are not. They include wood, other C&D, plastic, and carpet materials. Lastly, not divertible include insulation, roofing, and gypsum, as these broad categories do not currently have recycling markets in the region. These categories help indicate where opportunities lie across overall C&D projects as well as individual project types.

Clean, recyclable wood, representing half of the divertible materials, is the largest diversion opportunity across all project types, followed by cardboard. Scrap metal is also commonly produced at C&D sites. However, the audited material did not include significant amounts of scrap metal. This likely indicates the effectiveness of SCRAP's existing scrap metal recycling program.

Additional conclusions from this study were presented to the Summit County Board of County Commissioners on October 8, 2024.[xlv] Conclusions and recommendations include:

- Require or incentivize source separation of recoverable items including cardboard, scrap metal, clean wood, aggregates, and organics.
- Invest in technologies to process additional materials such as a wood grinder or treated lumber for biochar.
- Explore opportunities for reuse of items that can be readily recoverable, such as doors, furniture, and bulky waste.

C&D Trash

Remaining materials from C&D waste that are neither fines (small particles like dirt or dust) nor recyclable typically include mixed debris such as treated or painted wood, drywall,

asphalt shingles, insulation, non-recyclable plastics, and composite materials. These materials are often difficult to process due to contamination, low market demand, or their inability to be separated efficiently. Additionally, items like non-recyclable textiles, adhesives, and certain mixed laminates fall into this category. Since these residuals cannot be diverted for reuse or recycling, they are typically sent to landfills or waste-to-energy facilities. Proper management of these materials requires strategies such as pre-sorting at construction sites, innovative technologies for material recovery, and policies to minimize the generation of non-recyclable C&D waste.

Cost Assumptions for the C&D Model

Several assumptions were made to capture savings per ton for the C&D model, as shown in

Table 28. Costs are shown in parentheses while savings are shown without parentheses, and total savings and costs per ton of material diverted are highlighted in light blue.

Table 28: Estimated Savings per Ton and Capture Percentage of Estimated Composition

Material	Landfill Tip Fee per Ton*	Transport-ation Fee per Ton**	Market Fee per Ton***	Savings Total per Ton	Low Diversion Model	Medium Diversion Model	High Diversion Model
Wood	$40	($15)	$0	$25	0%	4%	10%
Gypsum	$40	($15)	0	$25	0%	20%	20%
Other C&D	$40	($15)	($42)	($17)	0%	1%	4%
Roofing	$40	($15)	0	$25	0%	6%	6%
Cardboard	$40	($15)	$25	$50	75%	4%	4%
Aggregates & Dirt	$40	($15)	($20)	$5	75%	3%	3%
Organics	$40	($15)	0	$25	75%	2%	2%
Plastic	$40	($15)	$0	$25	0%	0.3%	1%
Metal	$40	($15)	$50	$75	75%	2%	2%
Insulation	$40	($15)	0	$25	0%	2%	2%
Carpet	$40	($15)	($57)	($32)	0%	0.1%	0.3%

*The Landfill Tip Fee (also known as disposal fee) is estimated at $40 per ton. This is reflected as a cost savings or fee avoidance by choosing to divert. The Larimer County Landfill 2025 tip fee for compacted containers (including front, side, and rear loaders, but excluding compacted roll-off containers) is $34.00 per ton plus $3.43 per ton surcharge, and for roll-off waste (including loose and compacted roll-off containers with a 1 ton minimum) is $55.00 per ton plus $3.43 per ton surcharge.
**The Transportation Fee for movement of recyclable materials is estimated as a cost at $15/ton.
***The Market Fee is the cost or revenues made from selling or paying to recycle materials.

The savings total per ton is calculated as the savings from landfill tip fee per ton avoidance subtracted by the transportation tip fee per ton and market fee per ton. For example, wood diverted from landfill saves $40 per ton. However, the cost of transportation to the end user for C&D recycling is $15. The market feet is $0, because wood could be given to the end user or recovery project for free. Therefore, the total savings through diversion is $25.

Required Operating Volumes

This analysis suggests that a minimum of 40,000 tons of material would make a facility a viable option to justify capital and operating expenses while charging a reasonable tip fee compared to landfill tip fees. Due to existing diversion for separated concrete and asphalt, the analysis focused on mixed C&D loads not including these materials. Figure 13 presents a typical breakdown of mixed C&D: fines, recyclables, and trash (including roofing, insulation, and gypsum). This breakdown is generalized from conversations with C&D facilities, which categorize waste into the fines category due to the nature of many materials crumbling or smaller particles.

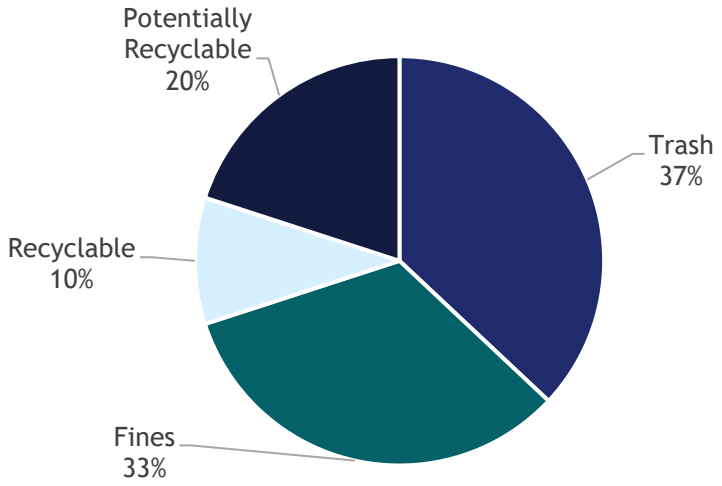


Figure 13: General Composition of C&D Mixed Waste (Not Including Clean Loads of Concrete/Asphalt)

Scenarios

The STEPS project team developed four distinct scenarios for developing a C&D diversion facility that differ based on total tonnage capacity and acceptance of materials from the City of Fort Collins, the County, or the greater region. These scenarios, as well as a breakdown of diversion potentials, are presented in Table 29 and Figure 14.

Scenario 1

Facility focusing on city-generated materials (with capacity of 40,000 tons of C&D input) based on the following estimations:

- Estimating that 100% of the City's C&D tons currently projected to go to landfill in 2035 (32,505 tons of C&D landfill) will be redirected to this facility.
- Estimating that 50% of the City's aggregate/soil tons currently projected to be diverted in 2035 (7,780 tons of C&D landfill) will be redirected to this facility.

Example Calculation:
100% of city C&D landfill tons 32,505
50% diverted for other aggregate/soil 15,559 tons = 7,780 tons
= 40,285 tons of C&D

Scenario 2

Facility focusing on city-generated materials (with capacity of 60,000 tons of C&D input) based on the following estimations:

- Estimating that 100% of the City's C&D tons currently projected to go to landfill in 2035 (32,505 tons of C&D landfill) will be redirected to this facility.
- Estimating that 50% of the City's scrap metal tons currently projected to be diverted in 2035 (14,856 tons of C&D landfill) will be redirected to this facility.
- Estimating that 50% of the City's aggregate/soil tons currently projected to be diverted in 2035 (7,780 tons of C&D landfill) will be redirected to this facility.

Example Calculation:
100% city C&D landfill tons 32,505 +
50% diverted for scrap metal 29,712 = 14,856 tons +
50% diverted for other aggregate/soil 15,559 tons = 7,780 tons
= 55,140 tons of C&D

Scenario 3

Facility focusing on county-generated materials (with capacity of 120,000 tons of C&D input) based on the following estimations:

- Estimating that 50% of Larimer County's C&D tons estimated to go to landfill in 2035 (116,243 tons of C&D landfill, includes Fort Collins) will be redirected to this facility.

Example Calculation:
50% of Larimer County C&D landfill tons 232,485 tons = 116,243 tons
= 116,243 tons of C&D

Scenario 4

Facility focusing on regionally generated materials (with capacity of 250,000 tons of C&D input) based on the following estimations:

- Estimating that 50% of Larimer County's C&D tons estimated to go to landfill in 2035 (116,243 tons of C&D landfill, includes Fort Collins) will be redirected to this facility.
- Estimating that 25% of Boulder County's C&D tons estimated to go to landfill in 2035 (64,454 tons of C&D landfill) will be redirected to this facility.
- Estimating that 25% of Weld County's C&D tons estimated to go to landfill in 2035 (48,545 tons of C&D landfill) will be redirected to this facility.

Example Calculation:

50% of Larimer County C&D landfill tons 232,485 tons = 116,243 tons +
25% of Boulder County C&D landfill tons 257,817 tons = 64,454 tons +
25% of Weld County C&D landfill tons 194,182 tons = 48,545 tons +
= 229,242 tons of C&D

Table 29: Tonnage Sources for C&D Facility Scenarios

Input Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total Rounded C&D Input Capacity (TPY)	40,000	60,000	120,000	250,000
Total Approximate C&D Input Capacity (TPY)	40,285	55,140	116,243	229,242
City's C&D Tons Capacity (TPY)	32,505	32,505	0	0
City's Aggregate/Soil Tons Capacity (TPY)	7,780	7,780	0	0
City's Scrap Metal Capacity (TPY)	0	14,856	0	0
Larimer County C&D Tons Capacity (TPY)	0	0	116,243	116,243
Boulder County C&D Tons Capacity (TPY)	0	0	0	64,454
Weld County C&D Tons Capacity (TPY)	0	0	0	48,545

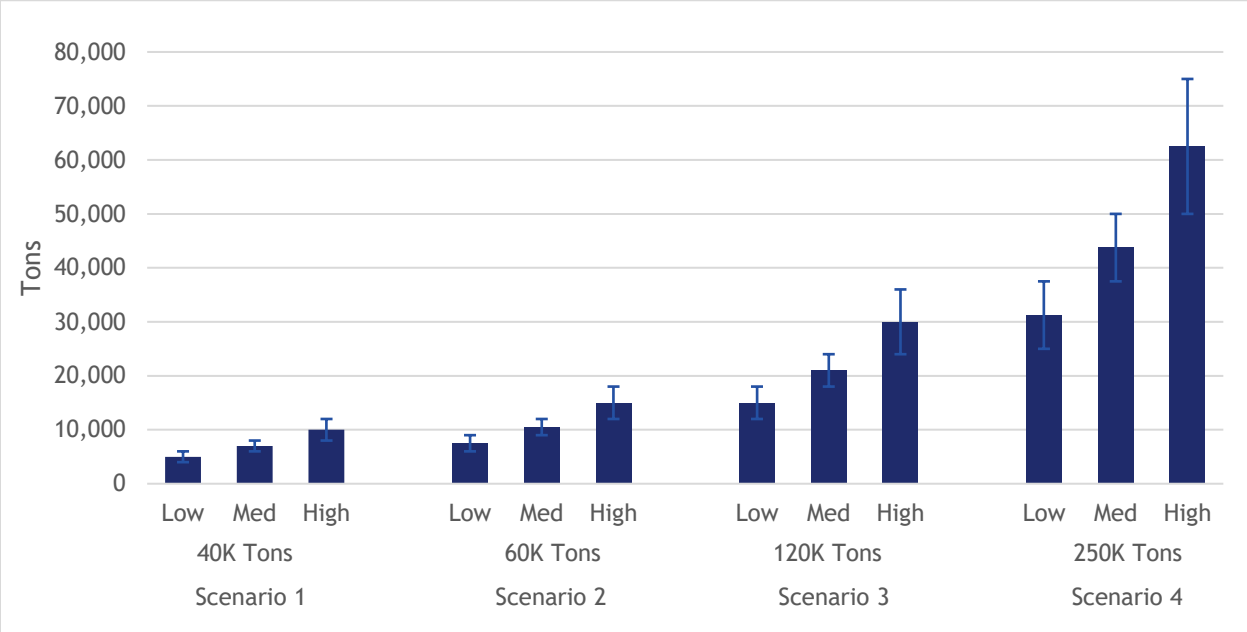


Figure 14: Scenarios 1-4 of Diversion Ton Potential Ranges

Estimated Capital and Operating Costs

Developing a city-scale construction and demolition (C&D) processing facility involves significant capital and operating costs that must be carefully assessed to ensure long-term feasibility and effectiveness. Capital costs include land acquisition, facility design, construction, equipment procurement, and necessary infrastructure upgrades to support sorting, processing, and storage of C&D materials. Operating costs encompass labor,

maintenance, utilities, equipment operation, regulatory compliance, and disposal fees for non-recyclable residuals.

The estimated operating and capital costs listed in Table 29 assume that the city-scale facility would process between 40,000 and 60,000 TPY. Fort Collins estimates that approximately 40,000 TPY of C&D landfilled materials is available for processing. Future growth of available materials throughout Larimer County and surrounding counties may support a processing facility with greater capacity. The three potential diversion scenarios include low diversion potential of 10% to 15%, medium diversion potential of 15% to 20%, and high diversion potential of 20% to 30%.

Table 30: Estimated C&D Facility Operating and Capital Costs for a C&D Facility

	City			Region		
	Low	Medium	High	Low	Medium	High
Assumptions for Throughput	40,000 – 60,000 Tons			120,000 – 250,000 Tons		
Equipment	$ 2.0 M	$ 2.5 M	$ 3.0 M	$ 3.0 M	$ 3.6 M	$ 4.2 M
Site Development	$ 12 M	$ 14 M	$ 16 M	$ 16 M	$ 20 M	$ 24 M
Annual Operating Expenses	$ 1.3 M	$ 1.4 M	$ 1.5 M	$ 3.0 M	$ 4.2 M	$ 5.5 M

Fort Collins already requires the separation of wood, aggregate, cardboard, and metal on C&D sites. The scenarios assume concrete and asphalt will not be brought to a C&D material recycling facility (MRF) as the materials generally will be directly hauled to an end user. The remaining materials would be mixed C&D material loads brought to a C&D Processing Facility.

Table 31, Table 32, Table 33, and Table 34 provide a range of costs for the four facility capacity scenarios while taking into account potential diversion scenarios and potential revenue streams from tipping fees, recovered material sales, and cost savings associated with diverting materials from landfills. Savings for all scenarios are estimated based on the sale of commodities and avoided landfill tip fees.

Table 31: Annual Estimated Capital and Operating Costs for a 40,000 TPY C&D Facility (Scenario 1)

Diversion Scenario	Tons Diverted (Low)	Tons Diverted (High)	Cost Type	Capital Cost per Ton	Operating Cost per Ton	High Diversion (Lowest Cost)*	Low Diversion (Highest Cost)**	Avg. Total Cost	Avg. Cost per Ton
10-15% (Low)	4,000	6,000	Initial cost	$24	$36	$2,200,000	$2,600,000	$2,400,000	**$57**
			Savings	-$1	-$2	-$148,500	-$99,000	-$123,750	
			Total	$23	$34	$2,051,500	$2,501,000	$2,276,250	
15%-20% (Medium)	6,000	8,000	Initial cost	$24	$36	$2,200,000	$2,600,000	$2,400,000	**$56**
			Savings	-$2	-$2	-$179,737	-$134,803	-$157,270	
			Total	$22	$34	$2,020,263	$2,465,197	$2,242,730	
20%-30% (High)	8,000	10,000	Initial cost	$24	$36	$2,200,000	$2,600,000	$2,400,000	**$55**
			Savings	-$2	-$3	-$226,592	-$151,061	-$188,827	
			Total	$22	$33	$1,973,408	$2,448,939	$2,211,173	

*High Diversion Lowest Cost: 15% diversion and $55 per ton Capital/Operation Cost/tip fee per ton for 40,000 tons input. Initial cost = 40,000 tons x $55 tons = $2,200,000.
**Low Diversion Highest Cost: 10% diversion and $65 per ton Capital/Operation Cost/tip fee per ton for 40,000 tons input. Initial cost = 40,000 tons x $65 tons = $2,600,000.

Table 32: Annual Estimated Capital and Operating Costs for a 60,000 TPY C&D Facility (Scenario 2)

Diversion Scenario	Tons Diverted (Low)	Tons Diverted (High)	Cost Type	Capital Cost per Ton	Operating Cost per Ton	High Diversion (Lowest Cost)*	Low Diversion (Highest Cost)**	Avg. Total Cost	Avg. Cost per Ton
10-15% (Low)	6,000	9,000	Initial cost	$25	$30	$3,000,000	$3,600,000	$3,300,000	**$52**
			Savings	-$1	-$2	-$222,750	-$148,500	-$185,625	
			Total	$23	$29	$2,777,250	$3,451,500	$3,114,375	
15%-20% (Medium)	9,000	12,000	Initial cost	$25	$30	$3,000,000	$3,600,000	$3,300,000	**$51**
			Savings	-$2	-$2	-$269,605	-$190,490	-$230,048	
			Total	$23	$28	$2,730,395	$3,409,510	$3,069,952	
20%-30% (High)	12,000	18,000	Initial cost	$25	$30	$3,000,000	$3,600,000	$3,300,000	**$50**
			Savings	-$2	-$3	-$339,888	-$226,592	-$283,240	
			Total	$23	$28	$2,660,112	$3,373,408	$3,016,760	

*High Diversion Lowest Cost: 15% diversion and $50 per ton Capital/Operation Cost/tip fee per ton for 60,000 tons input. Initial cost = 60,000 tons x $50 tons = $3.000,000.
**Low Diversion Highest Cost: 10% diversion and $60 per ton Capital/Operation Cost/tip fee per ton for 60,000 tons input. Initial cost = 60,000 tons x $60 tons = $3,600,000.

Table 33: Annual Estimated Capital and Operating Costs for a 120,000 TPY C&D Facility (Scenario 3)

Diversion Scenario	Tons Diverted (Low)	Tons Diverted (High)	Cost Type	Capital Cost per Ton	Operating Cost per Ton	High Diversion (Lowest Cost)*	Low Diversion (Highest Cost)**	Avg. Total Cost	Avg. Cost per Ton
10-15% (Low)	12,000	18,000	Initial cost	$23	$28	$5,400,000	$6,600,000	$6,000,000	**$47**
			Savings	-$1	-$2	-$445,500	-$297,000	-$371,250	
			Total	$21	$26	$4,954,500	$6,303,000	$5,628,750	
15%-20% (Medium)	18,000	24,000	Initial cost	$23	$28	$5,400,000	$6,600,000	$6,000,000	**$46**
			Savings	-$2	-$2	-$539,211	-$404,408	-$471,809	
			Total	$21	$25	$4,860,789	$6,195,592	$5,528,191	
20%-30% (High)	24,000	36,000	Initial cost	$23	$28	$5,400,000	$6,600,000	$6,000,000	**$45**
			Savings	-$2	-$3	-$679,776	-$453,184	-$566,480	
			Total	$20	$25	$4,720,224	$6,146,816	$5,433,520	

*High Diversion Lowest Cost: 15% diversion and $50 per ton Capital/Operation Cost/tip fee per ton for 120,000 tons input. Initial cost = 120,000 tons x $50 tons = $5,400,000.
**Low Diversion Highest Cost: 10% diversion and $60 per ton Capital/Operation Cost/tip fee per ton for 120,000 tons input. Initial cost = 120,000 tons x $60 tons = $6,600,000.

Table 34: Annual Estimated Capital and Operating Costs for a 250,000 TPY C&D Facility (Scenario 4)

Diversion Scenario	Tons Diverted (Low)	Tons Diverted (High)	Cost Type	Capital Cost/Ton	Operating Cost/Ton	High Diversion Lowest Cost*	Low Diversion Highest Cost**	Avg. Total Cost	Avg. Cost/ Ton
10-15% (Low)	25,000	37,500	Initial cost	$20	$25	$10,000,000	$12,500,000	$10,000,000	**$42**
			Savings	-$1	-$2	-$928,125	-$618,750	-$928,125	
			Total	$19	$23	$9,071,875	$11,881,250	$9,071,875	
15%-20% (Medium)	37,500	50,000	Initial cost	$20	$25	$10,000,000	$12,500,000	$10,000,000	**$41**
			Savings	-$2	-$2	-$1,123,355	-$842,517	-$1,123,355	
			Total	$18	$23	$8,876,645	$11,657,483	$8,876,645	
20%-30% (High)	50,000	75,000	Initial cost	$20	$25	$10,000,000	$12,500,000	$10,000,000	**$40**
			Savings	-$2	-$3	-$1,416,201	-$944,134	-$1,416,201	
			Total	$18	$22	$8,583,799	$11,555,866	$8,583,799	

*High Diversion Lowest Cost: 15% diversion and $50 per ton Capital/Operation Cost/tip fee per ton for 250,000 tons input. Initial cost = 250,000 tons x $50 tons = $10,000,000.
**Low Diversion Highest Cost: 10% diversion and $60 per ton Capital/Operation Cost/tip fee per ton for 250,000 tons input. Initial cost = 250,000 tons x $60 tons = $12,500,000.

Considerations for Facility Development

If the City of Fort Collins were to pursue developing a C&D processing facility, they could consider the following factors prior to development.

Site Evaluation

1. **Location Requirements**
    - Proximity to waste generation sources and disposal facilities.
    - Centralized location to optimize collection and transfer routes.
    - Assess distances to end markets and/or major travel arteries.
    - Evaluate proximity to disadvantaged communities or sensitive environmental areas.
    - Confirm proximity to emergency response facilities.
    - Ensure sufficient infrastructure for:
        1. Water supply for fire suppression.
        2. Electrical capacity (2400 amperes @480 VAC, three-phase).
    - Assess soil suitability for facility construction.
2. **Site Size and Capacity**
    - Adequate area for waste transfer operations, vehicle maneuvering, and storage.
    - Space for future growth or increased capacity.
    - Ensure sufficient area for facility needs (5-10 acres for a 40,000-60,000 tons annual capacity facility).
    - Explore shared space opportunities with other facilities of similar land use to reduce costs.
    - Consider co-location with or near landfill (25%-40% of C&D waste is non-recoverable with fines potentially accepted as alternate daily cover).
    - Verify the site is large enough to accommodate additional uses:
        1. Secondary processing (additional processing steps undertaken after the initial sorting to improve quality). Technology examples:
            1. Optical sorters
            2. Ai-powered robotics
            3. Pelletizers,
            4. Fine Metal Recovery Systems
        2. Recycling/reuse drop-off facility.
    - Account for space needs related to:
        1. Required setbacks.
        2. Stormwater runoff detention.
    - Optimize building location relative to:
        1. Prevailing weather conditions.
        2. Ground slope.
    - Ensure lot shape is functional (not too narrow).
    - Verify space for associated uses:

    1. Fleet parking or maintenance.
    2. Fleet fueling.
    3. Waste/organics transfer facility.
    4. Organics processing area.
  - Include space for:
    1. Worker facilities (break rooms, restrooms).
    2. Equipment storage.
3. **Environmental Constraints**
  - Compliance with environmental regulations (air, water, and soil quality).
  - Avoidance of protected areas, wetlands, and groundwater zones.
  - Wind-blown debris and minimizing wind-tunnel effect
4. **Traffic and Transportation**
  - Access to arterial roads or highways for large trucks.
  - Ability to manage traffic flow and minimize congestion.
  - Impact on local road conditions and infrastructure.
  - Confirm Class A road access for heavy vehicles.
  - Assess potential for separate access for passenger vehicles if:
    1. Educational activities are planned.
    2. Waste or recycling drop-off is open to the public.
5. **Operational Considerations**
  - Availability of utilities (power, water, drainage).
  - Feasibility of waste handling and processing technology.
  - Odor, dust, noise, and litter control measures.
6. **Economic Viability**
  - Site development costs (grading, utilities, access roads).
  - Long-term operating and maintenance expenses.
  - Cost efficiency in waste transportation.
7. **Community and Social Factors**
  - Impact on nearby residents and businesses.
  - Community acceptance and mitigation strategies.
  - Opportunities for public outreach and engagement.
8. **Permitting and Regulatory Compliance**
  - Local, state, and federal permitting requirements.
  - Compliance with zoning, safety, and environmental laws.
  - Confirm appropriate zoning and land use designation.
  - Ensure compliance with regulations regarding:
    1. Building size and height.
    2. Noise limits.
    3. Hours of operation.
  - Verify sufficient distance from:
    1. Regulated waterways.
    2. Wetlands.
    3. Floodplains.

4. Sensitive habitats.

9. **Safety and Risk Management**
    - Measures to prevent accidents, contamination, or environmental harm.
    - Emergency access and safety protocols.

Fatal Flaws in Site Selection

1. **Zoning Restrictions**
    - **Zoning Incompatibility**: Site is not zoned for storing waste, or significant rezoning efforts are required, which may be impossible or prohibitively expensive.
2. **Proximity to Sensitive Areas**
    - **Proximity to Sensitive Receptors**: Site is too close to residential areas, schools, parks, or other protected zones (e.g., wetlands, historical sites), which could lead to community opposition or regulatory barriers.
    - **Environmental Restrictions**: Site is in a floodplain, wetland, or other protected natural area, potentially making development impossible or costly.
3. **Environmental Impacts**
    - **Risk to air, water, and soil quality**: Potential environmental contamination risks that could violate regulatory standards or cause long-term harm to local ecosystems.
4. **Infrastructure Deficiencies**
    - **Poor Accessibility**: Lack of access to major roads or highways for large trucks, creating bottlenecks or traffic congestion.
    - **Absence of Utilities**: Lack of essential utilities (e.g., water, power, sewer) or prohibitively expensive infrastructure upgrades, preventing operations from starting or scaling.
5. **Regulatory Barriers**
    - **Permits or legal approvals** are unlikely to be secured due to local or state restrictions, environmental concerns, or community opposition.
6. **Community Opposition**
    - **Strong public resistance** from nearby residents or businesses making it difficult to gain public support and move forward with the project.
7. **Economic Infeasibility**
    - **Excessive costs** of acquisition, development, or operation, which render the transfer station financially unviable, including high costs for site preparation, infrastructure, and ongoing operational expenses.
    - **End markets** (availability and proximity)

Transfer Station

Choosing to site a transfer station in lieu of constructing a dedicated processing site for specific materials offers a practical solution that can streamline both costs and operational efficiencies. A transfer station can consolidate materials for transport to specialized processing facilities, reducing the need for expensive, large-scale processing infrastructure on-site. Trucks are weighed at a scale house upon arrival and waste is compacted to reduce volume for transport. This approach not only helps optimize operational logistics but also mitigates significant capital investment. In the following sections, potential capital and operating costs, ideal operating volumes, site parameters to consider, and potential flaws in site selection for transfer stations are evaluated.

One example in the region includes Western Disposal's Materials Management Center, located in Boulder County. This site is primarily a transfer station with a small semi-automatized construction waste materials sorting center that accepts and processes aggregates, metals, wood, and fiber.[xlvi]

The STEPS project team assessed two transfer station scenarios, with one being for processing construction and demolition (C&D) waste and one for processing compost.

C&D Transfer Station Operations

Trucks from C&D contractors or sites arrive for unloading, where debris is placed onto the floor or directly into another vehicle. The load mixture dictates the specific tipping areas. There is an opportunity for sorting and processing of materials to recover recyclables and remove hazardous waste. Processed waste is then loaded onto larger vehicles for transport to C&D processing facilities or disposal sites, with non-recyclable waste being sent to C&D landfills or other appropriate facilities.

Compost Transfer Station Operations

Food scraps and other compostable materials are collected from drop-off points, curbside programs, or businesses. Materials are inspected for contaminants and non-compostable items before being loaded onto vehicles for transport to composting facilities. Based on liquid content, loads may be directed to specific tipping areas, with some materials possibly being sent to an anaerobic digester instead of a compost facility.

Estimated Capital and Operating Costs

The volume at which a transfer station would make economic feasibility depends on how far a direct trip would be. Typically, a transfer station will be feasible if the radius can allow for more service collection to occur. A 2002 EPA manual has noted using a transfer station is cost-effective when the round-trip distance to the processing facility exceeds 35 miles.[xlvii]

Estimated capital and operating costs for a compost transfer facility are listed in Table 35. These estimations assume that the transfer station would transfer 40,000 TPY of organic

waste from Fort Collins or 60,000 TPY of organic waste from the region to a processing site 25 to 60 miles away. Costs are broken down between the three recovery rate scenarios (low, medium, and high) developed in the Organic Waste Recovery Potential section of this report.

Table 35: Estimated Operating and Capital Costs for a Compost Transfer Facility

	City			Region		
	Low	Medium	High	Low	Medium	High
Assumptions for Throughput	40,000 TPY			60,000 TPY		
Equipment	$ 0.2 M	$ 0.3 M	$ 0.4 M	$ 0.2 M	$ 0.3 M	$ 0.4 M
Site Development	$ 1.8 M	$ 2.0 M	$ 2.2 M	$ 2.1 M	$ 2.3 M	$ 2.5 M
Annual Operating Expenses	$ 0.5 M	$ 0.7 M	$ 0.9 M	$ 1.0 M	$ 1.2 M	$ 1.4 M

Estimated capital and operating costs for a C&D transfer facility are listed in Table 36. The City of Fort Collins estimates that around 40,000 TPY of C&D materials currently landfilled could be redirected to processing. Table 36 outlines the costs associated with a C&D transfer station, based on handling either 20,000 TPY or 40,000 TPY. Land costs are not accounted for in these calculations.

Table 36: Annual Capital, Operating, & Trucking Costs for a C&D Transfer Station

Transfer Scenario	Capital Cost	Operating Cost	Trucking Cost	Total Cost
20,000 tons handled by transfer station*				
25 Miles One Way	$259,345	$343,081	$240,000	$842,426
Cost/Ton	$12.97	$17.15	$12.00	$42.12
60 Miles One Way	$259,345	$343,081	$367,273	$969,699
Cost/Ton	$12.97	$17.15	$18.36	$48.48
40,000 tons handled by transfer station**				
25 Miles One Way	$279,976	$510,104	$480,000	$1,270,080
Cost/Ton	$7.00	$12.75	$12.00	$31.75
60 Miles One Way	$279,976	$510,104	$734,545	$1,524,625
Cost/Ton	$7.00	$12.75	$18.36	$38.12

*20,000 tons assumes 5 days a week at 4 operating hours per day,
**40,000 tons assumes 5 days a week at 7 operating hours per day.

Possible processing center tipping fees were set at $30, $40, $50, or $60 to estimate the total cost per ton, including all capital, operating, and trucking costs, as shown in Table 37. Tipping fees at compost facilities in Colorado range from $30 to $50 per ton, while fees at construction and demolition processing facilities typically range from $40 to $60 per ton.

Table 37: Total Transfer and Processing Center Tip Fees for a Compost Facility

Processing Center Tip Fee	$30	$40	$50	$60
20,000 tons handled by transfer station				
Total Cost/ton With 25 Mile Transfer ($42.12)	$72.12	$82.12	$92.12	$102.12
Total Cost/ton With 60 Mile Transfer ($48.48)	$78.48	$88.48	$98.48	$108.48
40,000 tons handled by transfer station				
Total Cost/ton With 25 Mile Transfer ($31.75)	$61.75	$71.75	$81.75	$91.75
Total Cost/ton With 60 Mile Transfer ($38.12)	$68.12	$78.12	$88.12	$98.12

Note: land costs are not accounted for in these calculations

Required Operating Volumes

The operating volumes of a transfer station will vary significantly based on several key factors, including staffing levels, operational hours, and the facility's capacity to move material.

In general, it is best to build a facility to accommodate present and projected maximum volumes and peak flows, with a preplanned footprint for facility expansion. A standard methodology is calculating how much tipping floor space a facility would require to store a full day's waste in case of an extreme emergency. "Chapter 4: Collection and Transfer" in *EPA's Decision Maker's Guide to Solid Waste Management* provides a series of formulas for helping determine transfer station capacity.[xlviii] This methodology has been applied to calculate capacity needs for Fort Collins and Larimer County and is presented in Table 38.

Table 38: Estimated Transfer Station Capacity Needs for City and County Materials

Materials for Transfer Station	City Capacity Needs	County Capacity Needs
Construction & Demolition	40,000 - 60,000 tons	60,000 - 120,000 tons
Food Scraps & Yard Trimmings	20,000 - 50,000 tons	50,000 - 85,000 tons
Transfer Station Range	20,000 – 60,000 tons	110,000 – 205,000 tons

The Regional capacity scenario was not considered because it would assume some materials would be hauled a longer distance to the transfer station. If the processing facility were closer than the transfer station, it would likely make sense for the materials to be hauled straight to a processing facility.

Recovery Opportunity

The recovery potential for a transfer station depends on various factors that influence material throughput and the destination facility for the materials. Throughput will be influenced by the size of the transfer station, with different tipping floors designated for food scraps/yard trimmings versus construction and demolition materials. Some materials may be quickly consolidated into a transfer trailer, allowing one load to carry 2-3 packer truck loads, which helps save on drive time and mileage. In some cases, certain loads—such as pallets or metals—could be diverted from transfer if they are homogenous enough to be collected by a broker directly from the MRF. However, this requires timely coordination to ensure a clean tipping floor by the end of the day. Additionally, the number of shifts worked will determine the volume of materials that can be processed at the site.

Demand for the transfer station will additionally affect the throughput. Policies such as flow control of materials to the facility or a cost/tipping fee will impact demand. There are also several ways to increase recovery opportunities and increase efficiencies, as highlighted below:

- **Optimizing Efficiencies**: Proper layout design and scheduling should focus on minimizing bottlenecks and maximizing throughput. Failing to plan for efficient operations could result in long wait times for haulers and underutilized capacity.
- **Designing for Varied Collection Trucks**: Transfer stations must be designed to accommodate a variety of vehicles, such as roll-offs, residential trucks, and compactors. Planning for enough scales and tipping doors to handle diverse material streams is essential.
- **Storage for Divertible Materials**: Some materials may need to be stored temporarily until they reach critical mass before being diverted to recycling. Without adequate space for such storage, the station could face disruptions in its operations.

Considerations for Facility Development

When siting a transfer station, careful consideration of various site parameters is essential to ensure the facility operates efficiently, meets regulatory requirements, and minimizes negative environmental and community impacts. A well-chosen location can streamline operations, reduce costs, and increase throughput, while also allowing for future growth and adaptability. Key variables to consider include waste type and quantity, site constraints, climate, wind, customers (private, commercial or public) and local zoning requirements.

State and Local Permitting

In Colorado, the minimum acreage required for a waste transfer station varies by county and is influenced by local zoning regulations and land use codes. For instance, Boulder County[xlix] mandates a minimum lot size of 35 acres for a Solid Waste Transfer Facility in certain zoning districts.

It is important to note that these requirements can differ significantly across counties and municipalities within the state. Therefore, it's advisable to consult the specific land use codes and zoning regulations of the county or municipality where you plan to establish the transfer station. Engaging with local planning and zoning departments will provide guidance tailored to the area's specific requirements and ensure compliance with all relevant regulations.

By thoroughly reviewing local regulations and consulting with appropriate authorities, you can determine the precise acreage and other requirements necessary for establishing a waste transfer station in your desired location within Colorado.

Site Evaluation

Key site evaluation criteria for a transfer station include those previously mentioned for a compost facility and C&D processing facility, such as environmental constraints, traffic and transportation, opportunity considerations, economic viability, community and social factors, permitting and regulatory compliance, and safety and risk management. Additional key parameters to consider unique to siting a transfer station are presented in the list below. The checklist below highlights the key parameters to consider when siting a transfer station, highlighting both operational needs and potential challenges that must be managed.

- **Location Requirements**
  - Proximity to waste generation sources and end market recycling/composting facilities.
  - Centralized location to optimize collection and transfer routes.
  - Assess distances to end markets and/or major state route travel arteries.
  - Evaluate proximity to disadvantaged communities or sensitive environmental areas.
  - Ensure proximity to emergency services and plans are in place for emergencies.
  - Ensure sufficient infrastructure for water supply for fire suppression, potential interconnect with sanitary sewer for leachate control, and assess soil suitability for facility construction.

- **Site Size and Capacity**
  - Adequate area for waste transfer operations, vehicle maneuvering, and storage.
  - Relatively flat site that provides for containment of storm water.
  - Space for future growth or increased capacity.
  - Verify the site is large enough to accommodate uses, including ample concrete surfaces for dumping, storage, and re-loading each material and ample turnaround for delivery trucks and transfer trailers.
  - Potential Public Recycling Drop Off containers placed at the facility for added community access.
  - Account for space needs related to required setbacks, stormwater runoff detention, and truck traffic.

- Optimize building location relative to prevailing weather conditions and ground slope.
- Verify space for associated uses including transfer truck parking, fleet fueling, and truck maintenance.
- Include space for worker facilities (e.g., break rooms and restrooms) and equipment storage.

Fatal Flaws in Site Selections

As with the fatal flaws discussed for site selection for an organics composting facility and C&D processing facility, the site selected for a transfer station must take into consideration zoning restrictions, environmental impacts, community opposition, regulatory barriers, and economic infeasibility. The criteria presented below should also be considered.

1. **Location Requirements**
    - Distance to waste generation sources and end market recycling/composting facilities does not justify travel time expense.
    - Inaccessible to state routes with ample load limits.
    - Response time for emergency service must be less than 15 minutes.
    - Site must have ample:
        - Water supply for fire suppression.
        - Potential interconnect with sanitary sewer for leachate control.
        - Assess soil suitability for facility construction.
        - Power availability.
2. **Site Size and Capacity**
    - Site does not have ample room to transfer products, contain blowing litter, store vehicles/equipment, and maneuver traffic.
    - The proposed site is not relatively flat and will require excessive grading to create water flow containment.
    - Site does not have suitable, permittable surrounding acreage for growth.
    - Site does not meet regulatory setback requirements and would require a planning/zoning variance.

Comparative Assessment

Building on the Processing Infrastructure Assessment, the STEPS project team further compared the identified material recovery facility scenarios with the following variables:

- Operating Cost
- Capital Costs
- Operating Expenses
- Diversion Impacts
- Greenhouse Gas (GHG) Impact
- Utilization of Facility
- How it will impact/connect stakeholders
- Potential Partners
- Pros for the City of Fort Collins
- Cons for the City of Fort Collins

In addition to comparing the eleven scenarios for organics or construction & demolition (C&D) material management provided in the Processing Infrastructure Analysis, four options assuming the direct haul of materials to a facility outside of Fort Collins and not owned by the City are explored in this assessment:

- Direct haul to Larimer County location (Organics) - 25 miles from City center
- Direct haul to Weld County location (Organics)
- Direct haul to Larimer County location (C&D) - 25 miles from City center
- Direct haul to Weld County location (C&D) - 40 miles from City center

Table 39 provides a high-level summary of key metrics identified through the Processing Infrastructure Analysis, covering aspects such as cost and material diversion from landfills. To provide an easy comparison of the performance of each scenario in the table below, darker colors represent higher values. This table is representative of a preliminary assessment of capital and operating costs incurred by the development of a facility, and is intended to aid in the decision-making process on which type of facility to pursue further.

Table 39: High Level Comparative Assessment

Scenarios	Facility Max Capacity (TPY)	Total Capital Cost	Annual Operating Cost*	Diversion Potential for Fort Collins (TPY)**
Compost Site	50,000	$ 6.1 M	$ 1.00 M	50,000
Regional Compost Site – 25 Miles	85,000	$ 8.3 M	$ 1.50 M	50,000
C&D Site (Scenario 1) - 40,000 TPY	40,000	$ 14.0 M	$ 1.32 M	10,000
C&D Site (Scenario 2) - 60,000 TPY	60,000	$ 19.0 M	$ 1.68 M	18,000
Regional C&D Site (Scenario 3) - 120,000 TPY	120,000	$ 23.6 M	$ 3.00 M	18,000
Regional C&D Site (Scenario 4) - 250,000 TPY	250,000	$ 28.2 M	$ 5.75 M	18,000
Transfer Station (Compost) - 25 Miles	50,000	$ 2.3 M	$ 0.99 M	50,000
Transfer Station (Compost) - 60 Miles	50,000	$ 2.3 M	$ 1.25 M	50,000
Transfer Station (C&D) - 25 Miles	60,000	$ 2.3 M	$ 0.99 M	18,000
Transfer Station (C&D) - 60 Miles***	60,000	$ 2.3 M	$ 1.25 M	18,000
Food Scraps for Co-digestion	47,000	$ 7.0 M	$ 2.83 M	13,554
Direct Haul (Compost) – 25 Miles	-	-	$ 1.99 M	50,000
Direct Haul (Compost) - 40 Miles	-	-	$ 3.18 M	50,000
Direct Haul (C&D) - 25 Miles	-	-	$ 2.83 M	10,000
Direct Haul (C&D) - 40 Miles	-	-	$ 4.54 M	10,000

*Cost to operate the facility annually, not including transportation costs except for direct haul options
**Only calculating materials from the City
**Capital cost for transfer station scenarios remains the same regardless of distance to final processing facility

Legend for Table 39 above

Table Color Coding
High Cost
Moderate Cost
Low Cost
High Diversion
Moderate Diversion
Low Diversion

Table 40 highlights the key pros and cons of each major scenario, comparing their feasibility and the varying impacts they will have on the community, stakeholders, and City of Fort Collins. These highlights are drawn from the Processing Infrastructure Assessment and conversations with the City and interested parties in the community.

Table 40: Summary of Pros and Cons Comparative Assessment

Scenarios	Opportunities & Pros	Risks, Challenges & Cons
Compost Site	• High diversion potential. • Smaller site area, potentially reducing land costs. • Provides community access to finished compost. • Close to City.	• High operating costs and tipping fees. • Location, especially in the City, likely to be opposed by immediately surrounding neighbors. • Increased competition with local composting stakeholders.
Construction & Demolition (C&D) Site	• Direct control over material diversion. • Increased transparency. • Easier access to send material for local contractors and haulers. • Potential for City to utilize salvaged items.	• Highest capital investment costs. • Limited remaining diversion potential. • Success is dependent on existing C&D practices. • Limited locations and possible land development challenges.
Transfer Station	• Low capital investment costs. • Likely easier to cite than a compost or C&D facility. • City not responsible for sorting or selling material. • Close to City if city-owned.	• High tipping fees from additional processing step. • May conflict with the County's transfer station plans. • Dependent on existence of operational compost or C&D site.
Co-Digestion	• Close to City if city-owned.	• Highest operating costs. • High capital investment costs required to update existing infrastructure. • Low diversion potential, since limited to low-contamination sources.
Direct-Haul	• No capital investment. • No risks from owning a facility.	• High transportation costs. • Requires an ordinance to direct materials to specific site. • Limited control over data and reporting.

Assumptions

In conducting the comparative assessment, several key assumptions were established to ensure a consistent and meaningful evaluation of the different facility options. These assumptions define the parameters for each option, including estimated tonnage, facility location relative to Fort Collins, and the origin of materials—whether from Fort Collins or surrounding areas, Larimer County or neighboring counties. Additionally, GHG emissions factors were utilized to calculate the emissions generated from hauling material and the landfill emissions avoided by processing organic material or recovering C&D material. This section outlines the foundational assumptions, providing context and clarification for the findings of the comparative assessment.

Factors used for estimated weight per cubic yard (cy) include:[l]

- **Food Waste**: 463 lbs. per cy
- **C&D**: 484 lbs. per cy C&D bulk

Assumptions used in option profile descriptions:

- Average load to compost facility/transfer station/direct haul: 15.75 cy, calculated from an average of the load capacity of various refuse trucks.
    - ROTO PAC[li]: 14 to 27 cy
    - CSC Truck[lii]: 6 cy
    - Load King[liii] 16-foot Dump Truck[liv]: 16 cy

Organics Operations

- **Compost Site**
    - A total processing capacity of 50,000 tons per year (TPY)
        - Assumed intake of up to 50,000 TPY of material only from Fort Collins food scraps/yard trimmings generation
    - City-owned
    - Operations performed by a contracted vendor (public or private) from an RFP process
    - Located within 5 miles radius of Fort Collins city center
    - Assumed travel distance for stakeholders: 5 miles
    - Potential sales from finished compost not included
    - Average load to compost facility is 3.65 tons (463 lbs./cy x 15.75 cy)
        - Approximately 13,699 loads per year to a facility 5 miles away

- **Regional Compost Site**
    - A total processing capacity of 85,000 TPY
        - Assumed intake of up to 50,000 TPY of material only from Fort Collins food scraps/yard trimmings generation
        - Additional 35,000 tons of materials from outside of Fort Collins food scraps/yard trimmings generation, including Loveland and Estes Park

  - City-owned
  - Operations performed by a contracted vendor (public or private) from an RFP process
  - Located within 25 miles radius of Fort Collins city center
  - Assumed travel distance for stakeholders: 25 miles
  - Potential sales from finished compost not included
  - Average load to compost facility is 3.65 tons (463 lbs./cy x 15.75 cy)
    - Approximately 13,699 loads per year to a facility 25 miles away

- **Food Scraps for Co-digestion**
  - Focused on up to 13,554 TPY of material only from Fort Collins food scraps
  - Not a viable option with limits of current city infrastructure
  - Assumes transportation to WWTP for co-digestion
  - Average load to transfer station is 3.65 tons (463 lbs./cy x 15.75 cy)
    - Approximately 3,713 loads per year to a facility 5 miles away

C&D Operations

- **C&D Site (Scenario 1: 40,000 TPY)**
  - A total processing capacity of 40,000 TPY
    - Assumed intake of up to 40,000 TPY of material only from Fort Collins C&D generation
  - City owned
  - Operations performed by a contracted vendor (public or private) from an RFP process
  - Located within 5 miles radius of Fort Collins city center
  - Assumed travel distance for stakeholders: 5 miles
  - No revenue assumed for reclaimed/recycled material.
  - Average load to C&D facility is 7.26 tons (484 lbs./cy x 30 cy)
    - Approximately 8,264 loads per year to a facility 5 miles away

- **C&D Site (Scenario 2: 60,000 TPY)**
  - A total processing capacity of 60,000 TPY
    - Assumed intake of up to 60,000 TPY of material only from Fort Collins C&D generation
  - City owned
  - Operations performed by a contracted vendor (public or private) from an RFP process
  - Located within 5 miles radius of Fort Collins city center
  - Assumes 25% of material is reclaimed/recyclable, 33% is diverted from landfill as fines/ADC and 42% ends up landfilled, as is consistent with current C&D mix
  - Transfer of waste is assumed at the max limit of 80,000 pounds per load for labor estimates.
    - Average load to C&D facility is 7.26 tons (484 lbs./cy x 30 cy)

- Approximately 8,264 loads per year to a facility 5 miles away

- **C&D Site (Scenario 3: 120,000 TPY)**
  - A total processing capacity of 120,000 TPY
    - Assumed intake of up to 60,000 TPY of material only from Fort Collins C&D generation
    - Additional 60,000 tons of materials from outside of Fort Collins C&D generation, to include material in Larimer County
  - City owned
  - Operations performed by a contracted vendor (public or private) from an RFP process
  - Located within 25 miles radius of Fort Collins city center.
  - Average load to C&D facility is 7.26 tons (484 lbs./cy x 30 cy)
    - Approximately 8,264 loads per year to a facility 5 miles away

- **C&D Site (Scenario 4: 250,000 TPY)**
  - A total processing capacity of 250,000 TPY
    - Assumed intake of up to 60,000 TPY of material only from Fort Collins C&D generation
    - Additional 190,000 tons of materials from outside of Fort Collins C&D generation, including material from Larimer County and surrounding counties, Weld and Boulder
  - City owned
  - Operations performed by a contracted vendor (public or private) from an RFP process
  - Located within 25 miles radius of Fort Collins city center
  - Average load to C&D facility is 7.26 tons (484 lbs./cy x 30 cy)
    - Approximately 8,264 loads per year to a facility 5 miles away

Transfer Station

- **Transfer Station (Compost) - 25 miles**
  - A total processing capacity of 50,000 TPY
    - Assumed intake of up to 50,000 TPY of material only from Fort Collins food scraps/yard trimmings generation
  - City owned
  - Operations performed by a contracted vendor (public or private) from an RFP process
  - Located within 5 miles radius of Fort Collins city center
  - Assumed travel distance for stakeholders: 5 miles
  - Assumed travel distance for Compost facility location: 25 miles

- **Transfer Station (Compost) - 60 miles**
  - A total processing capacity of 50,000 TPY

        - Assumed intake of up to 50,000 TPY of material only from Fort Collins food scraps/yard trimmings generation
    - City owned
    - Operations performed by a contracted vendor (public or private) from an RFP process
    - Located within 5 miles radius of Fort Collins city center
    - Assumed travel distance for stakeholders: 5 miles
    - Assumed travel distance for Compost facility location: 60 miles

- **Transfer Station (C&D) - 25 miles**
    - A total processing capacity of 60,000 TPY
        - Assumed intake of up to 60,000 TPY of material only from Fort Collins C&D generation
    - City owned
    - Operations performed by a contracted vendor (public or private) from an RFP process
    - Located within 25 miles radius of Fort Collins city center
    - Assumed travel distance for stakeholders: 5 miles
    - Assumed travel distance for next C&D location: 25 miles

- **Transfer Station (C&D) - 60 miles**
    - A total processing capacity of 60,000 TPY
        - Assumed intake of up to 60,000 TPY of material only from Fort Collins C&D generation
    - City owned
    - Operations performed by a contracted vendor (public or private) from an RFP process
    - Located within 60 miles radius of Fort Collins city center
    - Assumed travel distance for stakeholders: 5 miles
    - Assumed travel distance for next C&D location: 60 miles

- **City of Fort Collins Food Scraps for Co-digestion**
    - Assumed capacity up to 13,554 TPY of material only from Fort Collins food scraps
    - Assumes AD at Fort Collins WWTP with solids cured and land applied. Biogas used onsite to offset electricity use.
    - Located within 5 mile radius of Fort Collins city Center.
    - Not a viable option due to costly infrastructure upgrades necessary to accept food waste and potential detrimental effects to existing wastewater reclamation facility operations.

Direct Haul Operations

See next section "Direct Haul Cost Assessment" for more information.

- **Direct haul (Compost)- 25 miles**
  - Organics direct hauled to Larimer County location
  - Assumed up to 50,000 tons of material only from Fort Collins food scraps/yard trimmings generation
  - Not a sent to a city-owned facility
  - MOU with facility for sending food scraps and yard trimmings
  - Assumed travel distance for stakeholders: 25 miles

- **Direct haul (Compost)- 40 miles**
  - Organics direct hauled to Weld County location
  - Assumed up to 50,000 tons of material only from Fort Collins food scraps/yard trimmings generation
  - Not sent to a city-owned facility
  - MOU with facility for sending food scraps and yard trimmings
  - Assumed travel distance for stakeholders: 40 miles

- **Direct haul (C&D)-25 miles**
  - Direct haul to Larimer County location
  - Assumed up to 60,000 tons of material of Fort Collins C&D generation
  - Not sent to a city-owned facility
  - City would enforce specific facility requirements for C&D contracts
  - MOU with facility for sending C&D
  - Assumed travel distance for stakeholders: 25 miles
    - Average load to transfer station is 7.26 tons (484 lbs./cy x 30 cy)
      - Assumed average of 30 cy for load with range from 10 cy to 50 cy
    - Approximately 8,264 loads per year to a facility 25 miles away

- **Direct haul (C&D)- 40 miles**
  - Direct haul to Weld County location
  - Assumed up to 60,000 tons of material of Fort Collins C&D generation
  - Not sent to a city-owned facility
  - City would enforce specific facility requirements for C&D contracts
  - MOU with facility for sending C&D
  - Assumed travel distance for stakeholders: 40 miles
    - Average load to transfer station is 7.26 tons (484 lbs./cy x 30 cy)
      - Assumed average of 30 cy with range for load from 10 cy to 50 cy
    - Approximately 8,264 loads per year to a facility 40 miles away

Direct Haul Cost Assessment

To provide a comparative analysis of direct hauling to the processing infrastructure, an assessment of direct hauling of organics or C&D materials to a facility outside of Fort Collins and not owned by the City was conducted. This section presents the results and assumptions of direct hauling.

Key Assumptions

- **Transportation Costs**: The cost of direct-hauling materials can vary significantly. The type of vehicle used has different limitations and weight capacities.
  - Fuel expenses (dependent on vehicle fuel efficiency and current fuel prices)
  - Vehicle maintenance and wear-and-tear costs
  - Driver wages (time for a round trip plus loading/unloading)

  For a 40-mile distance, the cost is estimated to be in the range of $4 to $20 per ton. This variation depends on factors such as fuel prices, truck capacity, and local labor costs.
- **Vehicle Types/Capacity**: Light/medium-duty trucks and roll-off trucks are most commonly used for transporting C&D waste in the US.[vi] Trucks are typically equipped with containers that allow for maneuverability and modular interoperability. Average capacity (cy) for the collection vehicles was assumed.
- **Time Considerations**: A 25 to 40-mile haul would likely take 1-2 hours round trip, depending on traffic conditions and loading/unloading times. This impacts the number of trips possible per day and overall efficiency.
- **Tipping Fees:** Upon arrival at the facility, tipping fees will apply. These fees can range from $30 to $60 per ton for C&D materials at Volume Reduction Facilities (VRFs).
- **Mileage Assumptions:**
  - A location in Larimer County is assumed to be a 25-mile drive
  - A location in Weld County is assumed to be a 40-mile drive
- **Cost per Mile:** Due to the competitive open market, waste haulers are protective of their proprietary data and information on hauler transportation costs is difficult to obtain. For this report, the STEPS project team referenced the American Transportation Research Institute's 2024 Analysis of the Operational Costs of Trucking report to obtain a truck hauling cost of $2.27 per mile[lv]. This value incorporates vehicle-based costs, including fuel, vehicle payments, repair and maintenance, insurance, permits, tires, and tolls, and driver-based costs, included wages and benefits.

Operating Costs

Table 41 shows estimated costs for organic waste and C&D hauling. Tonnages of materials hauled were given low and high scenarios, ranging from 20,000 to 50,000 tons for organics materials and 40,000 to 60,000 tons for C&D materials.

Table 41: Estimated Cost for Direct Haul

Direct Haul		Organics		C&D	
Travel Assumed one way		25 miles	40 miles	25 miles	40 miles
Estimated Hauled to County		Larimer	Weld	Larimer	Weld
Low City Tons Managed		20,000	20,000	40,000	40,000
High City Tons Managed		50,000	50,000	60,000	60,000
Operating Cost per Ton		$56.75	$90.80	$56.75	$90.80
Annual Operating Expenses (TPY * Operating Cost/Ton)	Low	$1.1 M	$1.8 M	$2.3 M	$3.6 M
	Medium	$2.0 M	$3.2 M	$2.8 M	$4.5 M
	High	$2.8 M	$4.5 M	$3.4 M	$5.4 M

Considerations for Direct Hauling

When evaluating the logistics and feasibility of direct hauling for C&D or organics, several key factors must be considered:

- **Regulatory Compliance:** Ensure that the transportation and disposal comply with local and state regulations regarding C&D waste management.
- **Environmental Impact:** Longer haul distances increase fuel consumption and emissions, which should be factored into environmental assessments.
- **Material Identification:** Proper identification of Organics or C&D loads upon arrival is crucial to ensure appropriate handling and processing. Loads containing unacceptable materials may be turned away, potentially resulting in disposal at a sanitary landfill.
- **Processing Capacity:** The receiving facility's capacity to process C&D waste is an important factor. The maximum rate of processing in cubic yards per day should be considered to avoid bottlenecks.[lvi]
- **Vehicle Capacity**: Assess the type and capacity of vehicles needed for hauling food waste. Larger vehicles may reduce trips but increase fuel consumption and costs. Considered in the direct haul assessment was the average collection capacity (cy) that a collection vehicle can hold.
- **Trip Frequency**: Determine the frequency of trips based on the volume of food waste generated and the facility's capacity.
- **Fuel Costs**: Calculate the financial and environmental impact of fuel consumption for a 25-mile trip (round-trip: 50 miles).
- **Operational Costs**: Include fuel, vehicle maintenance, labor, and tipping fees at the compost facility.
- **Economic Viability**: Compare costs against alternative closer/local options, such as anaerobic digestion.
- **Organics Materials:**
    - **Food Scraps:** The ability to take packaged materials enables diversion from grocery stores, distributors and some food processors.

        - **Capital Investment:** If specialized vehicles are required (e.g., sealed trucks for liquid-containing food waste), this may require initial investments.
    - **Yard Trimmings:** Opportunities for closer/more local field spread of yard trimmings.
- **C&D Materials**
    - Availability and access to existing facilities which materials can be sent to
    - Limited end markets which results in lower diversion rates
        - Ex. Lack of end markets for drywall or carpet
    - Higher commodity materials already being diverted based on nature of C&D
        - Ex. Concrete, asphalt, scrap metals
    - **Transportation Costs:** The cost of direct-hauling C&D materials can vary significantly. For a 40-mile distance, the cost is estimated to be in the range of $4 to $20 per ton[lvii]. This variation depends on factors such as fuel prices, truck capacity, and local labor costs.

Greenhouse Gas (GHG) Assessment

To provide a comprehensive understanding of the potential GHG emissions across different scenarios, the GHG impact associated with the hauling, organics processing and C&D diversion scenarios are compared to landfilling. This section presents the results and assumptions of the GHG calculations.

It calculates the GHG impacts for diverted material for each scenario including the hauling of materials to the facility, as well as the GHG emissions from processing of the material into compost or recycling or reclaiming material for reuse (source reduction). It compares these emissions to those of landfilling that material including transporting the material to landfill, GHG emissions due operating the landfill and net methane emissions generated from the waste at the landfill. The result is reported as the net benefit for each scenario

By comparing various processing and hauling configurations, this analysis aims to provide an additional data point to identify which options have the most significant GHG impacts.

The EPAs WARM model was used to estimate GHG emissions. (The City of Fort Collins also appears to use WARM emissions factors in the city's GHG inventory). All GHG emissions are presented as metric tons CO2equivalents/year (MTCO2e).

Key Assumptions

- **Landfill**: Material is diverted from either WM North Landfill, Front Range Landfill or the North Larimar Landfill. Assumes an equal distribution (one third of waste diverted from each facility).
    - Average transportation distance to the landfill is calculated to be 22 miles.

  - Landfill conditions are set as dry conditions (k=0.02) based on estimated precipitation of less than 20 inches annually.
  - Assumes a landfill gas collection system, with landfill gas flared, and assumes typical implementation of the landfill gas collection system.[3]
- **Organic material diverted**: The standard category of Food Waste and Yard Trimmings are assumed.
- **C&D material diverted**: Assumes the following recovery for recycling:
  - 10% Dimensional Lumber
  - 2% Mixed Metal
  - 5% Carboard
  - 0.3% Mixed Plastic
- **Transfer Station**: For transfer station scenarios, transportation distance to Compost or AD facility is calculated as the sum of the distance to the transfer station plus the distance to the organics facility where applicable.

Greenhouse Gas Emissions Comparison

Table 42 and

Table 43 provide GHG emission comparisons for organic waste diversion scenarios and C&D diversion scenarios, respectively. The greatest net GHG impact for organic waste is through a regional compost site, and the greatest net GHG impact for C&D waste is through a regional C&D Site with 250,000 TPY capacity.

Table 42: Organics Greenhouse Gas (GHG) Emissions from only City Assumed High Diversion Tons

Scenario	Total Transport (miles)	Organics diverted (short tons/yr)		GHG Emissions (MTCO2e/yr)		
		Food Waste	Yard Trimmings	Landfill	Compost	Net GHG Impact (MTCO2e/yr)*
Local Compost Site	5	19,961	26,294	9,762	(5,935)	(15,697)
Regional Compost Site	25	29,072	52,891	13,603	(9,957)	(23,560)
Transfer Station (Compost) -25 miles	30	19,961	26,294	9,762	(5,746)	(15,507)
Transfer Station (Compost) - 60 miles	65	19,961	26,294	9,762	(5,480)	(15,241)
Food Waste for Co-digestion	12	19,961		10,868	(2,889)	(13,757)

[3] Data reported to the EPA indicates that the N.Weld, Front Range and current Larimar County Landfill all have landfill gas capture systems. It is assumed that Larimar County North will also implement a system. Both N.Weld and Larimar County currently flare captured methane while Front Range is reported to produce electricity with captured biogas which is not modeled. Therefore, the benefit may be slightly overstated however it is also uncertain whether Larimar County North will implement a landfill gas capture system so it is assumed to cancel. Project and Landfill Data by State | US EPA

Scenario	Total Transport (miles)	Organics diverted (short tons/yr)		GHG Emissions (MTCO2e/yr)		
		Food Waste	Yard Trimmings	Landfill	Compost	Net GHG Impact (MTCO2e/yr)*
Direct Haul (Compost) - 25 miles	25	19,961	26,294	9,762	(5,783)	(15,545)
Direct Haul (Compost) - 40 Miles	40	19,961	26,294	9,762	(5,670)	(15,431)

*Negative values indicate net benefit, positive values indicate net emissions.

Table 43: C&D Greenhouse Gas (GHG) Emissions from only City Assumed High Diversion Tons

Scenario	Total Transport (miles)	C&D diverted (short tons/yr)				GHG Emissions (MTCO2e/yr)*		
		Lumber	Card-board	Mixed Metal	Mixed Plastic	Landfill	Recycling	Net GHG Impact (MTCO2e/yr)*
C&D Site -(40,000 TPY)	5	3,900	2,000	800	120	(3,280)	(16,384)	(13,104)
C&D Site (60,000 TPY)	5	5,850	3,750	1,200	180	(4,919)	(24,576)	(19,656)
Regional C&D Site (120,000 TPY)	25	11,700	6,000	2,400	360	(9,839)	(49,084)	(39,245)
Regional C&D Site (250,000 TPY)	25	24,375	12,500	5,000	750	(20,497)	(102,259)	(81,761)
Transfer Station (C&D) - 25 miles	30	5,850	3,750	1,200	180	(4,919)	(24,534)	(19,614)
Transfer Station (C&D) - 60 24miles	65	5,850	3,750	1,200	180	(4,919)	(24,475)	(19,556)
Direct Haul (C&D) - 25 Miles	25	5,850	3,750	1,200	180	(4,919)	(24,542)	(19,623)
Direct Haul (C&D) - 40 Miles	40	5,850	3,750	1,200	180	(4,919)	(24,517)	(19,598)

*Negative values indicate net benefit, positive values indicate net emissions
See Appendix C for notes on interpreting GHG impacts

Pros and Cons from Matrix

An expanded Pros and Cons matrix for each scenario, with additional insight into community impacts, risks, and City control, is provided in Table 44.

Table 44: Detailed Pros and Cons Comparison

Scenario	Pros for the City of Fort Collins	Cons for the City of Fort Collins
City Compost Site	• **Local Control**: Ownership of operations, procurement of material, finished product quality, sale and use of product for community members and city operations, data and reporting, and outreach and education. • **Siting**: Smaller site required within close proximity to City would lower associated emissions and environmental impact, reduce travel distances, and provide greater access. • **Community Benefits**: Local facility creates jobs and opportunities for collaborations with partners such as CSU, and a local sense of ownership and investment in locally made compost.	• **Higher Operating Costs**. • **Risk and Costs**: City solely responsible for all costs and risks from low community usage of facility and local siting challenges. • **Community Concerns**: Increased competition for local compost businesses and residents may be concerned with the facility being located close to homes, schools, or businesses. • **Smaller Feedstock Base**: Creates limited revenue diversity. • **Resiliency:** Operations more likely to be impacted by variations in material flow. Smaller facility less likely to be able to manage debris management events.
Regional Compost Site	• **Shared Risks and Costs**: Lower operational costs due to economies of scale, and risks are distributed across multiple jurisdictions. • **Regional Commitment**: Potential for higher organic material recovery and impact in the County through collaboration. Could lead to additional partnerships, policy development, and grant opportunities. • **Siting**: Wider range of potential sites, including an identified site in Loveland, and • **Resiliency:** Operations less likely to be impacted by variations in material flow. Larger facility more likely to be able to manage debris management events. • **Greater Feedstock Base**: Larger amount of material produced and	• **Reduced Local Control**: Less control over operations, product quality, and reporting compared to a local facility. • **Regional Dependency:** For feedstock. • **Lower Access**: Less direct access to compost products, and likely longer travel times and distances, leading to increased greenhouse gas emissions. • **Regional Policy & Funding Challenges**: Requires coordination across multiple jurisdictions for policy development, funding efforts, and other decision-making, which may lead to a longer timeline for implementation.

Scenario	Pros for the City of Fort Collins	Cons for the City of Fort Collins
	greater client base to purchase finished product.	
City C&D Site (Scenario 1: 40,000 TPY)	• **Local Control:** Ownership of operations, procurement of material, finished product quality, sale and use of product for community members and city operations, data and reporting, and outreach and education. • **Local Circularity**: Facility's close location will it make it easier for local haulers and contractors to deliver materials, and end materials can be salvaged for use in city projects.	• **Siting**: Limited location options and potential land development obstacles. • **Risk and Costs**: City solely responsible for all costs and risks from low community usage of facility and siting challenges.
City C&D Site (Scenario 2: 60,000 TPY)	• **Local Control:** Ownership of operations, procurement of material, finished product quality, sale and use of product for community members and city operations, data and reporting, and outreach and education. • **Local Circularity**: Facility's close location will make it easier for local haulers and contractors to deliver materials, and end materials can be salvaged for use in city projects.	• **Siting**: Limited location options and potential land development obstacles. • **Risk and Costs**: City is solely responsible for all costs and risks from low community usage of facility and siting challenges.
City C&D Site (Scenario 3: 120,000 TPY)	• **Regional Partnerships**: If jurisdictions commit to participation, enables greater material diversion and consistent material flow for operations. • **Shared Risks and Costs**: Lower operational costs due to economies of scale, and risks are distributed across multiple jurisdictions.	• **Reduced Local Control**: Less control over operations, regional policy, and reporting compared to a local facility. • **Supply**: City would be responsible for securing contracts to guarantee material supply for the facility. • **Lower Access**: Likely longer travel times and distances for haulers and contractors, leading to increased greenhouse gas emissions.
City C&D Site (Scenario 4: 250,000 TPY)	Same as C&D Scenario 3.	Same as C&D Scenario 3, with addition of: • **Environmental Concerns:** Greater GHG emissions from increased tonnage processing and traffic.

Scenario	Pros for the City of Fort Collins	Cons for the City of Fort Collins
City Transfer Station (Compost) - 25 miles	• **Lower Risk & Fewer Obligations**: Not responsible for operating a compost facility, including sorting or selling materials. • **Multi-purpose Facility**: Could serve as a recycling transfer station or drop-off site. • **Partnership**: Opportunity to partner with CSU for use of their unoccupied land under industrial classification. • **Available Markets**: Larger-scale compost operations outside Fort Collins are available to accept material. • **Digestor Option**: Slurried materials from the transfer station could potentially be transported to a digestor facility.	• **Local Operations Exist**: Creates competition with composters already operating in the area. • **Dependent on Existing Facilities**: Reliant on processing capacity of other facilities to accept material. • **Less Control:** City not in control of accepted compostable materials. • **Greater Cost to Customers**: Residents and businesses will bear tip fees from both this facility and the end compost facilities, along with additional transportation costs. • **Environmental & Safety Concerns**: Environmental impacts and safety concerns need to be addressed, including pollution, odor, traffic, and staff health and safety.
City Transfer Station (Compost) - 60 miles	Same as C&D Transfer Station (Compost) – 25 miles.	Same as C&D Transfer Station (Compost) – 25 miles, with addition of: • **Longer Distance**: Further distance travelled adds to costs and fees that will be passed down to residents and businesses.
City Transfer Station (C&D) - 25 miles	• **Lower Risk & Fewer obligations**: Not responsible for operating a C&D processing facility, including sorting or selling materials. • **Multi-purpose Facility**: Could serve as a recycling transfer station or drop-off site. • **Partnership**: Opportunity to partner with CSU for use of their unoccupied land under industrial classification.	• **Dependent on Existing Facilities**: No C&D processing facility currently exists to accept materials. • **Siting:** No property currently marked for this type of facility. • **Greater Cost to Customers**: Residents and businesses will bear tip fees from both this facility and the end C&D facilities, along with additional transportation costs. • **Environmental & Safety Concerns**: Environmental impacts and safety concerns need to be addressed, including pollution, odor, traffic, and staff health and safety.
City Transfer Station	Same as C&D Transfer Station (C&D) – 25 miles.	Same as C&D Transfer Station (C&D) – 25 miles, with addition of:

Scenario	Pros for the City of Fort Collins	Cons for the City of Fort Collins
(C&D) - 60 miles		• **Longer Distance**: Further distance travelled adds to costs and fees that will be passed down to residents and businesses.
City Food Scraps for Co-digestion	• **Increased Diversion**: Integration of food scraps would provide additional capacity for diversion.	• **High Capital Costs**: Upgrading the current infrastructure and tanks would be costly for the city. • **Quality Degradation**: Introducing food scraps would lower the quality of biogas classification.
Direct haul to Larimer County Location (Organics)	• **Lower Risk**: Not responsible for operating the compost facility, including sorting or selling materials, or managing the associated risks. • **Fewer Responsibilities**: Facility will not be city-owned, but a partnership will help reduce capital and operating expenses. • **Lower Cost**: Only transportation and gate rate fees are under consideration, unlike other options.	• **Ordinance Required**: Will need to establish that all organic materials will be sent to this specific site. • **MOU**: Facility may require MOU of partnership to guarantee materials. • **Transportation Costs**: May require more trips to facility depending on vehicle capacity, and further hauling costs will be passed down to residents and businesses. • **Limited Drop-Off:** Less likely for residential sector to participate via drop-off.
Direct haul to Weld County location (Organics)	Same as Larimer County Direct Haul.	Same as Larimer County Direct Haul, with addition of: • **Longer Distance**: Further distance travelled adds to costs and fees that will be passed down to residents and businesses.
Direct haul to Larimer County location (C&D) - 25 Miles	• **Lower Risk**: Not responsible for operating the C&D facility, including sorting or selling materials, or managing the associated risks. • **Fewer Responsibilities**: Facility will not be city-owned, but a partnership will help reduce capital and operating expenses.	• **Ordinance Required**: Will need to establish mandate that all C&D materials will be sent to this specific site. • **Dependent on Existing Facilities**: No C&D processing facility currently exists to accept material. • **Transportation Costs**: Increased hauling distance will result in higher costs that will be passed on to contractors.

Scenario	Pros for the City of Fort Collins	Cons for the City of Fort Collins
		• **Reduced Control**: Less control over data, reporting, material flow and market development. • **Potential High Tipping Fee**: Fee will be impacted by how far the local landfill is from the facility. **Limited Drop-Off:** Less likely for the residential sector to participate via drop-off.
Direct haul to Weld County location (C&D) - 40 Miles	Same as Weld County Direct Haul.	Same as Weld County Direct Haul, with addition of: • **Longer Distance**: Further distance travelled adds to costs and fees that will be passed down to residents and businesses.

Opportunities for Partnerships

Stakeholder engagement conversations presented various pathways for partnerships to ensure facility tonnage capacity is reached and secure regional buy-in. Neighboring municipalities as well as existing haulers/facilities have expressed interest in utilizing a processing facility in closer proximity than what is currently available.

- **Collaboration with Regional Partners:** Work with neighboring cities to enhance regional waste management efforts.
    - City of Longmont: Interested in developing a regional facility to manage multiple waste streams.
    - City of Loveland: Currently operates a yard trimming drop-off site and is interested in directing material to a closer facility through regional collaboration. Additionally, Loveland may consider expanding into food scrap collection if a nearby processing facility becomes available.
- **Engage Local Haulers and Processors:** Engage with at least one local organics hauler to align facility design with collection needs.
    - A1 Organics, which operates facilities in Eaton and Keensburg, has expressed interest in accepting yard waste from Fort Collins.
- **Facility Operator Input:** Gather feedback from potential facility operators to refine design and operational considerations.
- **Opportunities to Process Materials Locally:** Capture materials that are currently traveling farther distances to be processed.

- Ewing currently accepts yard trimmings and wood waste, transferring these materials to A1 Organics. Partnering with Ewing could help capture their material and reduce transportation distances for processing.

Example Partnership Opportunities from Stakeholder Engagement

The following entities were researched or engaged in conversations to assess their potential for partnerships in developing a compost or C&D facility.

A1 Organics

- A1 Organics has food scrap and yard trimmings composting facilities in Keenesburg and Eaton and is considering partnering with Larimer County.
- They stopped accepting compostable packaging due to contamination issues.
- Opportunities include expanded organics collection, potential facility operations, and education/outreach collaboration.
- A1 Organics expressed interest in the opportunity to accept yard trimmings and clean wood from C&D.

City of Longmont

- Longmont operates a yard trimmings transfer and is interested in building a food and yard composting site, along with a C&D recycling facility.
- They are considering developing these facilities on City-owned land in Weld County.
- There is an opportunity to collaborate on a regional facility with shared funding and risk.

City of Loveland

- Loveland has a successful yard waste transfer program and has operated it for over a decade.
- As a founding member of the Wasteshed Coalition, there is an opportunity to collaborate on a regional facility with Loveland's yard trimmings program.

Colorado State University

- CSU operates a windrow composting facility for food scraps and yard trimmings but is limited to accepting materials from CSU due to permitting.
- There is an opportunity to collaborate if CSU is willing to expand its permit to accept external materials.

Common Good Compost

- Common Good Compost previously managed their composting but now takes material to A1 Organics in Keenesburg.
- They prefer a closer composting facility and are interested in collaborating on education and outreach initiatives.

Compost Queen

- Compost Queen operates small-scale food composting sites and aims to expand to yard and food collection for all of Fort Collins.
- They are interested in partnerships with the City of Fort Collins and lease their composting properties.
- Currently, they do not collect yard trimmings, but customers can drop them off at their sites. They are trialing compostable foodware in their operations.
- There is an opportunity for expanded organics collection, facility operations, and education/outreach collaboration.

Custom Disposal

- Custom Disposal manually sorts mixed C&D materials from job sites at a small-scale operation near Fort Collins.
- While they are not interested in expanding their processing capacity, they offer an opportunity to collaborate on C&D recovery and education/outreach initiatives.

Ewing

- Ewing acts as a transfer station for yard trimmings, bringing materials to A1 Organics, and does not compost on-site.
- They are not interested in expanding their yard trimming collection but present an opportunity to collaborate on material management at a city-owned facility.

Hoffman Facility

- Hoffman Facility accepts brick from non-structural buildings.
- There is an opportunity to collaborate and receive materials from city projects.

Larimer County

- Larimer County is potentially planning a C&D recycling facility and yard trimmings compost site.
- There is an opportunity to lease land and/or collaborate to increase material recovery in the region.

National Center for Craftsmanship

- This local non-profit in Greeley focuses on deconstruction.
- Opportunities include collaboration with Hoffman Facility for city operations and education/outreach initiatives to develop a regional program with schools and local workforce.

Organix Recycling

- Organix Recycling focuses on hauling food scraps from restaurants for animal feed.
- There is an opportunity to collaborate and receive materials at a city-owned facility.

Republic Services

- Republic Services does not operate an organics facility and currently takes residential yard trimmings to a dairy.

- There is an opportunity to negotiate the collection of yard trimmings and food scraps to be hauled to a compost facility chosen by the city.

Timberline Facility

- Timberline Facility accepts wood waste.
- Opportunities include hosting drop-off sites or receiving materials collected from public sources.

Waste Management

- Waste Management does not currently operate composting or C&D sites.
- There is an opportunity to collaborate and receive materials at a city-owned facility.

West Highland Management

- West Highland Management has a project concept for landfill, yard and food composting, and C&D sorting facilities near Greeley.
- They are seeking an 80-acre site and present an opportunity to collaborate on a regional compost and C&D facility.

Recommendation for Infrastructure to the City of Fort Collins

As a result of the comparative assessment, processing infrastructure assessment, and discussions with stakeholders, the STEPS project team recommended and supported a feasibility-level cost analysis for a compost facility, which is provided in subsequent report materials. This recommendation is based on the need for expanded organics processing capacity, the potential economic and environmental benefits of local composting, and the opportunity to collaborate with regional partners to maximize efficiency and cost-effectiveness. Developing a compost facility to process food scraps and yard trimmings from the city—and potentially the region—advances circular composting systems in support of Fort Collins' Road to Zero Waste Plan. There are two potential capacity scenarios: a 50,000-ton-per-year facility if the focus remains solely on organic materials generated within the city, or an 85,000-ton-per-year facility if regional partnerships are established and a sufficient, reliable supply of material is secured.

Additional reasons the STEPS project team recommends considering a compost facility include:

- Addressing food scraps and yard trimmings presents the most significant diversion potential in Fort Collins when compared to C&D material not already being diverted.
- Operating at full capacity, a 50,000 ton per year compost facility would divert 72,317 metric tons CO2e/year and an 85,000 ton per year compost facility would divert 122,284 metric tons CO2e/year.
    - By comparison, A 60,000 ton per year C&D facility would divert only 19,371 metric tons CO2e/year.
- Capital costs are significantly lower for a compost facility when compared to a C&D facility.

  - 50,000 TPY Compost Facility Capital Cost: $4,600,000
  - 85,000 TPY Regional Compost Facility Capital Cost: $6,500,000
  - C&D Site (Scenario 1: 40,000 TPY) Capital Cost: $19,000,000
  - C&D Site (Scenario 2: 60,000 TPY) Capital Cost: $19,000,000
  - C&D Site (Scenario 3: 120,000 TPY) Capital Cost: $28,200,000
  - C&D Site (Scenario 4: 250,000 TPY) Capital Cost: $28,200,000
- If a regional compost facility is chosen, there are opportunities for regional partnerships with neighboring municipalities/counties, third party operators, and haulers.

Supportive Policy Options

This assessment offers policy examples and recommendations to help the City of Fort Collins advance its waste diversion goals and enhance potential C&D or organics recycling infrastructure. As a state leader in organics diversion and construction and demolition (C&D) waste recycling policies, Fort Collins is already making significant progress. The following recommendations aim to complement and improve the city's existing organics and C&D recycling policies to further boost waste diversion efforts.

Recommendation Overview

- Pass an Organics Flow Control Ordinance
- Pass a Commercial Organics Waste Ordinance
- Require Organics Diversion and Reduce Food Waste at City Buildings
- Buy and Use Local Compost and Mulch
- Incentivize the Private Sector to Subscribe to Organics Collection Services
- Pass a Deconstruction Ordinance

The following organics diversion policy recommendations align with strategies detailed in the State's Colorado Organic Diversion Study (2024) and the Colorado Statewide Organics Management Plan (2022). Additionally, requiring deconstruction is a policy model highlighted in the Construction, Demolition, and Deconstruction Toolkit as the best strategy to increase circularity and minimize the environmental impacts of building material waste.

Recommendation #1: Pass an Organics Flow Control Ordinance

The STEPS team recommends passing an ordinance to require certain organic wastes generated in the City to be delivered to the City's compost facility. It would mandate that certain food scraps and yard trimming waste streams, such as the City's contracted curbside yard trimmings program and Timberline Recycling Center collections, are hauled to and processed at the new site. It is important to consider current composting processors in the area, particularly small and local businesses, and understand the impact this ordinance will have on them. Therefore, it is not recommended to mandate all organic waste generated in the City be delivered to the composting facility. Organics Flow-Control could be developed early and be tied to the facility's launch to guarantee a certain amount of organic feedstock, which will aid in the processing operator plan during the early phases of the facility.

There have been numerous court cases regarding flow control ordinances, which have shaped these policies. Generally, flow-control ordinances are allowed to direct waste streams specifically to publicly owned infrastructure as a public benefit investment and to help communities work towards waste diversion goals. Some entities argue that such policies are unconstitutional trade restrictions, citing the Commerce Clause. The STEPS project team

recommends consulting with municipal and state legal departments as a key step in policy development.

Model Policy Examples

In Colorado, the City of Lafayette adopted an intergovernmental agreement with Boulder County to ensure single-stream recyclables are sent to the publicly-owned Boulder County Recycling Center, which is operated by the non-profit Eco-Cycle. The City of Fort Collins has also adopted a flow-control ordinance to direct construction and demolition (C&D) waste to Larimer County's C&D facility once it's built. Notably, the C&D flow-control ordinance was passed several years before a C&D sorting facility was proposed. The Fort Collins C&D flow control ordinance is detailed later in this section.

Recommendation #2: Pass a Commercial Organic Waste Ordinance

The existing City of Fort Collins Community Recycling Ordinance (CRO) requires food stores to subscribe to a service for the collection of food scraps. STEPS recommends expanding the list of covered entities required to compost by the CRO to include all large organic waste generators, such as restaurants, landscapers, and institutions, or passing a standalone Commercial Organics Recycling Ordinance. This recommendation aligns with the goals of the City of Fort Collins' Our Climate Future Plan and defined Zero Waste Neighborhood actions (ZWN3: Explore Universal Composting Ordinance and Related Composting Infrastructure/Facilities.).

National best practices, such as those compiled in Closed Loop Partners' Municipal Blueprint for Composting, suggest phasing in diversion requirements for organics generators, beginning with larger, cleaner organics streams not likely to be contaminated with non-compostable materials. Targeting larger, cleaner generators sets the program up for success and provides the most diversion with the least effort to educate generators about how to properly divert organic material. Once the infrastructure, education materials and collection systems have been implemented to accommodate these large generators, phasing in successively smaller generators will be easier than starting with all organics generators at one time. Additionally, the Harvard Food and Law Clinic report on Promoting Food Donation: Food Waste Deterrence Policies notes the importance of phasing and education for food donations.

Since the City already requires grocery stores to compost, the next step would be expansion to other large generators such as businesses with commercial kitchens. For example, the City of Aspen recently implemented an Organics Diversion Ordinance requiring all businesses within Aspen city limits with retail food licenses to divert organics from trash bins.

Successful implementation of municipal composting through a permit or license should be integrated with extensive and ongoing education. In addition to up-front outreach and

education, the most effective models emphasize education to encourage compliance rather than immediately resorting to fines. While it may be beneficial to include provisions for penalizing non-compliant entities at a later stage, the City could initially focus on education to build compliance. Furthermore, the City could help with the cost of compliance by providing a rebate or grant program to help offset the starting costs such as initial subscriptions to compost hauling companies (see Recommendation #4: Incentivize the Private Sector to Enroll in an Organics Diversion Program).

The City could eventually broaden the ordinance to include all businesses generating a minimum volume of food scraps per week.[4] Diverting food scraps from the front-of-house or customer-facing areas can result in high contamination of the compost stream unless the community has adopted good diversion practices, such as robust education and outreach. Therefore, STEPS recommends a phased in Commercial Organics Waste Ordinance initially prioritizing diverting food scraps from back-of-house operations, such as kitchens or food prep areas, where it is easier to train kitchen staff resulting in a larger volume of food scraps with less contamination. A robust food scraps diversion education program can be phased in before public-facing, front-of-house foods scraps collection requirements.

Since the City has already prioritized residential yard trimmings diversion through its contract with Republic Services, STEPS recommends that the Commercial Organic Waste Ordinance includes a requirement for landscaping businesses to compost. The City must work with small landscaping businesses to ensure the ordinance does not have an outsized financial impact. Many landscaping companies are small, mobile operations that operate in multiple municipalities. They may face language barriers that require additional time and educational efforts. Landscapers may need guidance on where to dispose of yard trimmings as they shift away from traditional disposal methods. Phasing in compliance will enable the City to conduct further outreach and education for these small businesses.

Similar organics diversion requirements in other Colorado municipalities allow entities to apply for temporary exemptions from compliance. These exemptions may include space constraints for additional organics bins, proof of self-hauling to approved facilities, economic hardships, minimum generation threshold, and flexibility to encourage businesses to prioritize edible food donation and diverting food scraps to become animal feed.

A Commercial Organic Waste Ordinance would best be supported by first expanding internal city diversion requirements (Recommendation #2) and financially supporting businesses that want to subscribe to compost services (Recommendation #4). Additionally, buying and applying compost (Recommendation #3) to municipal projects and fields will help Fort Collins' residents understand the benefits of organics circularity, which may ease the transition to a Commercial Organic Waste Ordinance. While implementing Recommendation #1 will lead to the greatest increase in organics diversion, the other organics-related recommendations

[4] For example, the City of Longmont offers exemptions for businesses that generate less than 96 gallons of trash per week (which is about 300-400 lbs.). Oregon's policy implemented in March 2022 applies to businesses that generate greater than a 60-gal roll cart (250 lbs.) or more of food waste per week.

(Recommendations #2, #3, and #4, described later in this section) are recommended to be implemented first.

Model Policy Examples

The City of Longmont's Universal Recycling Ordinance requires commercial entities, including food waste-generating businesses, multi-family housing buildings, and landscaping companies, to divert their organic discards. Longmont does not require landscapers to compost until 2029 to account for the possibility of a new compost facility in the region becoming a convenient place for landscapers to bring yard trimmings.

The City of Aspen's Organic Waste Ordinance prohibits businesses from sending organic materials to landfills. The first phase of the ordinance required all businesses within city limits with a Food Retail License to comply starting in October 2023. The second phase, starting in January 2026, will require all businesses and multifamily housing buildings to comply. Finally, in January 2028, every owner or occupant within city limits must comply. Aspen's ordinance doubled its organics diversion rate within the first year of implementation.

Recommendation #3: Require Organics Diversion & Reduce Food Scraps at City Buildings

The City of Fort Collins could continue to lead by example by adopting a food scraps reduction policy and internal composting requirements for city buildings and events. The City's operations may likely be able to comply with organics diversion requirements more quickly and thoroughly than the commercial sector requirements outlined in Recommendation #1, Pass a Commercial Composting Ordinance. Composting requirements can include requiring a phased in approach for all city buildings to collect food scraps alongside trash and recycling to serve as an example to the community.

Internal city composting is most effective when accompanied by education for staff emphasizing the importance of composting and keeping contamination out of the organics stream. Additional policy components may include setting an overall food scraps reduction target, assigning a central program administrator, requiring onboarding and annual training for municipal staff, requiring annual department reports, rebates or incentives backyard composting and creating a recognition program for highly outstanding employees and departments.

It is recommended that a municipal food scraps reduction policy follow and include language from the Environmental Protection Agency's Food Waste Scale which prioritizes preventing food scraps. This can include but is not limited to measuring/benchmarking food scraps generation annually, donating surplus food, eliminating trays and buffets, implementing "offer versus serve" protocols, offering variously sized portions and diverting food suitable for feeding to animals.

Procurement preference for outside contractors and vendors that employ food scraps reduction measures should also be incorporated such as requiring caterers to measure and report the amount of food they order compared to how much is wasted and how it is lost. Such a policy could also include donating human-edible food to local food rescue organizations and animal-edible food as animal feed, before composting what is left.

The special event permitting application process provides an opportunity for the municipality to educate event hosts (and often event attendees, by extension) on food scraps, zero waste, and organics recycling, as well as to require and/or incentivize food waste reduction measures before, during, and after the permitted event. The City can require city-permitted events to submit a plan for waste collection that includes providing three-stream waste collection (trash, recycling, and organics) with signage. An incentive or rebate for zero-waste events or requirement to donate excess food are recommended considerations, given the EPA's hierarchy on food waste diversion and the greater benefits of food rescue over composting. The City could partner with local food rescue groups to reduce food scraps at city events and general operations. Fort Collins has multiple food rescue programs, including Vindeket Food Rescue, Food Bank for Larimer County, and Rams Against Hunger (serving the Colorado State University (CSU) population). By building or strengthening relationships among City departments and these groups, the City could better understand the needs and pathways for local donations of edible food. These groups can also provide educational resources to supplement training for City staff, businesses, and residents on donating usable food. Diverting food suitable for being fed to animals should also be considered.

Approximately 2,500 people are employed by the City of Fort Collins, and implementing an internal policy on composting access, requirements, and food scraps reduction where applicable would expand composting opportunities for City staff. The accompanying training could also have ripple effects that extend beyond local government operations. Food donation and food scrap composting are some of the most environmentally beneficial actions individuals can take because diversion from landfills minimizes methane emissions and applying compost to soil helps store carbon, retain water, and grow more nutrient-dense crops. This policy would solidify the City of Fort Collins' sustainable workplace culture.

Model Policy Tools

The Natural Resources Defense Council (NRDC) provides an extensive Model Executive Order on Municipal Leadership on Food Waste Reduction and a presentation slide deck. This model policy includes ordinance language for all of the food waste reduction recommendations detailed above. Additionally, NRDC created a Model Ordinance on Mandatory Reporting for Large Food Waste Generators, including a separate background memorandum document, presentation slides, and a sample reporting template to help implement the food waste reporting requirement.

Recommendation #4: Buy and Use Local Compost and Mulch

The environmental benefits of composting, such as water retention, carbon sequestration, runoff minimization, and increasing soil nutrients are only fully realized once the finished products (including compost and mulch) are applied to soils. People and entities using these products, or "end markets," are essential to creating a circular economy for organics.

Municipalities can play a significant role in ensuring that locally manufactured compost and mulch are integrated into open space, landscaping, and public works projects. Several local policies across Colorado support increasing public and commercial access to organics diversion, while there are far fewer examples of municipalities "closing the loop" on organics recycling by requiring buying and using compost and mulch. A Compost Procurement Policy specifies that a municipality shall purchase compost for use in public projects in which compost is an appropriate material (e.g. landscaping, construction, roads and highways, green infrastructure) wherever practicable. A strong compost procurement policy would require the use of compost in municipal projects, encourage the use of compost in private landscaping projects, involve the maximum number of government agencies, require compost be sourced locally, establish targets (such as a percent) for the amount of compost to purchase, require a compost quality standard, and mandate recordkeeping.

The City of Fort Collins Forestry Division already mulches all the trimmings they generate. Mulch is then made available for the public at the Gardens on Spring Creek and the Timberline Recycling Center. In Eco-Cycle's "2024 State of Recycling and Composting Report," Colorado communities reported that using mulch from municipal mulching programs saved the municipalities money, reduced labor compared to using commercially bagged mulch, and reduced the spread of tree-borne pathogens by keeping mulch local. Additionally, the City of Fort Collins City Council passed Ordinance No. 007, 2025, which updates the soil loosening and amendment requirements in certain instances. Ordinance No. 007 establishes a strong foundation for additional compost application requirements to build upon.

Communities also benefit from applying locally made, STA-certified compost (or an equivalent high-quality compost), which ensures an end market for food and yard trimming-derived compost, as a soil amendment for public works projects. A compost procurement policy will require coordination from multiple City departments to ensure consistency of operations and support. STEPS recommends the City of Fort Collins adopt a municipal compost procurement policy based on the examples below.

Model Policy Examples

The Natural Resources Defense Council (NRDC) created a Model Compost Procurement Ordinance that requires the use of compost in municipal projects and strongly encourages the use of compost in private landscaping projects. STEPS suggests that if this ordinance is used as a model, it should be broadened to codify the requirement for municipal use of locally

generated bulk mulch. Codifying “locally generated” or “prioritized” provides an end use for woody mass from city tree maintenance and wildfire mitigation.

King County, Washington requires compost procurement in county projects. They require it in landscaping projects, construction and post-construction soil amendments, erosion prevention applications, stormwater runoff filtration systems. The requirements’ goals are to promote vegetation growth, improve the stability and longevity of roadways; low-impact development and green infrastructure to filter pollutants and keep water on-site. The King County Code Title 18 requires that compost be considered for public projects which help to provide consistent end markets for compost but does not have requirements for businesses or residents.

Utility provider Denver Water requires all new residential, commercial, governmental, and industrial properties in their service area to amend their soil by applying four cubic yards of compost per 1,000 square feet of permeable area. This requirement comes from the Denver Water Operating Rules by the Board of Water Commissioners of the City and County of Denver under Article 10.1.18 of the Charter of the City and County of Denver. Monitoring and enforcing this code rely on buy-in from the jurisdiction's planning and permitting department to implement it before granting a certificate of occupancy. Proof of compliance depends on contractors showing a receipt for the required amount of STA-certified compost. Denver Water uses this requirement as a tool to increase the use of compost as a way to reduce the need for watering landscaping and retain more water in Colorado's otherwise dry and clay-heavy soils.

The City of Greeley also demonstrated the benefits of municipal compost procurement by applying compost to city-owned sports fields. Although their soil amendment program was not part of a procurement policy, this partnership with A1 Organics showed the role of compost in soil nutrient uptake, water retention, lessening runoff, and overall turf recovery. The collaboration resulted in greener turfs within four weeks, and, unlike the application of some fertilizers, the fields were able to be used right after application of the compost.

The Zero Food Waste Coalition, which is comprised of leading food waste reduction organizations, has developed an in-depth "Developing End Markets for Compost" toolkit and model legislation.

Recommendation #5: Incentivize the Private Sector to Subscribe to Organics Collection Services

The commercial sector generates a large percentage of a community's overall waste stream and presents an opportunity to boost the City's diversion rate. Beyond the current requirement for grocery stores to compost per Fort Collins’ Community Recycling Ordinance, businesses are not required to compost. Businesses, especially restaurants that generate large volumes of food scraps, may be interested in subscribing to an organics collection service, but the cost of collections can be a barrier.

STEPS recommends the City of Fort Collins create a financial incentive or grant program to encourage the private sector to sign up for organic collection services. Businesses can be reimbursed for infrastructure, hauling, compostable foodservice ware items, education, training, and signage. The City may use money from the disposable bag fee fund to help incentivize businesses. For example, the City of Louisville provides rebates funded by their bag tax to businesses to help them add recycling and composting services.

Recommendation #4 aligns with the City of Fort Collins' *Our Climate Future* goal ZWN16: "Financial incentives to support composting, recycling, and waste reduction." Recommendation #4 also supports Recommendation #1, Pass a Commercial Composting Ordinance, because it will provide businesses with resources to help them comply with the ordinance.

Fort Collins has the Waste Reduction Assistance Program (WRAP), which provides rebates for composting. STEPS recommends the City revitalize this program and build upon the lessons learned. Additionally, the City already partners with NOCO BizConnect, which offers businesses free, bilingual, sustainability-focused technical assistance.

Model Policy Examples

The Town of Vail offers business rebates for subscribing to compost hauling. The sustainability tax funds the program for up to $2,000 per business. The maximum award amount was determined using the average annual cost for hauling from the town's two organic waste haulers. The Town rewarded early adopters; companies that already had composting could apply for $500-$1,000.

For other communities considering similar programs, the Town of Vail recommends supporting interested businesses to help them determine how to make composting work in their location. Many companies need more than just funding; they also need technical assistance to create composting systems and educate staff. Municipalities should consider working with local composters and/or environmental groups to help with business training. The Town of Vail partners with the Walking Mountains Science Center to assist with their educational efforts. Finally, Vail recommends designing a system that provides funds upfront rather than reimbursements to help smaller businesses and schools that don't have capital to invest up-front.

Recommendation #6: Pass a Deconstruction Ordinance

The City of Fort Collins currently has one of Colorado's most successful construction and demolition (C&D) recycling ordinances, with a recycling rate of 82.9% in 2023. Most of the C&D material that is currently recycled is aggregates and soil, which is processed at the Hoffman Mill, and there is room for increased diversion for other types of C&D materials. As part of the Solid Waste Infrastructure Master Plan, the City passed a "flow control" ordinance

in the building code to require mixed loads of C&D debris to be sent to Larimer County's C&D debris sorting facility once it is built. While new infrastructure will support more C&D recycling, the recovery and reuse of usable materials can be improved by passing a deconstruction ordinance.

In contrast to demolition, deconstruction is the process of dismantling buildings to maximize the amount of recoverable, valuable materials. While C&D recycling alone recovers aggregates (e.g., concrete foundations), scrap metal and unusable clean wood that can be mulched, deconstruction salvages useable materials such as appliances, fixtures, cabinets, flooring, studs, windows and more. Unlike C&D recycling, which requires advanced sorting and processing infrastructure, such as a mixed C&D waste sorting facility, deconstructed materials can be stored and resold at warehouses or sold at active job sites.

Deconstruction can be more expensive and time-intensive than demolition and requires City resources to administer, but this process helps recover more materials compared to C&D recycling alone. For some projects, particularly remodels, deconstruction can actually be more cost effective than demolition due to reduction of trash hauling costs. Deconstruction policy components may include requiring a deconstruction plan when applying for a demolition permit, a minimum C&D recycling requirement by weight (the City of Boulder requires 75% of the total weight of deconstruction projects to be recycled), submitting a refundable deposit based on the square footage of a building, and paying an administrative fee. Currently, the City of Fort Collins requires aggregates, untreated wood, metal and cardboard to be recycled in their Building Code Requirements.

By maintaining the embodied energy in reusable materials, deconstruction provides tremendous environmental benefits. Reusing salvaged structural materials displaces the need to extract and process more natural resources, adding to a greater supply of affordable construction materials. For example, according to Boulder County's "Deconstruction and Recycling" factsheet, an average of 41 trees are required to build a 2,500-square-foot home. Much of a home's lumber can be recovered and resold through deconstruction. Further, for older structures, a deconstruction ordinance would help meet two of the City of Fort Collins' *Our Climate Future* goals: Deconstruction would create the supply of recovered construction materials to help meet goal ZWE7, "Require recycled/recyclable materials in city projects," and fulfill goal ZWE12 "Expand C&D ordinance."

Deconstruction would also help Fort Collins Historic Preservation Services meet its goals by preserving materials that reflect Fort Collins' history and culture. The City's Historic Preservation Services already features successful deconstruction projects on its webpage. To best implement a deconstruction ordinance, the City should partner with the non-profit National Center for Craftsmanship (NCC) based in Greeley. NCC provides education and training to develop craft skills, including deconstruction. According to the stakeholder interview, NCC led six projects in 2023, engaging 120 students and diverting 493 tons of material from the landfill.

The City of Fort Collins could consider identifying a partner to sell deconstructed building materials to, such as the Fort Collins Habitat for Humanity ReStore or the Colorado State University Surplus Property. Alternatively, the City could considering operating a municipally run deconstruction resale store like Pitkin County's Motherloade Mercantile.

Model Policy Examples

The City of Boulder's Sustainable Deconstruction Requirements is an excellent set of requirements and compliance resources for Fort Collins to model. Notably, the Boulder Community Health Hospital was deconstructed, which kept 60.8 million pounds of C&D waste out of the landfill. Many of Boulder's recovered C&D materials are resold at Resource Central. Recyclable materials like scrap metal and porcelain are recycled at the Center for Hard to Recycle Materials, or CHaRM, which is a recycling drop-off center similar to Fort Collins's Timberline Recycling Center.

Compost Facility Feasibility Study

This section of the report presents the findings of the feasibility-level cost analysis conducted using a model developed for an aerated static pile (ASP) composting facility. A detailed examination of facility site development and operations parameters, equipment and rolling stock needs, staffing requirements, total operating and capital costs, and supportive policy needs are included. Two facility configurations were modeled: a city-scale facility designed to process 25,000 tons per year (TPY) of food scraps and yard trimmings, and a regional-scale facility designed for 50,000 TPY capacity.

The city-scale facility would divert 7,200 TPY of food scraps and 17,800 TPY of yard trimmings. The regional-scale facility would increase these volumes to 10,400 TPY of food scraps and 39,600 TPY of yard trimmings. Estimated upfront capital costs, excluding cost of land, are $11.7 million and $17.8 million for the city and regional facilities, respectively. The cost of land is assumed to be $150,000 per acre and would cost $2.7 million (18 acres) for the city facility and $5.1 million for the regional facility. Annual operating costs are projected at $1.2 million for the city scenario and $2.2 million for the regional scenario. Revenue estimates from the tipping fees and compost product sales total $1.4 million for the city scenario and $2.9 million for the regional scenario.

This feasibility assessment provides Fort Collins with a technically grounded and financially informed framework to support the next steps in developing composting infrastructure. The analysis is based upon generic facilities as defined by the assumptions provided. Cost and site modeling for any specific site may vary. The full facility model analysis is available in Appendix K: Modeled Summary of Options. A summary of high-level findings from this report is presented in Table 45 below.

Table 45: Summary of Feasibility Level Cost Model Findings

Key Metrics	Fort Collins	Region
Facility Capacity	25,000 TPY	50,000 TPY
Food Scraps Capacity	7,200 TPY	17,800 TPY
Yard Trimmings Capacity	10,400 TPY	39,600 TPY
Active Composting Time	45 Days	45 Days
Equipment Pieces	11	15
Full-Time Employees	8	14
Total Marketed Material	11,325 TPY	22,650 TPY
Upfront Capital Costs	$11.7 M	$17.8 M
Cost of Land	$2.7 M	$5.1 M
Annual Revenue	$1.4 M	$2.9 M
Annual Operating Expenses	$1.2 M	$2.2 M
Time to Break Even*	71 years	33 years

*This assumes no grant funding or land swaps

Facility Capacity Assumptions

For this feasibility level cost analysis, the medium projections for 2035 for a city-scale and regional-scale facility were used, as presented in

Table 46. The medium diversion scenario, recovering 25% of food scraps and 60% and 71% of yard trimmings for the City and regional facilities, respectively, was chosen as an achievable diversion target that would ensure a facility is operating at full or near full capacity. However, additional land requirements were provided to allow for future expansion to accommodate the high diversion scenarios.

Table 46: Recovery Rates for 2035 Projected Tonnage (Medium Scenarios)

Scenarios	City	Regional
	2035 Forecast	2035 Forecast
Percentage of Food Scraps Recovered	25%	25%
Food Scraps Recovered (TPY)	7,129	10,383
Percentage of Yard Trimmings Recovered	60%	71%
Yard Trimmings Recovered (TPY)	17,529	38,972
Percentage of Total Organics Recovered	43%	51%
Total Organics Recovered (TPY)	24,658	49,355

The two organics facilities modeled are: a city-scale facility designed to process 25,000 TPY of organics (7,200 TPY of food scraps and 17,800 TPY of yard trimmings), and a regional-scale facility designed to process 50,000 TPY (10,400 TPY of food scraps and 39,600 TPY of yard trimmings).

Facility Model Recommendation: ASP

Various methods exist to manage and recycle organic waste. These involve biological processes that reduce and stabilize organic material. Composting is an aerobic process, meaning that it requires oxygen. The organic material is decomposed by microorganisms in the presence of air, resulting in compost, a nutrient rich soil amendment.

The most common methods and engineered approaches for large scale composting are turned windrows, aerated static pile (ASP), and in-vessel composting systems. Each method has its own set of advantages and disadvantages, making them suitable for different scales and types of organic waste management programs. Descriptions, including advantages and disadvantages, to each composting method are provided in Appendix E: Composting Methods Comparison.

An aerated static pile (ASP) composting facility was analyzed and is the recommended composting method for Fort Collins to pursue for both city-scale and regional-scale scenarios. ASP composting is a highly efficient and scalable method for processing large volumes of food

waste. It can process compostable products, such as compostable service ware and bags, and is particularly well-suited for combined municipal yard trimmings and food scraps collection programs. In this system, organic material is placed over perforated pipes, air ducts, or an aeration pad, and airflow, either pushed (positive aeration) or pulled (negative aeration) with fans, maintains optimal oxygen and temperature levels to accelerate decomposition. Covers, in the form of a synthetic cover or a biolayer such as finished compost or woodchips, are placed over the piles to maintain heat and moisture and control odors. Primary benefits and drawbacks to an ASP system are presented below.

Pros

- **Ideal for municipal food scrap programs:** Efficiently manages large volumes of food-based organics.
- **Reduced land footprint**: Requires less space than other composting models through vertical and adjacent pile setups and higher control of decomposition.
- **Faster composting**: Controlled aeration speeds up decomposition, producing finished end products in as little as 2-4 months.
- **Odor and emissions control**: Piles are covered with biological material, such as compost, wood chips or a synthetic cover (impermeable or micro-porous covers), and it acts as a filter, minimizing odors, particulate matter, and volatile organic compounds (VOC) emissions.
- **Leachate control**: These systems come with engineered stormwater and leachate collection systems, preventing runoff.
- **No need for windrow turners**: ASP avoids the capital cost and operational expense of maintaining a windrow, including reduction in diesel consumption.
- **Aesthetics**: These systems are more visually appealing than standalone piles, due to the concrete and asphalt infrastructure built around them.

Cons

- **Higher upfront costs:** Investment needed for concrete/asphalt pads, specialized designs to place pipes below the grade, and aeration systems.
- **Electrical energy use**: Fans and mechanical aeration increase electricity consumption.
- **Ongoing maintenance**: Aeration systems must be regularly maintained to ensure efficiency and prevent blockages.
- **Specialized mechanical equipment**: ASP systems require additional initial staff training to understand how the system works.

ASP Facility Design & Operations

Composting Process

In general, there are three main phases to an ASP composting facility: pre-composting where the feedstock materials are received and prepared, active composting where the materials are decomposed and stabilized, and post-composting where the materials are readied for market use. Figure 15 illustrates the six-step process used in Aerated Static Pile (ASP)

composting systems, organized into three main phases: Pre-Composting, Active Composting, and Post-Composting. The Pre-Composting phase includes unloading feedstocks and removing contaminants, reducing the size of feedstocks, and mixing materials to achieve the proper carbon-to-nitrogen ratio and moisture content. In the post-composting phase, materials undergo active composting and curing, followed by screening to separate finished compost from oversized materials, and a last step to remove any remaining contaminants. This process flow chart highlights the structured approach used to prepare, process, and refine organic materials into high-quality compost.

Figure 15: Aerated Static Pile (ASP) System Stages

The feedstocks, including yard trimmings and food scraps, are first received, inspected, and sorted for contaminants through an initial screening area where the materials are shredded, and contamination is picked out. The material is then blended with yard trimmings and, if needed, additional bulking agents such as wood chips to achieve the proper bulk density, carbon-to-nitrogen ratio, and moisture content.

Piles are then built in the aeration zones and covered. The ASP system is turned on and the active-composting stage begins. This stage will have constant temperature monitoring that will regulate the aeration of the system to minimize odors and optimize the breakdown of the organic material. The material will be moved from an initial aeration phase to a secondary aeration phase with optimized parameters to accelerate the decomposition.

From here, the material will be transferred to a curing stage where it will stabilize, and temperatures will decrease. When the material is ready to be screened, it will go through a screener and the fine fraction (“compost”) will be separated from the coarse fraction (“overs”). If needed, three-way screeners are available to create large, mid, and fine (sized) end products. The overs are recirculated back into the composting process, or they can be used as biocover in the ASP system. The compost is stored until it is ready to go to the market.

The active composting phase generally takes 4 to 6 weeks, while the curing stage ranges from 30 to 90 days, as outlined in Table 47. This variability depends on the composition of the feedstock and the targeted maturity standards for the final product. To maintain consistency and align with best practices, the model assumes a six-week aeration period and a 60-day curing duration.

Table 47: Aerated Static Pile (ASP) System Timeline

Composting Stage	General Practices	Modeled Duration
Primary/Secondary Aeration	4-6 weeks	6 weeks
Curing	30-90 days	60 days

ASP Engineered Systems

The method of ASP composting is straightforward: compost piles are built over perforated pipes and supplied with controlled airflow to speed up decomposition and manage odors effectively. However, a variety of ASP engineered system designs have been developed and used nationally. For most applications, fully engineered systems with advanced controls and odor minimization are suggested. The following section highlights three engineered ASP systems from three different providers: Engineered Compost Systems (ECS), Green Mountain Technologies (GMT), and Sustainable Generation (SG).

The footprint of each system is a relationship between the geometry of each pile and the time needed to move material. ECS and GMT can design various types of pile layouts and geometries, including individual piles, piles separated by walls, and piles touching each other ("extended ASP"). SG's layout is based on single piles as they use GORE® covers for each pile. The walls allow the footprint to gain additional air space, but it must be equipped with the correct amount of aeration to avoid anaerobic conditions and accelerate decomposition. The ideal amount of air that the composting piles need within the first 10 days is 3-10 cubic feet per minute per cubic yard of material (cfm/cy). After this, the aeration requirement is reduced to 1.5-3 cfm/cy, and 0.5-1.5 cfm/cy after 20 days.[lviii]

The aeration can be provided by single blowers (one per pile or "aeration zone") or by centralized blowers (one blower providing aeration to multiple zones). The centralized layout requires a larger blower, pressure sensors, and a variable frequency drive (VFD) to manage the airflow going to the various zones. It is effective at managing various stages of composting with a few large blowers, thus providing more control over the decomposition process. ECS and GMT provide these types of systems. The single blower layout is simpler, and the aeration is limited to a single blower which tends to be designed to run on timed intervals or based on the temperature (or oxygen) sensors. Typically, VFDs are not installed for single blowers and thus the aeration flow rate cannot be changed. All three vendors provide these types of systems.

The final key difference is that SG uses GORE® covers to control odors and prevent rainwater from entering the pile, thereby reducing stormwater runoff. ECS and GMT use on-site biofilters (biolayer covers made from compost itself) and a different aeration system to control odors. Additionally, ECS and GMT provide negative and reversing ASP systems. The reversing ASP systems are very advanced systems to control odors. When the system is in

negative mode (pulling air from the piles), air moves through a biofilter to filter any potential air contaminants.

Photos of the three systems are provided below. Though each company has various layouts, one representative photo is shown for each system for illustrative purposes. Selection of a specific system and site design is usually part of the design process, and a further review of needs and tradeoffs should be considered at that time. For the modeling included in this report, the STEPS project team assumed a generic engineered ASP system.

Figure 16: Engineered Compost Systems (ECS) example of a 20,000 TPY ASP Curbside Food Scrap and Yard Trimming Facility

The ECS facility shown in Figure 16 is owned by the City of Lethbridge in Alberta, Canada. It was designed to process 20,000 TPY of commingled yard trimmings and food scraps. The material is designed to move through two aeration phases. Phase 1 is a reversing ASP system (on the left side of the picture), and the material sits there for 22 days. In this aeration phase, the air is regulated by temperature probes and can be turned on in a positive manner, allowing any air emissions to go through the biolayer on top of the piles. It can alternatively be turned on in a negative manner, and any air emissions would be routed towards the center (see light brown color material: biofilter). Then the material is moved to Phase 2, the second aeration area (on the right of the picture) for another 22 days, where the piles are placed adjacent to each other (this is called extended ASP or mass bed). Phase 2 is a positive aeration floor forcing air up into the bed. The pipes are buried below ground on both sides.

Figure 17: Green Mountain Technologies (GMT) Example of a >500,000 TPY ASP Curbside Food Scrap and Yard Trimming Facility

The GMT facility shown in Figure 17 is operated by Recology Blossom Valley in Vernalis, California. It was designed to process 546,000 TPY of yard trimmings and food scraps. It uses a reversing covered ASP system similar in description to the ECS system in Figure 3.

Figure 18: Sustainable Generation (SG) Example of a 65,000 TPY ASP Curbside Food Scrap and Yard Trimming Facility

The last photo shown in Figure 18 is a SG project operated by Maryland Environmental Services in Upper Marlboro, Maryland. It was designed to process 65,000 TPY of food scraps and yard trimmings. There is a single blower per pile and each pile is covered by its own GORE® cover using a tarp system. This system shows short walls around each pile for better control of leachate and to anchor the covers.

Cost Model Results

To evaluate the financial feasibility of developing an ASP composting facility, cost models were created for the city-scale and regional-scale scenarios. The models provide initial capital investment and ongoing operational costs.

Total Costs & Revenue

Table 48 provides a summary of the estimated capital costs, operating costs, and projected revenues for both facility scenarios. Capital costs encompass total expenses for site procurement and development, systems, and equipment. Operating costs include ongoing labor, maintenance, and equipment maintenance expenses. Revenues are calculated based on tipping fees and the sale of finished compost. Additional details of these subcomponents are provided in the subsequent sections.

Table 48: Estimated Costs & Revenue for ASP Facilities

ASP Facility Cost & Revenue Factors	City Facility	Regional Facility
Feedstock Throughput (TPY)	**25,000**	**50,000**
Land Costs, excluded from Profitability section	**$2.7 M**	**$5.1 M**
Capital Costs		
ASP System ($)	$2.2 M	$4.4 M
Equipment Capital ($)	$3.2 M	$4.8 M
Site Development and Building Capital ($)	$6.2 M	$8.6 M
Total Capital Cost ($)	$11.7 M	$17.8 M
Total Annualized Capital Cost ($)	$1.1 M	$1.7 M
Total Annualized Capital Cost ($/ton)	$45.51	$34.48
Operating Costs		
Annual Operating Cost - Labor ($)	$770,000	$1.3 M
Annual Operating Cost - Maintenance ($)	$100,000	$170,000
Annual Operating Cost - Equipment ($)	$300,000	$600,000
Waste Disposal ($/ton)	$37.00	$37.00
Total Annual Operating Cost ($)	$1.2 M	$2.2 M
Total Operating Cost ($/ton)	$48.56	$43.24
Revenues		
Tipping Fee ($/ton)	$37	$37
Compost Sales ($/CY)	$23	$23
Total Annual Revenue ($)	$1.4 M	$2.9 M
Total Revenue ($/ton)	$57.84	$57.84
Profitability		
Total Annual Income ($/ton) *	$9.28	$14.60
Total Annual Profit ($/ton) **	($36.23)	($19.88)
Total Annual Profit ($) **	($906,000)	($994,000)

*Total Annual Income = Total Revenue – Total Operating Costs
**Total Annual Profit = Total Revenue – Total Operating Costs – Annualized Capital Costs
Note: Negative values are represented using parentheses ()

The annual profit of the city-scale facility is ($906,000), and the annual profit of the regional-scale facility is ($994,000). With an overall estimated capital cost of $11.7 M for the city-scale facility and $17.8 M for the regional-scale facility, the annual profit of the facilities after tip fees and compost sales would be ($36.23) per ton of incoming material for the city-scale facility and ($19.88) per ton for the regional-scale facility. It will take approximately 50 and 24 year respectively to reach the break-even point, calculated as capital costs divided by annual revenue less annual operating costs:

- 50 years for the 25,000 TPY facility (Calculation: $11.7M / ($9.28/ton x 25,000 TPY)
- 24 years for the 50,000 TPY facility (Calculation: $17.8 M / ($14.60/ton x 50,000 TPY)

However, this timeline assumes no grant funding up front capital expenses and all new equipment. Excluding the capital costs, the annual income of the facility is $9.28 and $14.60 per ton processed for the city-scale and regional-scale facilities, respectively.

High capital expenses may be offset through additional funding opportunities or other cost offsets. Examples of funding opportunities include the Larimer County fund or the Colorado Circular Communities (C3) Enterprise. While grants or outside funding could lower capital costs and increase total annual revenue, these offsets were not incorporated into the cost model.

Cost Model Assumptions

The capital and operational cost assumptions in the model include:

- **Land acquisition**: Assumes purchase of land at double the site area, or area needed for site operations. It is not included in capital or operational costs.
- **Site development**: Includes surveying, minimal grading, and utilities installation.
- **Infrastructure**: Provision of an office trailer, scale, and scale house.
- **Composting system**: Installation of an ASP system with a leachate collection and management system at $88 per ton of annual processing capacity. This figure includes the total cost to design and build the system.
- **Staging area:** Designated area sized to support triple the incoming feedstock material capacity and compost storage capacity for six months.
- **Professional services**: 10% of site development capital expenses cover engineering fees, and 30% of site development capital expenses cover general construction conditions, mobilization, overhead, and profit.
- **Utilities and road:** $1 million allocated as a placeholder to account for connection to sewer, water and electrical, traffic engineering and road improvements.
- **Contingency**: A 50% capital expenses contingency is included to account for unforeseen costs.
- **Pre-processing equipment:** Assumes that the yard waste and woody material will need to be reduced in size, so shredders and grinders are included.
- **Operational equipment:** Additional equipment such as loaders, trommel screens, skid steers, work trucks, and a service truck (for regional-scale facility only) are included.
- **Contamination management**: Includes a pick line with an integrated screener for pre-compost processing, and a secondary screener with a vacuum system for refining the finished compost product.
- **Revenue assumptions**: Includes tip fee for all incoming materials, averaging $37 per ton, and finished compost sales at $23 per cubic yard.
- **Waste disposal:** Assumes 5% of incoming material is residual waste and is disposed of at $37 per ton at the Larimer County Landfill. Does not include hauling to landfill, as this is dependent on the location of the site.
- **Labor costs:** Developed based on Fort Collins wages and with a 40% salary burden.
- **Maintenance:** Equipment and building maintenance are estimated at 4% of capital cost.

- **Fuel**: Fuel consumption costs are included as part of operational expenses at $3.70 per gallon of diesel.

These costs do not include items such as an excavator that could be used in place of a loader to feed the shredder or grinder, cost of water, a water tank and system to hydrate the composting piles, or fire and dust suppression equipment, such as fire hydrants and fire trucks. The right amount of moisture is important to have proper composting conditions. Moisture could come from feedstocks (food scraps, liquid waste, etc.), stormwater, or clean water. Assuming initial moisture needs to be increased from 45% to 60% optimal conditions, then between 7 and 15 annual acre-feet of water are needed. These costs can be fine-tuned and added after a site is selected.

Portable Equipment (Rolling Stock) Needs

Portable equipment, including rolling stock and machinery, is required to process and move the material through the site. The scale of the facility directly influences equipment sizing and quantity. Table 49 provides a summary of the estimated capital costs and portable equipment requirements for both ASP composting scenarios modeled in this study. As shown, the total amount of portable equipment needed for the city-scale facility is 11, and the regional-scale facility is 15. These values do not include small-scale supplies, such as bins, shovels, or wheelbarrows.

Table 49: Equipment Requirements and Estimated Capital Costs for ASP Facilities

Equipment	Estimated Capital Cost Per Item	Notes	City Facility Quantity	Regional Facility Quantity
Portable Equipment				
Loader (large bucket capacity)	$320,000	CAT930 or similar	3	6
Shredder	$750,000	Doppstadt Inventhor T6 and T9, Ecoverse	1	1
Picking Line Conveyor Belt	$200,000 – $300,000	Ecoverse	1	1
Screener 1 (for inbound materials)	$350,000	Doppstadt SM617	1	1
Grinder	$450,000- $750,000	Doppstadt AK315 and AK640, or similar	1	1
Screener 2 (for finished products)	$350,000- $475,000	Doppstadt SM617 and SM726 on tracks, or similar	1	1
Vacuum	$50,000	Windsifter, Ecoverse	1	1
Skid Steer	$80,000	CAT 262	1	1

Equipment	Estimated Capital Cost Per Item	Notes	City Facility Quantity	Regional Facility Quantity
Service Truck (for mechanic)	$50,000	Chevy 3500HD or similar	0	1
Pickup Truck	$50,000	Ford 150 or similar	1	1
Total Equipment			11	15

Contamination Considerations

To create a comprehensive cost model that accounts for contamination, including the expansion of curbside collection and drop-off programs, a pick line is incorporated. A pick line is a designated area where feedstock is sorted to ensure that only appropriate compostable materials continue in the composting process. Both the city-scale and regional-scale cost models include a pick line, which is equipped with a shredder and a trommel screen. This type of equipment cleans and processes the material before it is fed into a grinder. This step is necessary to reduce the material size and eliminate compost fines before the material moves onto the picking conveyor belt, where workers remove contaminants such as plastics, glass, and metals. After the stream is cleaned, the remaining compostable material is sent through a grinder to reduce the size to approximately two inches, enabling proper composting. Pick lines play a critical role in managing commercial source-separated food scraps as well as commingled yard trimmings and food scraps collected via curbside programs.

A depackager is a machine or system designed to remove packaging materials from organic waste before it advances to the next stage of composting. Depackagers are recommended for food scraps sourced from commercial retailers, such as grocery stores, food distribution centers, and industrial food manufacturers that manage food in packaging that has gone bad, expired, mislabeled, or for any reason that the food must be disposed of. The cost of depackaging systems can range from $250,000 to $1 million, not including overall system design and installation costs (such as electricity, water, liquid waste handling system, concrete pad, and covered area). Depackaging systems were excluded from the model for this analysis.

Labor & Maintenance Needs

The cost model accounts for all labor, operational expenses, and maintenance needed to ensure effective operation of an ASP facility. Key staffing roles include a mechanic (only in regional scenarios), equipment operators, a facility manager, general laborers, and a scale operator.

To estimate total labor costs, the STEPS project team used 2023 data from the Bureau of Labor Statistics, as 2024 figures for Colorado were not available. Calculations for developing labor expenses are provided in Appendix H: Local Labor Rates for Full-Time Employees.

Table 50 summarizes the staffing requirements for a city-scale and regional-scale facility. Employees are assumed to work full-time at 2,080 hours per year, and costs include benefits and overtime. For the model, there is an additional salary burden of 40% to incorporate indirect costs.

Table 50: Full-Time Employee Needs for ASP Facilities

Labor	Annual Cost per Staff Member	City Facility	Regional Facility
Mechanic	$95,784	0	1
Equipment Operators	$59,925	3	6
Facility Manager	$155,563	1	1
Laborers	$53,206	3	5
Scale Operator	$53,206	1	1
Total Labor		**8**	**14**

End-Market Products

The cost model assumes that the facility operator will be able to sell the finished compost. An average market price of $23 per cubic yard was determined based on a review of local compost sales in the region. It assumes that the facility would sell it in bulk at that price and the third-party resellers would make a 50% gross margin. This price reflects an average that combines various sale types, ranging from a single cubic yard sold to a resident to multiple semi-truck loads sold at discounted rates to large construction projects or third-party resellers. Details of this analysis are provided in Appendix I: Local Compost Price Factors. This value was applied consistently across both scenarios in the cost model. The estimated total finished compost produced for each facility is presented in Table 51.

Table 51: End-Market Material

Total Marketed Material	City Facility	Regional Facility
Compost (fines) – CY Per Year	22,650	45,300
Compost (fines) - Tons Per Year	11,300	22,650

Supportive Policy Needs

The cost model assumes that the facility will accommodate current organics collection systems, with the potential to expand these programs to achieve organics diversion rates of 43% for Fort Collins and 51% for the region. To support the increased diversion of food scraps and yard trimmings and meet the facility's capacity needs, the STEPS project team developed five policy recommendations:

1. Pass an Organics Flow Control Ordinance
2. Pass a Commercial Organic Waste Ordinance

3. Require Organics Diversion and Reduce Food Scraps at City Buildings
4. Buy and Use Local Compost and Mulch
5. Incentivize the Private Sector to Subscribe to Organics Collection Services

Detailed explanations of each can be found in the Supportive Policy Options section.

Ownership Models & Case Studies

Through ongoing discussions between Fort Collins staff and the STEPS project team and consultations with local composters in the region, there has been interest in developing a facility owned by Fort Collins but operated by a private company.

Appendix J: Summary Findings of Operating Models for Municipal Organics Processing outlines successful compost facilities with various operational and ownership structures to leverage lessons learned. These include examples of public-private partnerships, public owned-and-operated facilities, and privately owned-and-operated facilities. Appendix F details location, ownership structure, and key features.

The STEPS project team has identified key success factors from three publicly owned and privately operated composting facilities: the City of Phoenix's partnership with WeCare Denali, the City of San Antonio's partnership with Atlas, and the City of Napa's partnership with Napa Recycling & Waste Services. The following lessons learned provide valuable considerations for the City of Fort Collins as it explores potential agreements with private operators.

- **Supportive Policy & Programs:** Many large-scale, successful composting facilities are supported by comprehensive food scrap reduction, collection, and education programs. These efforts are complemented by a strong policy infrastructure that helps promote decentralized waste management practices within their communities.

- **Diversion Rates**: Setting clear and achievable diversion rates helps guide the development of programs. The City of San Antonio currently has a waste diversion rate of 34%, with a goal of reaching 40% by 2025. Previously, their goal was 60%, but this was adjusted to align more realistically with current capabilities and needs.

- **Contamination Challenges**: Contamination from non-compostable items, like plastic, glass, and metal, diminishes the quality of end products. The City of San Antonio continues to face contamination issues and is currently restricted to using finished compost only for construction projects. This underscores the need to reduce contamination through ongoing public education and potential pick lines or screeners, to improve the quality of diverted materials.

- **Compost Markets**: The City of Phoenix's processing partner faced challenges in establishing a robust market for finished compost. While there is high demand for the

fines produced by the facility, larger-sized compost products struggle to find a steady market. To address this, the City and WeCare initiated a pilot program with the Parks Department and Arizona State University (ASU) to utilize the finished compost. Pilot programs with regional partners can be an effective strategy to increase demand for the end product.

- **Compostable Service ware**: To ensure the viability of compostable service ware, the City of Phoenix worked closely with the Compost Manufacturing Alliance and the organizations that send food scraps to their facility, such as ASU and Sky Harbor Airport, to establish clear guidelines and standardize sorting practices. This collaboration ensured that compostable materials were compatible with the facility's processes.

- **Site Design & Development**: The City of San Antonio faced significant site design challenges during the initial development of their facility, including tree ordinances, wetlands, and creek restrictions. This required substantial redesign efforts. To avoid similar setbacks, it is important to allocate time and expertise for identifying potential sites and designing a thorough Request for Proposals (RFP) that includes all relevant site information.

- **Integrated Approach to Waste Management**: The City of Napa integrates trash, recycling, and composting services under a single umbrella. This approach enhances continuity and cohesiveness across education, diversion, and waste management programs, promoting a more unified system.

- **Clear Agreements & Collaboration**: Strong, clear contracts that define responsibilities, particularly for education and initiative management, are essential for aligning all parties involved. One key challenge identified for the City of Napa was the separation of hauling and processing operations. Integrating these services can help streamline efforts and provide a more holistic approach to waste management. Early and ongoing collaboration between haulers and processors also fosters a more efficient system and helps to improve waste management strategies by understanding what haulers gain from cleaner waste streams.

Site Parameters Analysis

The STEPS project team conducted an analysis of requirements and considerations for site parameters of an Aerated Static Pile (ASP) compost facility designed to process materials generated by the City of Fort Collins or regional material, including Fort Collins, Loveland, and Estes Park. Two facility configurations were modeled: a city-scale facility designed to process 25,000 tons per year (TPY) of food scraps and yard trimmings, and a regional-scale facility designed for 50,000 TPY capacity.

While no specific site has been selected, this report outlines critical site selection criteria and considerations, including zoning compatibility, proximity to arterial roads, access to utilities, buffer space, and stormwater management capacity. Land costs, topography, and regulatory pathways, including Colorado's Class III composting requirements and local Larimer County and Weld County regulations, will also influence site feasibility and permitting timelines.

This assessment of site parameters required and recommended for both the city and regional facility options provides a framework and guidance on the next steps for Fort Collins to pursue the development of composting infrastructure. A 25,000 TPY facility would require approximately 9 acres of site area just for the actual composting operations, while a 50,000 TPY facility would require 17 acres. Approximately double that would be required to provide full functionality, including offices, perimeter roads, and stormwater and runoff infrastructure. However, it is advised to consider additional space expansion, so parcels of 18-37 acres and 34–69 acres are recommended, respectively. A summary of high-level findings from this report is presented in Table 52 below.

Table 52: Summary of Site Parameter Needs

Key Metrics	Fort Collins	Region
Facility Capacity	25,000 TPY	50,000 TPY
Operational Area	5.5 Acres	11.4 Acres
Site Area	9 Acres	17 Acres
Recommended Parcel Size	18-37 Acres	34-69 Acres

Site Selection

Selecting an appropriate site is one of the most important steps in developing a composting facility. This section outlines the primary factors considered for site suitability, including spatial requirements, access, zoning compatibility, and other key characteristics that influence feasibility and permitting.

Site Development and Infrastructure Needs

An ASP composting facility includes several key operational areas that support the full composting process from material intake to finished product storage. The cost model assumes the development of all necessary operational areas, including:

- Tipping area for unloading incoming materials.
- Contamination removal area for screening out non-compostable items.
- Mixing area where feedstocks are blended for optimal composting conditions.
- Active composting area where the ASP system is installed, and material undergoes decomposition.
- Curing area to allow compost to stabilize.
- Storage area for oversized material removed during screening.
- Finished compost storage for the final product to be held before distribution.

The design and layout of the facility must accommodate not only the physical flow of materials but also ensure proper aeration, environmental controls, and worker access. Therefore, the total site area includes entrance and exit roads, scales, a scale house, an office, a maintenance shed, stormwater management features (including a pond), and a perimeter road.

Additional key infrastructure requirements in the model include:

- Installation of engineered aeration system, including blowers, relay panels, electrical service, power panels, and switchboards.
- A concrete pad for active composting.
- Optional concrete bin blocks or walls for containment and waterproof covers for controlling air and moisture levels.

Size/Spatial Requirement

Site sizing is directly tied to the type of composting system selected, the throughput capacity, and operational flow. The modeled site area for operational needs for a city-scale facility (25,000 TPY) is approximately 9 acres, and the regional-scale facility (50,000 TPY) requires 17 acres. However, total parcel size must account for buffers, stormwater features, future expansion, and site circulation. Composting facilities include several operational zones: feedstock receiving and tipping, contamination removal, mixing, active composting (ASP), curing, screening, overs storage, and final product storage. Additional site elements include entrance roads, perimeter roads, office and maintenance buildings, stormwater ponds, and leachate control systems. Depending on the site shape and setback requirements, a larger parcel may be needed to fit all components effectively. To support these functions and ensure long-term flexibility and growth, recommended parcel sizes are 18-37 acres for the city-scale facility and 34-69 acres for the regional-scale facility.

Parcel Selection Considerations

For general purposes, it is recommended to look for parcels at a minimum of twice the size of the site area required for the actual composting, unless co-located at an existing industrial parcel that has already taken the required setbacks into account. This allows space to provide full functionality, including offices, perimeter roads, and stormwater and runoff infrastructure. To allow for growth in processing capacity, it is recommended that a parcel 4 times the size of the site area is identified.

The city-scale ASP facility would need a site measuring approximately 9 acres to manage 25,000 TPY, and the regional-scale ASP facility would need 17 acres to manage 50,000 TPY. The parcel size recommended for the city-scale facility is 18-37 acres and for the region-scale facility is 34-69 acres, as this would allow for potential expansion. The cost model assumes parcel sizes of 18 and 34 acres for the city-scale and regional-scale facilities, respectively.

In Fort Collins, where land and housing costs are higher than both the national average and nearby communities, acquiring affordable land presents a unique challenge. To address this, it is recommended that Fort Collins explore options outside city limits, including potential land swaps with neighboring jurisdictions, to secure a cost-effective site. For modeling purposes, a conservative land value of $150,000 per acre was used to allow for standardized comparisons. A local land pricing comparison is provided in Appendix B: Land Prices Analysis.

The total area required to construct a composting facility is highly dependent on the specific characteristics of the chosen parcel. Key factors influencing site suitability include the parcel's shape and geometry, topography, access points, and required setbacks from property boundaries, wells, residences, and environmentally sensitive areas.

Site Preparation Considerations

Site preparation costs can vary widely based on the extent of development needed. Critical considerations such as soil conditions, proximity to surface or groundwater, and the level of grading or site leveling required can have a significant impact on overall project costs.

For this analysis, the project assumed developing a new site with the following requirements:

- Minimal grading across the site.
- 6-inch aggregate base course (ABC) compacted gravel pads for all areas where compostable material is placed, except for the ASP compost pad.
- Asphalt paving for the perimeter road, driveway, and parking areas.
- Concrete pads for the ASP and structural foundations.
- A 100'x100' covered building and a 50'x50' building shed.
- A scale and scale house.
- Automated gates, full perimeter fencing, and revegetation along 1/5 of the perimeter (assumed to be the front of the site).

- A 50% capital expense contingency is included in the cost, as well as 10% for engineering and 30% for construction.

Access and Transportation

Reliable access to the site is critical for feedstock delivery, equipment transport, and finished product distribution. Sites should be located near roads that can accommodate heavy truck traffic year-round. Internal circulation should allow for efficient one-way traffic flow with designated areas for loading, tipping, and outbound compost sales while minimizing outside vehicles crossing heavy equipment. Proximity to feedstock generators is also a key consideration to minimizing transportation costs and reducing greenhouse gas emissions and costs associated with hauling.

Key Factors to Consider in Site Evaluation

When evaluating potential sites for development, the following factors should be prioritized:

- Generally flat topography to reduce grading and improve site layout.
- Stable soil for infrastructure support.
- Adequate space for required buffers and stormwater infrastructure.
- Distance from sensitive receptors (such as residences, schools, and waterbodies).
- Access to electricity, water, and nearby road networks.
- Compatibility with existing land use and potential for favorable zoning.
- Cost of land acquisition and feasibility of securing the parcel.

Given high land values in Fort Collins, parcels outside city limits or located in adjacent jurisdictions (such as Weld County) may offer more cost-effective opportunities. Appendix A: Land Prices Analysis details average land costs in the city and region.

Regulatory Landscape

Colorado State Regulation on Organics Facilities

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 facilities. 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."[lix]

The regulatory structure and permits are based on the defined feedstock types and processing volumes. 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." 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."

Feedstocks are classified as:

- **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.
- **Agricultural Waste**: All discarded or residual plant or animal materials directly resulting from the raising of crops or animals, including animal manures, which are applied to the soils as fertilizers, soil conditioners, or compost, are composted and applied to the soils or used for other agricultural purposes. Includes animal carcasses resulting from any mass livestock mortality.

Amendments to Section 14 were adopted by the Solid and Hazardous Waste Commission on February 20, 2024, and went into effect on March 30, 2024. The aims of the regulatory changes were to increase mid-tier food scrap composting options. Ultimately, the revisions increase the volume of Type 2 material that Conditionally Exempt Small Quantity Composting Operations can manage and create increased opportunities for composting source-separated organics and food residuals under the Type I designation.

Table 53 presents the current classifications, feedstock materials, and key regulations, including permitted volumes. The full regulations can be found on CDPHE's Solid Waste Regulations website.[lx]

Table 53: Colorado Department of Public Health and Environment (CDPHE) Compost Facility Classifications

Classification	Material	Size & Regulations
Class I	Type 1, SSOs, Food Residuals, and/or Vegetative Waste	• (A) Composts less than 50,000 cubic yards of Type 1 feedstock onsite at any one time (not including finished compost) **OR** • (B) Composts less than 5,000 cubic yards of Type 1 feedstocks, SSOs, food residuals and food processing vegetative waste at any one time (not including finished compost) **OR** • (C) Composts on agricultural zoned property using onsite agricultural waste together with Type 1 feedstocks, SSOs, food residuals and food processing vegetative waste on a composting area of 2 acres or less and less than 5,000 cubic yards of SSO onsite
Class II	Type 1 and Manure	• Composts Type 1 feedstocks and manure and has less than 50,000 cubic yards of feedstocks and in-process material onsite at any one time (not including finished compost)
Class III	Type 1, 2 and/or 3	• Composts Type 1, Type 2 and/or Type 3 feedstocks or other materials • Most stringently regulated class in the state
Conditionally Exempt Small Quantity (CESQ) Compost Operations	Type 1 and/or 2	• Must register with CDPHE, if operating commercially • (A) Compost up to 100 cubic yards of Type 1 feedstock onsite or in process **OR** • (B) Compost up to 100 cubic yards of Type 1 feedstock and up to 20 cubic yards of Type 2 feedstock • If operating commercially, must keep records of feedstock types and quantities, report annually, submit a closure report if

Classification	Material	Size & Regulations
		ceasing operations, and sample and test finished compost
CDA Facilities – Generally Exempt	On-Site Agricultural Waste	• Must register with CDA • Finished compost distributed off-site meets the specifications for compost established by the CDA
CDA Facilities – Conditionally Exempt	On-Site Agricultural Waste & Imported Wood, Leaves, Lumber	• Must register with CDA and comply with all requirements and specifications • Imported wood chips, tree branches, sawdust, leaves, or untreated lumber occurs only in quantities necessary for effective composting • Storage of these imported materials is limited to 9 months • Finished compost can only be used on agricultural zoned property

The city-scale and regional-scale facilities modeled support 25,000 TPY (or approximately 60,000 cubic yards) and 50,000 TPY (or approximately 120,000 cubic yards) of yard trimmings, food scraps, and source separated organics. Due to these projections, both facilities would require Class III specifications and must meet associated requirements.

County Land Use Regulations

While state-level regulations govern the technical permitting of composting operations, local land use and zoning codes determine where facilities can be developed. Regulations for composting facilities in Larimer County and Weld County were examined, as Fort Collins is located in Larimer County and Weld County offers more available land in close proximity.

Larimer County does not have composting-specific zoning ordinances, but commercial-scale composting may require a special use permit depending on parcel location, size, and existing land use designation. Certificates of designation and zoning regulations establish the allowable land uses and development requirements. Additionally, considerations related to health nuisances, such as pest control, air pollution control, odor, stormwater, noise, and pollutant criteria, must be addressed.

In Weld County, the composting permitting process is more defined and requires submittal of a Site Development Plan and Engineering Design and Operations Plan (EDOP). These plans must be reviewed and approved by both Weld County and CDPHE to obtain a Certificate of Designation. A Special Use Permit may also be required, particularly if the facility is classified as a Class III composting operation. Although the Weld County Code does not provide specific

air pollution control measures for composting operations, facilities must comply with state regulations that manage air quality and control criteria pollutants. Furthermore, plans must address concerns such as pest control, noise, dust, stormwater and odors.

Fort Collins Land Use Regulations

Fort Collins defines a composting facility as a site that processes organic materials (excluding biosolids) to produce compost. Notably, this definition excludes composting activities that are accessory uses, such as small-scale composting on residential properties. Articles 4 and 5 of Fort Collins Land Use Code outline key requirements, provisions, and regulations regarding compost facilities. In addition to following standard regulations on environmental and pollution control, operators must develop a comprehensive Composting Plan. Additional key requirements of each article are outlined below.

Key Requirements for Composting Facilities in Fort Collins Land Use Code Article 4[lxi]

- **Setback Requirements**: Composting facilities must be located at least 660 feet from any land in the RL (Residential Low Density), LMN (Low Density Mixed-Use Neighborhood), or MMN (Medium Density Mixed-Use Neighborhood) zone districts, as well as from any residential use, except when the residence is occupied by the owner, operator, or an employee of the composting facility.
- **Water Runoff Management**: Facilities are required to contain and treat all on-site water runoff that comes into contact with feedstocks or compost. This treatment must prevent contamination of surface or groundwater.

Compost Facility Requirements and Provisions Fort Collins Land Use Code Article 5[lxii]

- **Buffer Yard Requirements:** Composting facilities are classified as "High Intensity" land uses and must adhere to Buffer Yard Type B standards. This entails specific landscaping and spatial separation from adjacent properties to mitigate potential impacts such as odors, noise, and visual intrusion.
- **Setback Regulations:** For urban agriculture uses, including composting, compost piles and containers must be set back at least ten feet from any property line when adjacent to residential land uses.
- **Maintenance Standards:** Composting operations must be maintained in an orderly manner, which includes necessary watering, pruning, pest control, and removal of dead or diseased plant materials. Additionally, they must comply with the provisions of Chapter 20 of the City Code.
- **Water Conservation and Conveyance:** To the extent reasonably feasible, the use of sprinkler irrigation between the hours of 10:00 a.m. and 6:00 p.m. should be minimized. Drip irrigation or hand watering is permissible at any time. The site must be designed and maintained so that any water runoff is conveyed off-site into a City right-of-way or drainage system without adversely affecting downstream property.
- **Identification and Contact Information:** A clearly visible sign must be posted near the public right-of-way adjacent to all urban agriculture land uses, including composting

facilities. This sign should contain the name and contact information of the manager or coordinator.

- **Environmental Compliance:** Composting facilities must adhere to environmental standards that prevent negative impacts on surface water and groundwater. This includes implementing surface water control systems designed to manage stormwater runoff and prevent contamination. Facilities composting manure or animal materials have additional requirements, such as controlling runoff from a 25-year, 24-hour storm event and constructing containment structures with specific materials and dimensions.
- **Operational Requirements:** Operators of composting facilities must develop a comprehensive Composting Plan that includes site descriptions, maps, processing and storage areas, and measures to control contact water. This plan must be maintained on-site and available for review upon request by the Department or local governing authority during business hours.
- **Registration and Financial Assurance:** Prior to commencing operations, composting facilities must register as a Class I composting facility with the Colorado Department of Public Health and Environment. This includes submitting documentation such as a closure plan and establishing financial assurance to cover potential closure costs.

Implementation Pathways

This report outlines potential pathways for implementing a Class III organics processing facility, with an in-depth analysis of key steps for implementation and timeline expectations. The STEPS team leveraged best practices, case studies from other composting facilities, local and state permitting processes, and industry insights to create a robust actionable plan.

The timeline for implementation is divided into three phases: Planning and Pre-Development, Site Construction and Engagement, and Operational Launch and Expansion. The overall timeline from site selection to operations spans up to 6 years, depending on project complexity and external factors. Phase 1 has a longer timeline compared to phases 2 and 3, with a wide range to account for the potential for delays and difficulty in securing land suitable for a compost facility. Several actions within each phase can occur concurrently, and delays at each stage could impact the overall timeline.

The project will be influenced by several key variables, including whether a city-scale or regional-scale scope is pursued and, critically, the selection and acquisition of land for the facility. While the STEPS team has outlined several assumptions, the report provides flexible options for various pathways.

Table 54 outlines a high-level implementation timeline organized by phases and actions with brief descriptions and estimated completion durations. Each phase and action are further detailed in the report, including assumptions made and specific steps.

Table 54: Summary of Implementation Timeline and Actions

Phase	Action	Description	Timeline
Phase 1	Land Acquisition	Find suitable parcels (timeline can vary greatly) and facilitate siting analysis, site selection, property purchase, and zoning approval.	Approximately 12 months
	Stakeholder and Community Engagement	Begin community outreach and engagement concurrently with the land acquisition process. Identify and consider critical concerns related to buy-in.	Approximately 12 months
	Preliminary Engineering Design	Develop site, building, and equipment layout and selection.	6 to 12 months
	Permitting	Initiate state and local permitting processes and special authorizations.	12 to 18 months
	Funding	Secure funding through the City's budget, grants, or bonds.	6 to 18 months
	Contractor Procurement	Begin request for qualifications (RFQ) or request for proposals (RFP), vendor	6 to 18 months

Phase	Action	Description	Timeline
		selection, and/or contracting processes.	
	Policy Development	Evaluate policies to mandate, regulate, or incentivize the collection of organics and end use of compost.	6 to 24 months
Phase 2	Final Engineering Design	Finalize engineering design prior to construction.	3 to 6 months
	Facility Construction	Install equipment, stormwater features, and grading features.	9 to 18 months
	Policy Consideration and Implementation	Work with legal and code enforcement departments, stakeholders, and impacted entities.	6 to 24 months
	Outreach and Education	Ensure community buy-in and readiness before facility start-up.	3 to 6 months
	Securing Feedstocks	Establish contracts and work with stakeholders to secure feedstock.	Approximately 6 months
Phase 3	Commissioning and Start-up	Verify all systems operate to design specifications prior to full-scale operations.	Approximately 6 months
	Roll-out and Policy Implementation	Align policy implementation with opening of facility, phased feedstock ramp up, and expansion.	6 months ongoing

Each phase in the implementation process includes action items that can occur simultaneously to keep the timeline moving and mitigate delays. For example, policy ramp up and implementation can occur concurrently with steps such as preliminary engineering design or permitting. Table 55 presents a Gantt chart illustrating the timeline for each implementation step, indicating the expected year and quarter(s) of activity, as well as any periods of overlap. Cells labeled “M” represent the minimum duration and core timeline for each step, while cells labeled “E” represent the extended timeline if a step takes the full length of the anticipated timeline.

Table 55: Gantt Chart of Implementation Timeline

Years	1				2				3				4				5				6			
Quarters	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Phase 1																								
Land Acquisition	E	E	E	E																				
Stakeholder and Community Engagement	E	E	E	E																				
Preliminary Engineering Design									E	E	M	M												
Permitting												E	E	E	M	M								
Funding												E	E	M	M	M								
Contractor Procurement					E	E	M	M																
Policy Development			E	E	M	M	M	M	M	M														
Phase 2																								
Final Engineering Design																E	M							
Facility Construction																	E	E	E	M	M	M		
Policy Consideration and Implementation							E	E	M	M	M	M	M	M										
Outreach and Education															E	M								
Securing Feedstocks																			E	E	M	M		
Phase 3																								
Commissioning and Start-up																							M	M
Roll-out and Policy Implementation																							M	M

Timeline and Steps for Implementation

A well-structured and detailed implementation plan and timeline is critical to the success of the program. The timing of site design, permitting, policy implementation, and collection rollout are integral to have streamlined, efficient facility implementation. Therefore, a phased implementation approach is highly recommended.

Maintaining transparency and securing buy-in at every stage is key to ensuring continued progress in facility development. Feedback from stakeholders at the City of Fort Collins and potential partners is integrated into the timeline to build support and maintain alignment throughout the development process.

Assumptions

The timeline for developing an aerated static pile (ASP) composting facility is based on key assumptions informed by the STEPS team, consultations with the City of Fort Collins, and prior project reports. These assumptions inform the strategic direction and planning efforts for this project and include the following:

- **Dedicated Project Manager**: The City of Fort Collins will commit staff time (e.g., a project manager) to oversee the planning and development process and facilitate timely decision-making.
- **Facility Scale**: A decision will be made prior to the commencement of this timeline to pursue either a city-scale or regional-scale facility. The Regional Partners section of this report offers further guidance on potential partnerships with county and municipal entities, as well as opportunities for collaboration with community organizations and private-sector organics processors.
- **New Site**: It is assumed that the facility will be constructed on a newly acquired parcel of land, rather than retrofitting or expanding an existing site.
- **Public-Private Partnership Model**: The ownership and operational framework explored here follows a public-private partnership (PPP) structure. Under this model, the City would retain ownership of the facility, while operations could be managed by a contracted private-sector partner (as recommended).
- **Private Haulers and Hauling**: It is assumed that waste collection and transportation services to the facility will be conducted by private haulers, as hauling is not considered in this implementation plan.
- **Reliable Availability**: The project assumes that sufficient and consistent financial and human resources will be available to support all phases of planning, permitting, and implementation.
- **Local and State Permitting**: Reasonable assumptions have been made based on relevant previous experience and conversations with City and state authorities to suggest expected timelines. However, without having selected a site, it is not possible to suggest specific timelines as challenges could arise once a site is found (e.g., brownfield that needs redevelopment, community opposition, or lack of funds available).

Phase 1: Planning and Pre-Development

Phase 1 represents the foundational stage of the project and includes key preparatory actions necessary to advance the development of the composting facility. This phase includes securing a viable parcel of land, developing a conceptual engineering design, evaluating and pursuing funding opportunities, introducing supportive policy frameworks, and developing the Request for Proposals (RFP) for facility construction and operations.

As this stage lays the groundwork for all subsequent phases, it is expected to require a substantial investment in time and resources. Land acquisition may vary significantly based on

the ability to identify a suitable site quickly or secure a location through regional partnerships. For the purposes of this implementation timeline, land acquisition is expected to take one year. Once land has been acquired, it is expected that the City should anticipate an average of three years to complete Phase 1.

Land Acquisition

The initial step in identifying suitable land for the development of a composting facility entails assessing available parcels in the City and neighboring communities. This begins with a cursory review of parcels available within the City that meet size requirements of approximately 20 to 40 acres for a City-scale facility or 30 to 40 acres for a regional-scale facility. Additional technical specifications are provided in the separate "Site Parameters Analysis" document. Potential parcels should be in areas with favorable zoning designations, compatible land use, and predominantly outside of floodplains. Parcels should then be mapped in relation to distance from the City and large generators of organics.

Once potential land parcels are narrowed down, a fatal flaw analysis can begin to assess each site's fundamental suitability. Key evaluation criteria include topography (with flatter sites being preferred), soil types, proximity to water features, distance from sensitive receptors (e.g., residences, schools, and community centers), road accessibility, and proximity to utilities. These items are critical for conducting a high-level comparative assessment and selecting a site most suitable for a future composting facility.

Following the fatal flaw analysis, a candidate parcel should be selected for a conceptual engineering design to evaluate its feasibility. This feasibility evaluation would include developing a conceptual design based on the existing parcel and limitations, creating an initial construction budget, and evaluating traffic impacts. A desktop analysis for traffic impact may suffice at this point, but a comprehensive traffic impact study may be required later.

For the purposes of this project, it was assumed that site identification will take 12 months. However, this will be dependent on the cooperation of the community and regulatory stakeholders, as well as the zoning approval. To support the evaluation and selection of a suitable parcel, consult an engineering firm so all components are thoroughly and properly assessed.

Stakeholder and Community Engagement

Proactive, transparent, and early outreach and education is essential to the land acquisition and facility development process. Early engagement with the community, impacted stakeholders, and interested parties helps build buy-in and ensure concerns are heard and addressed if possible. Strategies for public involvement may include hosting town hall meetings and facilitating community dialogue forums. Stakeholders and regional partners should be developed and established in this phase as well to strengthen collaborative efforts

throughout facility development. Regional partners were identified through the stakeholder interview process, and collaborations to explore further are highlighted in the Regional Partners section of this report.

Lessons learned from previous efforts by communities along the Front Range have highlighted the importance of community engagement. In the case of Boulder County, consideration for a specific site was withdrawn in response to significant public feedback and additional concerns on cost information, engineering challenges, and market analysis information. In response, Boulder County has prioritized transparency and public engagement by launching a dedicated webpage to provide ongoing information about the facility's development. Additionally, the County has hosted public meetings to deliver project updates and facilitate community discussion (Boulder County Compost Facility Exploration). [lxiii]

While stakeholder involvement should continue throughout all project phases, it is best practice to initiate the formal community engagement process after potential parcels have been identified. This allows community feedback to be included in the feasibility analysis of selecting a parcel, as outlined in the previous section.

Considerations around impact to community members include sharing a detailed plan on provisions put in place to mitigate odor, noise, pollution, and other potential nuisances and impacts to the surrounding environment and citizens. Engagement can take various forms, including those detailed below:

- Create space for feedback and concerns to be addressed through public forum discussion.
- Share detailed environmental and community impact information on how the facility is being developed over the different phases while mitigating impact to the surrounding environment and community.
- Have a dedicated page on the City's website with information about the facility development including timeline, a point of contact to share concerns, and information publicly available that may answer questions.

Preliminary Engineering Design

Once a site is selected and has undergone a fatal flaw analysis, a preliminary engineering design (which represents 30% of the total design completion) for the composting facility should be developed. This includes the preliminary layout of the site, building, and equipment; assessing mass and volume movement in the site; length of time materials should be kept in storage; and a comprehensive budget for the full build-out. This preliminary design will be included with the permit drawing documents in the permitting process. After the permits are issued, a Final Engineering Design will be developed considering permit conditions as well as fully detailed designs for bidding and construction, outlined in Phase 2: Site Construction and Engagement.

During this time, traffic impacts may need to be studied further through a traffic impact study. The analysis should confirm that site access is suitable for heavy truck traffic and any potential road degradation from estimated facility traffic will be mitigated through impact fees. Impact fees are imposed by the local government on new facilities that support the costs associated with supporting this new development. Hauling routes should be designed to minimize disruption to adjacent residences, schools, and general traffic flow.

Within this stage, an Engineering Design and Operations Plan (EDOP) should be developed. This document, which will be a critical component of permitting for a Class III composting facility by CDPHE and local authorities, provides a thorough description of the facility's design, operations, and environmental management strategies. The development of an EDOP is typically conducted by a specialized consultant team and procured through a request for qualifications (RFQ) or proposals (RFP) process that is distinct from the eventual construction and operational contracting for the facility. Preparation of the EDOP is anticipated to require approximately 6 to 12 months. This timeline is contingent on several factors, including the clarity of the facility's defined scope and operations, site complexity (e.g., topography, hydrology, and environmental conditions), the availability of qualified consultants (e.g., surveyors, engineers), and the number and complexity of the permits required. The City may consider engaging a private operator early on to inform the design and permitting process.

Permitting

The permitting process for a composting facility in Colorado requires approvals from both CDPHE and the relevant local city or county authorities. Key documents such as the EDOP will be prepared and used by both parties. However, local land use approval is typically required before CDPHE will initiate review of a permit application for a composting facility. The City will need to determine whether to directly oversee this process or delegate the task to the future composting operator, while retaining approval authority and oversight during its process throughout key stages such as site layout and ASP equipment selection.

For a Class III permit through CDPHE, a Certificate of Designation (CD) is required. A CD is a land use agreement separate from the zoning process and is issued by the local governing body. The process of obtaining a CD involves the following steps:

- Develop an EDOP and gather any additional CD application requirements.
- Submit the CD application, including the EDOP, to the local governing body. If the site does not have appropriate zoning, a special use zoning permit may also be required, and that would be on a separate timeline.
- The local governing body forwards the application to the state for a technical review, which may take up to a month.
- The state conducts a review of completeness within 30 days to ensure the EDOP is adequate for technical evaluation.
- Once deemed complete, the state has 150 days to conduct the technical review, excluding any comment-and-response time.

- At the end of the technical review, there is a public comment period (typically 30-60 days). If there is no reason to deny the permit, the state issues a recommendation of approval to the local governing body.
- The local governing body then reviews this and issues their approval.

Additional requirements may include submitting and receiving approval for construction quality assurance documentation, providing financial assurance, and complying with other state and local regulations. Discussions with the City of Fort Collins Environmental Planning Division suggest applicants could anticipate a minimum of 6 months for local permitting processes. This timeframe accounts for a development review, including comments from multiple city departments, a zoning review, and a round of revisions. Overall, it is recommended that applicants plan for a total permitting timeline of 12 to 18 months, starting from the date the application materials are submitted.

Funding

To support capital expenses in developing the facility, the City of Fort Collins may need to pursue external funding sources, including loans, grants, or municipal bonds. Securing financing in advance of issuing an RFP for construction and development is essential to ensure project viability and minimize delays. Diversifying funding streams is also recommended to reduce financial risk.

A range of local funding, plus federal, state, and local grant opportunities are available to assist with capital equipment purchases for waste diversion initiatives. Notable funding sources include the Larimer County Fund and the Colorado Circular Communities (C3) Enterprise (particularly its Capacity Building Grant). It is recommended to monitor the U.S. EPA's Solid Waste Infrastructure for Recycling (SWIFR) program and the USDA's Composting and Food Waste Reduction Pilot Project Fund as potential opportunities as well.

Considering the lengthy process in securing government grant funds, including application preparation, review and selection, and contracting, it is recommended to allocate 6 to 18 months from the application opening to being considered for receipt of grant funds.

Contractor Procurement

Establishing reliable partnerships for the development and operation of the composting facility is essential to the project's success. A formal RFQ and RFP could be issued to solicit bids for the design, construction, and operation of the facility. Since the City is interested in exploring having a private partner operate the facility, it is recommended to engage potential contractors early to help inform early phases of planning.

The City can enter into agreements with contractors to do one, all, or some of the following elements for the facility's development: design, build, operate, and finance. The preferred approach should align with the City's capacity, risk tolerance, and long-term goals. To ensure

long-term success, if the City is to lead and manage the design and build phases, it is recommended the operating contractor is involved throughout the process. If the operating contractor is to lead and manage the design and build phases, it is recommended that the City reserves the right to approve various design elements throughout the process, potentially hiring an independent composting engineer to oversee the development.

The RFP should clearly define cost-sharing responsibilities. Specifically, it is recommended that the City fund permanent site development and infrastructure, such as concrete work, utilities, and stormwater management, while the selected operator should be responsible for procuring and maintaining rolling stock equipment such as loaders, a grinder, and a screener. This arrangement balances capital investment with operational accountability while building the partnership.

A relevant model for reference is the City of San Antonio's partnership with Atlas Organics, Inc. Atlas was contracted in 2020 to design, build, operate, and finance a composting facility for San Antonio; the City retained ownership of the infrastructure and Atlas the rolling stock. The ordinance authorizing the agreement is available for reference in the City of San Antonio's legislative records.[lxiv]

Table 56 lists the various stages required to build a facility and the possible options for involving a private partner. 'City' indicates that the city would oversee and lead that part of the process, and 'private' indicates that the contracted private operator would oversee that part of the process. Due to the complexity and specialized expertise required, particularly in relation to permitting and design, it is recommended that the City engage private partners for all aspects of planning, build-out, and operation. This would preserve City control over siting and local permitting, and provide support for the overall project requirements in alignment with the City and community vision.

Table 56: Implementation Pathway Scenarios

Stages	Partnership Options
Local Approval	City
State Permit Application	City or Private
Design	City or Private
Build	City or Private
Finance	City, Private, or Combined
Operate	Private

As an example, the City could first issue an RFQ to select an engineering firm to assist in conducting a site analysis and selecting the ASP system (from leading vendors such as Engineered Compost Systems (ECS), Green Mountain Technologies (GMT), and Sustainable Generation (SG)). The selected engineering firm would handle preliminary design and permitting. Once this phase is complete, the project could formally engage a builder and/or operator to advance facility development.

Policy Development

The long-term success of the organics processing facility depends on securing a consistent stream of clean food scraps and yard trimmings as well as strong community and political support. Early adoption of supportive policies that are backed by the City Council and community members is essential. Policy discussions and engagement are recommended to begin early in the project to ensure sufficient time to consider and adopt supportive ordinances and policies before the facility is operational.

The following types of policy options and ordinance recommendations were included in this research for consideration, and are described in more detail in the Supportive Policy Options report:

- **Organics Diversion at City Facilities**: Mandate composting at City buildings and City sponsored events, with phased implementation and supportive resources to ensure clean collections. This not only generates feedstock for the facility but also positions City staff as leaders and educators for the community.
- **Organics Flow-Control Policy**: Require certain organic waste generated in the City to be delivered to the City's compost facility. It would mandate that certain food scraps and yard trimming waste streams, such as the City's contracted curbside yard trimmings program and Timberline Recycling Center collections, are hauled to and processed at the new site. This policy is modeled after Fort Collins' Construction and Demolition Waste Flow-Control Ordinance. Organics Flow-Control should be developed early and tied to the facility's launch to guarantee a certain amount of organic feedstock, which will aid in the processing operator plan during the early phases of the facility.
- **Compost Procurement Policy**: Require the use of facility-manufactured compost in City landscaping, open spaces, and public projects. This ensures a stable end market and sets a visible example of organics circularity for residents and businesses. This policy should be developed early and be tied to the facility's launch.
- **Private Sector Incentives**: Create a grant or incentive program to help businesses subscribe to organics collection services. Costs for infrastructure, compostables, and education could be covered using existing funds, such as those from the disposable bag fee fund. This policy can be phased in once the facility is operational and should precede a complementary requirement for commercial organics.
- **Expanded Commercial Organics Ordinance**: Scale the existing Universal Recycling Ordinance currently in place in Fort Collins to include food scraps and yard trimmings recycling requirements from larger generators. It is critical to begin municipal collection expansion with low contamination streams to maximize early success. This policy can be phased over time once the facility is operational.

As a future policy recommendation, universal food scrap collection is an option. With this, there is the potential to expand universal food scrap collection to the residential sector if desired. However, doing so will require strong community support along with extensive education and training efforts to maintain clean feedstocks. It is recommended that

residential program expansion be delayed for consideration until foundational policies and systems are already established.

Phase 2: Site Construction and Engagement

Phase 2 involves the final site design and construction process, outreach and education, considerations for impending policy implementation, and securing feedstock through policy requirements, contracts and partnerships with stakeholders. It is anticipated that this phase would take an estimated two years to complete.

Final Engineering Design

At this stage, all required state and local approvals should be secured before commencing. The EDOP should be approved, and now the Final Engineering Design can be developed. This design includes adding construction level details in the drawings, as well as putting together the bid package so that a contractor for construction can be selected. If the operator is overseeing the design and building of the facility, it is preferred that the Final Engineering Design is fully prepared before the start of construction. The City should have final approval of this to ensure all considerations and potential concerns have been addressed.

Site Construction

The construction of the facility can take between 9 and 18 months (or longer), depending on equipment procurement and installation timelines. Certain electrical components may have lead times of up to 12 months, which can significantly influence the overall project schedule. Additionally, external factors such as seasonality and weather may contribute to delays in this stage.

To mitigate disruptions, it is recommended for the procurement process to begin at the initiation of site construction. It is important to engage vendors early and begin to identify and understand constraints around lead times for specialized items. This includes mechanized composting equipment (e.g., grinders and blowers) and heavy-duty electrical items (e.g., transformers).

Policy Consideration and Implementation

For any new supporting policy adopted, an implementation plan should be put into place. This ensures entities impacted by new policy implementation are prepared to meet requirements, and provisions are in place for collection and diversion.

Incentives may be considered, depending on the policies, to further increase participation among businesses, residents, or other private sector feedstock generators. For example, businesses can be reimbursed for infrastructure, hauling, compostable foodservice ware items, education, training, and signage. Implementation should align with timelines to allow flow control to go into effect once the facility is officially open.

Outreach and Education

With stakeholder and community feedback continuously integrated from Phase 1, outreach and education should now be focused on ensuring impacted entities and community members have the resources and support needed to participate in organics diversion and comply with ordinances and policies.

Phase 3: Operational Launch & Expansion

The final phase encompasses an operational launch and gradual increase in organics feedstock to meet full capacity levels. A phased roll-out that complements policy implementation is recommended to ensure clean feedstock and build support over time. The total time necessary, from commissioning to full operations, may take up to 4 years or longer.

Commissioning and Start-Up

At least 6 months should be reserved for commissioning and start-up of the facility. This allows the facility to ensure all components are operating properly, specifically electrical and mechanical mainly. Operations should be gradually ramped up to test and optimize all operational systems and address any issues with mechanical and electrical components, which are particularly vital in systems like aerated static pile (ASP) composting. This helps to manage any incoming material while making necessary adjustments to ensure smooth operation. Start-up time is critical to fine-tuning the facility's processes and ensuring staff are adequately trained to handle operations efficiently for the life of the facility.

It is recommended that the City slowly increase the volume of incoming feedstock with the earliest timeline to reach full operational capacity being 12 months after start-up. In the start-up period, it is advised to maintain operational flexibility in case there are major setbacks in equipment or electrical components. Once the flow of incoming feedstock increases, it is difficult to slow the flow of incoming feedstock or store additional feedstock. Rather, the facility should plan for a slow start-up period to ensure that all the systems are working properly.

Roll-out & Policy Implementation

As previously mentioned, each recommended policy, if adopted, would have its own roll-out and implementation considerations and timelines. In general, policies should be rolled out with plenty of notice to impacted entities. The best practice is to lead with education, outreach, and technical assistance for commercial entities prior to any non-compliance enforcement.

- **Organics Diversion at City Facilities**: Diversion requirements for City facilities should be implemented early on to show that the City is an early adopter and leader in organics diversion. Ensuring organics diversion options are available at appropriate

City facilities will support the overall local compost economy by increasing diversion and training City employees in the importance of proper organics diversion practices.

- **Organics Flow-Control Policy**: Reaching full processing capacity (25,000 tons per year (TPY) for a city-scale facility or 50,000 TPY for a regional-scale facility) is expected to take up to four years, depending on how quickly supporting policies are implemented. To reach this capacity, it is recommended that a local organics flow-control ordinance be passed early in the project development. Like Fort Collins' C&D waste flow control policy, an organics flow-control policy can be passed before a facility is constructed.
- **Compost Procurement Policy**: The City should consider supporting soil amendment programs for City-run infrastructure and landscaping projects through a procurement policy that will create end-market stability for the future compost processing facility. This policy could be developed prior to facility operations, with time allocated to educate City departments, develop plans for compost application, and create compliance and enforcement mechanisms, such as submitting receipts of compost purchases.
- **Private Sector Incentives**: Incentives for the private sector to enroll in organics diversion service could be phased in alignment with increasing feedstock over time and include reporting diversion numbers to the City. As described in the Policy development section, incentives could include reimbursements for costs incurred for participation.
- **Expanded Commercial Organics Ordinance**: Expanding commercial organics diversion requirements could be implemented after other policies and systems are in place to support greater throughput. Successful Private Sector Incentive programs and support from the business community will lead to better compliance and less compost contamination.

Regional Partners

The City of Fort Collins has opportunities to partner with private operators for overseeing the compost facility, as well as partner with neighboring jurisdictions to direct regional feedstock. To support this effort, 13 stakeholder groups were interviewed in Fall 2024, with findings detailed in the Stakeholder Engagement Report. Stakeholders included municipal agencies, food waste haulers, and organics processors. The City is advised to continue ongoing discussions with these groups to develop strategic partnerships to shape the project.

Community Partnerships for Regional Facility

Interviews included meetings with representatives from the Cities of Longmont and Loveland, Boulder County, and Larimer County's Sustainability & Climate Division. Both Longmont and Loveland expressed interest in potential collaboration, with Longmont specifically awaiting outcomes from Boulder County's regional composting study. These potential partnerships present opportunities to share costs and risks in developing an organics processing facility through joint procurement, while helping to secure a steady feedstock supply for the proposed facility.

City of Loveland and Town of Estes Park

The proposed regional-scale facility developed in the Feasibility Cost Model Analysis Report is tailored to collect feedstock from the Cities of Fort Collins, Loveland, and Estes Park, which make up two-thirds of the Larimer County population. These three communities formed an intergovernmental agreement for solid waste programming and infrastructure improvements in 2019 and are collectively a part of the North Front Range Regional Wasteshed Coalition. Partnerships with these cities could lead to co-ownership opportunities to mitigate risks. Alternatively, Fort Collins may choose to accept feedstock from neighboring cities, including those mentioned here, and secure a contract, while maintaining full control over the facility.

Larimer County

Larimer County is focused on closing their current landfill and is expected to open a new landfill in 2026. However, as part of the 2018 Larimer County Solid Waste Infrastructure Master Plan, Larimer County is developing their own feasibility plan for composting facilities for yard trimmings and food scraps and seeking grant funding opportunities to support. The STEPS project team was unable to meet with the Larimer County Solid Waste & Community Planning team, but these developments present possible collaborations.

Boulder County

Boulder County is exploring the viability of developing their own local composting facility and has expressed interest in any combination of public private partnerships that align with the County's goals. Since the stakeholder engagement discussion in October of 2024, Boulder County has considered collaborating with the City of Longmont and conducting a land swap that could lead to the creation of a compost facility.

Private Partnerships for Processing

There are nine registered and permitted composting facilities operating in the areas in and surrounding Fort Collins. These facilities have implemented a variety of composting methods including windrow, aerated static piles (ASP), and in-vessel, as well as an anaerobic digestor. Facility operators include A1 Organics, Compost Queen, Colorado State University, and Mountain View Farm. Discussions with stakeholders in the fall of 2024 highlighted the potential for collaboration with existing operators in the region such as Compost Queen, Republic Services, and A1 Organics.

Compost Queen

Compost Queen provides curbside food waste composting services to residential and commercial customers in Fort Collins, Timnath, Wellington, and Loveland. The company operates Conditionally Exempt Small Quantity (CESQ) food waste recycling sites within Fort Collins and is exploring the development of additional facilities to expand processing capacity. Compost Queen has expressed strong interest in operational partnerships with the City of Fort Collins.

Republic Services

Republic Services, currently contracted with the City to provide seasonal yard trimmings collection to residents, could be engaged to explore potential roles in supporting the composting facility. This may include supplying their existing yard trimmings to the new site and gradually phasing in co-collected food scraps through a pilot program, with the goal of expanding to universal residential access in Fort Collins. Given Republic Service's experience operating composting facilities nationally, discussions may also open the door to a potential operational partnership.

A1 Organics

A1 Organics is the largest composter in Colorado's Front Range region, currently operating out of four locations and serving multiple cities in the region. During their meeting with the STEPS project team in October 2024, they indicated a strong interest in partnering with the City, contingent on solid financial investments and long-term commitments.

End-market (Compost) Use

The city-scale and regional-scale facilities explored are expected to produce about 11K and 23K tons per year (TPY) of end-market material, respectively, when operating at full capacity (using 2025 estimates). To ensure a closed loop is established, the City should consider supporting initiatives to promote the use and sale of finished compost.

Compost quality and certifications are important considerations for end-market use, because of how they influence primary uses and price points. Higher-quality compost should be used on soils that the public interacts with, such as ballparks and community gardens. Lower-quality, less expensive compost can be used to amend soils that people interact with less, such as road medians. Colorado's Department of Agriculture (DOA) requires any compost sold in the state to meet minimum standards, such as registering to be a Compost Manufacturing Facility with the state if they generate ten or more tons of compost per calendar year.[lxv] A sample of finished compost must also be sent to the DOA's Biochemistry Laboratory to test for ingredients. There are additional certifications to consider, including the U.S. Composting Council (USCC) Seal of Testing Assurance (STA) and Organics Materials Review Institute (OMRI), for establishing standard quality assurance.

A compost procurement policy, as recommended in the Policy Implementation section of this report, would ensure that the City purchases compost for applicable public projects, such as landscaping, construction, roads, highways, and green infrastructure, whenever feasible. Fort Collins has over 966 acres of developed parks and 55,000 acres of natural areas in which the application of compost can be explored to improve water conservation, vegetation, and environmental resiliency.[lxvi]

There are also opportunities to sell compost at a bulk rate in the private market. The 2012 Boulder County Compost End Market study[lxvii] listed current compost end markets as tree farms and nurseries, large retail and garden centers, state government, city government, landscape (contractors, design, maintenance), agricultural, construction (road and reclamation), sod farms, golf courses, universities, school districts and private schools, sports complexes, landscape architects, and households (retail sales).

Residents could be encouraged to participate in compost use, either through free public compost giveaways or by making compost available for purchase through partnerships with local hardware stores to stock the compost. Given the arid climate of Fort Collins, compost can serve as a resource to improve soil water retention and provide essential nutrients for gardens and other landscaping needs. Examples of local participation incentives include the City and County of Denver's "EcoGro" bagged compost sale through hardware stores in partnership with A1 Organics (Denver Compost Sale).[lxviii] Additionally, several local composting facilities sell finished compost directly back to consumers. Denver also hosts compost giveaway events, where residents can register to receive coupons for free compost. These events typically require participants to provide their own containers and collect compost onsite.

Appendix A: Infrastructure Inventory

Inventory for infrastructure in Fort Collins and the greater region for food scraps, yard trimmings, and C&D materials.

Facility Name & Link	Infrastructure Type	Materials Accepted	Operating Hours	Physical Address
Larimer County	Landfill	Municipal Solid Waste (MSW) Electronics Hazardous Waste	Mon – Sat: 8:00am – 4:30pm	5887 S Taft Hill Rd Bldg E, Fort Collins, CO 80526
Timberline Recycling Center	Drop-Off Center	Recyclables Hard-to-Recycle (HTR) items	Recyclables: Everyday 6:00am – 8:00pm HTR: Everyday 8:00am – 6:00pm	1903 S Timberline Rd, Fort Collins, CO 80525
Larimer County Recycling Center	Drop-Off Center	Single-Stream Recycling	Mon - Sat: 8:00am - 4:30pm	5887 S Taft Hill Road, Fort Collins, CO 80526
Waste Not Recycling	Hauler	Commercial and Industrial Waste and Recyclables	Mon - Fri: 8:00am - 4:30pm	2010 Howard Smith Bldg C15, Windsor, CO 80550
Compost Queen	Composting Site	Food Scraps Yard Trimmings	Mon – Thurs: 8:00am – 5:00pm Fri: 8:00am – 3:00pm	1505 N College Ave, Fort Collins, CO
Common Good Compost	Hauler	Food Scraps	Everyday: 8:00am – 8:00pm	2217 Airway Ave Bay 5, Fort Collins, CO 80524
Organix Recycling	Hauler	Food Scraps		
Ewing Landscape Materials	Drop-Off Facility	Yard Trimmings Wood Scraps	Mon – Sat: 8:00am – 4:30pm	3501 E. Prospect Ave. Fort Collins, CO 80525
A1 Organics	Drop-Off Facility	Yard Trimmings	Mon - Fri: 7:00am - 5:00pm	16350 WCR 76, Eaton, CO 80615

Facility Name & Link	Infrastructure Type	Materials Accepted	Operating Hours	Physical Address
Doug Weitzel, Inc	Drop-Off Facility	Yard Trimmings	Mon, Wed - Sat: 8:00am – 4:00pm	2630 W. Mulberry St. Fort Collins, CO 80521
City of Loveland Recycling Center	Drop-Off Center	Yard Trimmings Wood Scrap Concrete	Tues – Sun: 7:30am - 4:30pm	400 N Wilson Ave, Loveland, CO 80537
Eco-Cycle CHaRM	Drop-Off Center	Hard-to-Recycle items	Mon – Sat: 9:00am – 5:00pm	6400 Arapahoe Rd, Boulder, CO 80301
Rocky Mountain Battery Recycling	Drop-Off Center	Scrap Metal Wood Pallets	Mon - Fri: 8:00am - 5:00pm	1475 N College Ave, Fort Collins, CO 80524
Colorado Iron and Metal Inc	Drop-Off Center	Scrap Metal	Mon - Fri: 8:00am - 4:30pm	903 Buckingham St, Fort Collins, CO 80524
Hoffman Mill Crushing Facility	Drop-Off Center	Concrete Asphalt Soil Porcelain	Mon - Fri: 7:00am - 5:00pm	1380 Hoffman Mill Road, Fort Collins, CO 80524
Bivens	Drop-Off Center	Concrete Asphalt Gravel	Mon - Fri: 8:00am - 4:00pm	862 W Willox Lane, Fort Collins, CO 80524
Connell Resources	Drop-Off Center	Concrete Asphalt		7785 Highland Meadows Parkway Suite 100, Fort Collins, CO 80528
Barker Construction	Drop-Off Center	Concrete Asphalt Gravel		142 N. Timberline Rd, Fort Collins, CO 80524

Appendix B: Stakeholder Interviews

Municipalities in Larimer County

Larimer County - Solid Waste and Community Planning

The STEPS project team contacted several personnel at the Larimer County Solid Waste and Planning Department but was unable to meet with them. The STEPS project team received an email response with the following key learnings.

Key Learnings:

- **Updates:** Indicated the County has been diligently working on developing Tier 1 projects. The North Landfill is currently under construction and the new Diversion and Transfer Station is in the bidding process.
- **Next phases:** Remaining Tier 1 projects are being evaluated and developed, and the County is seeking grant funding to support future programs and infrastructure.
- **Planning:** STEPS team was referred to further information available on the Larimer County Solid Waste website, and specifically the Solid Waste Infrastructure Master Plan.

Larimer County - Sustainability and Climate

The STEPS project team met with CEP & Sustainability Climate Manager on October 28, 2024.

Background

Larimer County's Climate Smart Future Ready is a plan that developed in collaboration with community partners with the goal of addressing risks from worsening air quality, extreme weather, and natural disasters. The plan's goal is to assist the county to thrive in the face of a changing climate by supporting economic and community wide resilience and protection of human health and natural resources.

Key Learnings

- **Updates:** There is now a Climate Smart Future Ready Active Dashboard intended to be updated by the county every 6 months and replace an existing PDF report.[lxix]
- **Project timeline:** The county's priority is closing the current landfill and opening a new one. Projects focused on Diversion of C&D, yard waste, and food waste are still slated to begin per their timelines on their website for 2026. The project will be built to the scale that the city can participate in.
- **Past 6 months:** The County has been focusing on the update.
- **Study:** Goals will be updated after completion of a C&D study to be completed Q1 of 2025.

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- There is potential for menthane capture and reuse for the remaining sections of the landfill which do not currently have a system.

City of Fort Collins – Environmental and Code Compliance

The STEPS project team met with Senior Specialist of Environmental Compliance, and Inspector of Code Compliance, on October 3, 2024.

Background

The building code recycling requirements were adopted in 2010 but have evolved in its oversite and enforcement since then. The code requires cardboard, metal, wood, and aggregate recycling for new construction and additions over 2,500 square feet and demos over 1,000 square feet. Crushing facilities will take some concrete with rebar and other mixed materials. The City recently refined the system so the initial plan requires accepting responsibility for recycling materials. There have been no penalties for noncompliance with the ordinance, however Monty reported that the presence of an inspector influences compliance.

Key Learnings

- **Lack of C&D recycling**: The primary reason for the lack of C&D recycling appears to be implicit non-compliance with regulations by subcontractors. Training is the responsibility of the builder/project manager, and subcontractors in Fort Collins typically know about the recycling requirements. Occasionally subcontractors come from Denver, in which case the ordinance is new for them.
- **Haulers**: A common excuse Monty hears for not separating materials on the job site is that the builder assumes the hauler knows the requirement to divert required materials and that will be done as part of the service. However, there is only one hauler that offers mixed C&D processing. Monty's job is to educate the job site superintendent and ensure that they separate materials before going into roll-off boxes.
- **Sites**: Job sites sometimes cannot fit multiple bins, but there are workarounds, such as staging material.
- **Facilities**: A mixed C&D facility at the Larimer County landfill was proposed but they haven't been apprised of the status, though they heard it was pushed back and eliminated. A mixed C&D facility would be the most sensible next step to ensure all C&D materials are being processed for recovery.
- **Ordinances**: There is currently no deconstruction ordinance to require recovery of fixtures.

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- Deconstruction could be made more affordable. The City is sensitive about consumer costs since the price to build a home is high in Fort Collins.
- Any measures that simplify the process for the builder. Straightforward solutions that do not require subcontractor training would be beneficial.
- A transfer station for C&D materials would allow for cost-effective transportation of materials to a processing facility without the need for an additional facility in Fort Collins.
- There is a need for more markets for more materials to be recovered.

City of Fort Collins - Anaerobic Digestion

The STEPS project team met with Director of Water Treatment Plant Operations, and Senior Director of Water Operations on September 24, 2024.

Background

The City of Fort Collins has four anaerobic digesters (AD) located at the Drake Water Reclamation Facility. The digesters process solid waste from the wastewater treatment process, creating dry solids that are applied as fertilizer (Class B biosolids) at the Meadow Springs Ranch, a 26,000-acre city-owned property used as pasture. Recovered gas is used via heat exchangers to heat half of the wastewater treatment plant in winter.

Key Learnings

- **No food waste processing:** The AD system is unable to increase capacity right now and is not set up to receive food waste.
- **Repairs needed:** Major work is needed on the digesters. Ideally, the existing digesters would be scrapped and replaced with stainless steel or in-ground tanks, which would last longer.
- **Older systems:** Two digesters are from 1962, and the others were added in 1992 and 1998. Capital improvement projects in 2014/15 and 2018 replaced two digester lids with coated carbon steel lids; these need replacement every 3-5 years. Stainless steel is more durable but more expensive. There are also other needs at the facility, such as pumps and piping. The department spent $2.1 million for digester #2 in capital project costs (including lid, design, procurement, piping, etc.). Adding food scraps would increase hydrogen sulfide gas, which increases corrosion.
- **Biogas:** The biogas system is old. Staff would like to see it updated so it can comply with the renewable fuel standard, where gas can be sold as a renewable energy credit to offset companies' emissions. If they accepted food scraps, it would likely lower the classification of the credit, though this may have changed since the last policy update.
- **University trial:** The digesters used to accept food waste from CSU (more than 6 years ago), but much of it was contaminated and ended up in the landfill, so the City didn't see big benefits from the program.

- **Other examples of AD and food scraps:** Heartland Biogas and A1 Organics have a large AD in Eaton and have encountered many permitting problems and resident complaints about odors. The Metropolitan Water Reclamation District of Greater Chicago might accept food waste, but it's in an industrial area and does not have to deal with neighbors.

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- Major repairs are needed for the existing digesters, and if there were money for it, a complete overhaul would be recommended. If funding were available, staff would still be hesitant to add food scraps because of the potentially detrimental effects, such as downgrading their biogas classification or getting complaints from neighbors due to odors.

Food Waste Haulers Serving Fort Collins

Compost Queen

The STEPS project team met with the Founder of Compost Queen, on September 10, 2024.

Background

Compost Queen (CQ) is a locally owned and operated food waste hauler and compost processor. Established in 2018, CQ primarily collects food scraps from residential accounts in the Fort Collins area, although they are increasingly collecting from commercial accounts. CQ's food scraps are composted at Conditionally Exempt Small Quantity (CESQ) sites that CQ operates within Fort Collins city limits.

Key Learnings

- **Possible partnership:** CQ expressed interest in exploring possible partnerships with the City of Fort Collins. CQ leases the properties where they compost.
- **Accepted materials:** CQ does not collect yard trimmings, though customers can drop off yard trimmings at CQ's composting sites. They are trialing compostable foodware products in their processing operations.
- **End markets:** Finished compost is distributed to CQ customers and sold to partners in the regenerative agriculture field. CQ was recently awarded a grant for a bagging system, which will help sell to retail stores and customers. Currently, they have sufficient end markets. Incentives for municipalities and landscaping companies to use compost would help.
- **Capacity:** CQ has enough infrastructure to double the amount of feedstock they receive. They have another site coming online this year as a potential Class I facility.
- **Site size:** Their largest CESQ is designed to meet the updated state regulations, which include increased processing capacity. This CESQ also utilizes aerated static pile technology, which accelerates the composting processing time and minimizes odors.

- **Outreach:** CQ hosts compost workshops and tables at farmers' markets and community events to educate the public about the benefits of composting. They want municipalities to offer more public education on composting and buying back compost.
- **Contamination:** CQ addresses contamination by checking each bucket during collection. If there is contamination, CQ takes a picture of it and emails the account holder explaining the problem. This strategy has proven successful with residential customers, but they started a "three strike" rule for commercial customers that includes a fee system and offers re-training.

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- A decentralized system of Class I aerobic facilities would be best to reduce transportation, supply more jobs, provide backup options in case one facility has an issue, and prevent neighbor complaints often coming from Class III facilities. This should be paired with public education by municipalities and increased procurement of compost by municipalities. Drop-off and hauling options should be provided, with direct inspection of consumers' buckets to educate people and reduce contamination.

Common Good

The STEPS project team met with the Owner of Common Good, on September 16, 2024.

Background

Common Good specializes in residential food scrap collection, serving 954 customers, primarily in Fort Collins, and has had a 17% growth rate over the past year. The company stated a desire to "localize food waste" and create a circular composting system within Larimer County or Fort Collins. They believe they have the potential capacity to quadruple their customer base if onboarding is done strategically. In addition to residential services, Common Good collects 400,000 pounds of food scraps from several middle and high schools. Common Good collects food scraps but doesn't process them. Instead, they haul food scraps to be processed at A1 Organics. They started out composting the material they collected but then shifted to hauling to A1 Organics.

Key Learnings

- **Hauling distance:** Common Good would prefer to use a compost facility closer to Fort Collins if one were available. They are also proud of their environmentally conscious fleet, which includes three electric trucks.
- **Contamination:** Contamination is rare among their residential customers, as participation is voluntary and customers follow the clear guidelines provided on the 5-gallon kitchen bins. However, contamination is more challenging at schools. Common Good drivers conduct close inspections of each load before collection at schools.
- **Local government promotion:** The owner expressed appreciation to the City of Fort Collins for promoting both Common Good and Compost Queen as subscription compost

services on the City's website and suggested adding similar signage at the Timberline Recycling Center to inform residents about residential food scrap collection services.
- **No policy changes:** No further recommendations were made regarding changes to policies, ordinances, or zoning to advance food scrap diversion.

Organix Recycling

The STEPS project team made multiple attempts to contact Organix Recycling and other Denali staff to schedule an interview but did not receive a response.

Background

The STEPS project team's understanding is that Organix Recycling collects food scraps from restaurants for animal feed. Organix Recycling was recently purchased and is now part of the Denali Corporation which provides, "innovative solutions to divert organics from landfills."[lxx] With these changes and being unable to contact a staff member, the STEPS project team has not been able to confirm the current or future operations details.

Yard Trimming Haulers Serving Fort Collins

Republic Services

The STEPS project team made multiple attempts to contact representatives of Republic Services to schedule an interview but were declined a meeting.

Background

Republic Services is the service provider for the new Fort Collins residential contracted hauling program. They haul yard trimmings collected from Fort Collins to Mountain View dairy, where it is composted on site with the manure generated from the dairy operation. In conversations with City staff, Republic shared the owners of Mountain View may be interested in expanding to accept food scraps at this site as well.

Organics Processors

Ewing Outdoor Supply

The STEPS project team met with Branch Manager of Ewing, on September 17, 2024.

Background

Ewing accepts yard trimmings (leaves, grass, garden waste, sod, and soil) separate from wood scraps (branches, dimensional lumber, and cedar fencing) from residents and commercial clients. Ewing grinds wood into mulch for sale onsite and transfer yard trimmings to A1 Organics for composting.

Key Learnings

- **No expansion:** Ewing is not interested in expanding its yard trimming collection since it is not profitable. They simply act as a transfer station for yard trimmings and bring the materials to A1 Organics. Ewing passes the tip fee from A1 Organics through as part of their drop off fee to customers.
- **More wood waste:** Ewing is receptive to receiving more wood waste since they can grind it on-site and then resell it as mulch, thus becoming a profit center.
- **Uncertainty:** Ewing expressed uncertainties with how Fort Collins' contract with Republic Services will affect their business. It could potentially reduce quantities of wood waste received thus reducing its processed mulch revenue stream. Republic Services has approached Ewing to ask if they could drop-off residential yard waste collections at their site. Ewing has declined this offer because of their requirement that the two different material streams (yard trimmings and wood waste) be separated.
- **Location challenges:** While their Fort Collins site could expand capacity and accommodate more wood waste, the site is locationally challenged. On one hand, their city location is convenient but on the other hand, their road signage is obstructed making it hard to find and drivers don't give grace to large trucks entering and exiting. Ewing would like to see the city help with better road signage and have the stop light at Summit View and Prospect cycle more frequently to slow the traffic flow between the hours of 7:30 - 9am and 6:30 - 9pm.

A1 Organics

The STEPS project team met with Marketing Manager and President and Chief Financial Officer of A1 organics on October 1, 2024.

Background

A1 Organics is the leading compost processor in Colorado. They are interested in accepting yard trimmings and clean wood from C&D from Fort Collins, though facility upgrades would be needed. They produce more compost than they sell and urge municipalities to buy back compost for parks and open spaces to close the loop. There is a potential for partnership by using their Eaton facility, which is much closer to Fort Collins than their main Keenesburg facility.

Key Learnings

- **Municipal compost collection:** A1's biggest challenge is contamination. A1 contracted with the City of Denver's curbside program for several years. A1 hand sorts and uses a Tiger Depackager to address contamination. A1 emphasized the necessity of having good public education, enforcement, and municipal compost buy-back plans on the front end.
- **Compostable packaging:** A1 stopped accepting compostable packaging because of contamination. Even 10% contamination is a significant challenge for processors.

Infrastructure is costly - they would need to invest $6-10 million to handle contamination. Composters face liability if there's glass or bad contamination.

- **End markets:** A1 is creating more compost than it sells. They could process more material if they sold more compost. They suggest that cities should make buying back compost part of their waste management plans and apply it to parks and open spaces. This could be a good story to tell the public and could help close the loop on compost. Greeley recently used A1 compost on ballparks.
- **Eaton facility:** Expanding the facility would require infrastructure investments. It would be an estimated $2.5 million investment for a covered GORE system to handle 20,000 tons, as well as other large improvements. A1 would need a solid, long-term commitment of volumes from the City to make these investments.
- **C&D waste:** A1 accepts dimensional lumber, but C&D site roll-off boxes are full of contamination, as materials may contain asbestos or other contaminants. Wood is a great material if it is not stained, painted, or treated.

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- Expanding A1's Eaton facility would take a significant amount of investment but could be possible with a solid commitment from the city. A new compost facility created by Larimer County wouldn't have much effect on A1, but they would love to partner if this happens.
- A1 suggested that public/private partnerships would create efficiencies, reduce risk, and reduce costs. Governments could help fund infrastructure and help with land and permitting, while private companies would manage and operate facilities.

C&D Material Haulers & Processers

Custom Disposal

The STEPS project team met with Owners of Customer Disposal on October 3, 2024.

Background

Custom Disposal provides one-container C&D collection service for new home construction. They manually sort the collected materials at their site. Custom Disposal operates a small-scale operation on a limited footprint. They do not accept general trash and they continue to struggle with 'theft' (illegal dumping) in dumpsters on job sites. They reuse wood by giving it away for free and recycle metal and cardboard. They have challenges with people illegally dumping materials in their containers. Loads that contain illegal dumping go directly to landfill. Custom Disposal has been operating for 25 years, and have started operations prior to the Fort Collins construction site recycling requirements. For sorting, Custom Disposal uses a skid steer with a claw, but do not have any processing equipment.

Key Learnings

- **Main Barriers**: Business is overwhelmed, and they have 140 boxes that are always in service. Illegal dumping, including refrigerators is a constant issue. Since they have been in operation prior to Fort Collins' construction site recycling requirements, they recover all things that make sense, regardless of financial incentives.
- **Separation of Materials**: Custom Disposal doesn't require separation of material. Most haulers collect one material per bin, which requires multiple bins per site. The one bin service is much easier for builders to use than multiple bins.
- **Illegal Dumping**: Custom Disposal takes precautions to alert illegal dumpers of the penalties.
- **Financial Incentives:** Custom Disposal's perspective is that financial incentives will drive recovery, not policies.

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- Deter the illegal dumping (which Custom Disposal refers to as theft of services). The mattress disposal cost at the landfill is creating an illegal dumping crisis. (Research on the fees at Larimer County Landfill indicates the cost for mattress disposal is $40 for each unit – mattress or box spring.) dispose of appliances at the landfill is $80. (Research on the fees at Larimer County Landfill indicates the cost for appliance disposal is $36 with freon and $20 without freon).

National Center for Craftsmanship

The STEPS project team met with Executive Director of National Center for Craftsmanship, on October 2, 2024.

Background

Formed in 2006, the National Center for Craftsmanship (NCC) is a non-profit organization dedicated to preserving and enhancing quality craftsmanship. They provide education, training, and research to support craft skills at all levels to fill critical shortages of skilled workers and boost economic productivity. The NCC works in fields from construction to art and aims to preserve these skills and ensure their continuity.

The interview focused on NCC's deconstruction projects in Fort Collins. In 2023, NCC completed 6 projects, working with 120 students. These projects reused or recycled 493 tons of material. NCC sells materials on job sites as they deconstruct buildings.

Key Learnings

- **Local partners**: NCC collaborates with highs schools so students can engage in on-site experiences and build their skills.
- **Materials**: Drywall, asphalt shingles, and asbestos (e.g. walls, tiles, and tape in drywall)

Asbestos: In 2023, NCC had at least two occasions in which asbestos was found in significant portions of the building. As a result, the owner needed to hire someone for asbestos abatement and the project could not progress toward deconstruction as expected.

- **Cost**: Deconstructing buildings has become exceedingly costly.
- **Incentives**: Incentives, rather than fines, for deconstruction would benefit the positive view of the work. See Figure 19.
- **Donations:** NCC shared the idea of local contractors being able to benefit from tax incentive on the donation of materials instead of or in addition to the owner of the building. Since these donations would likely be valued at thousands of dollars, the donated materials would need to be appraised.

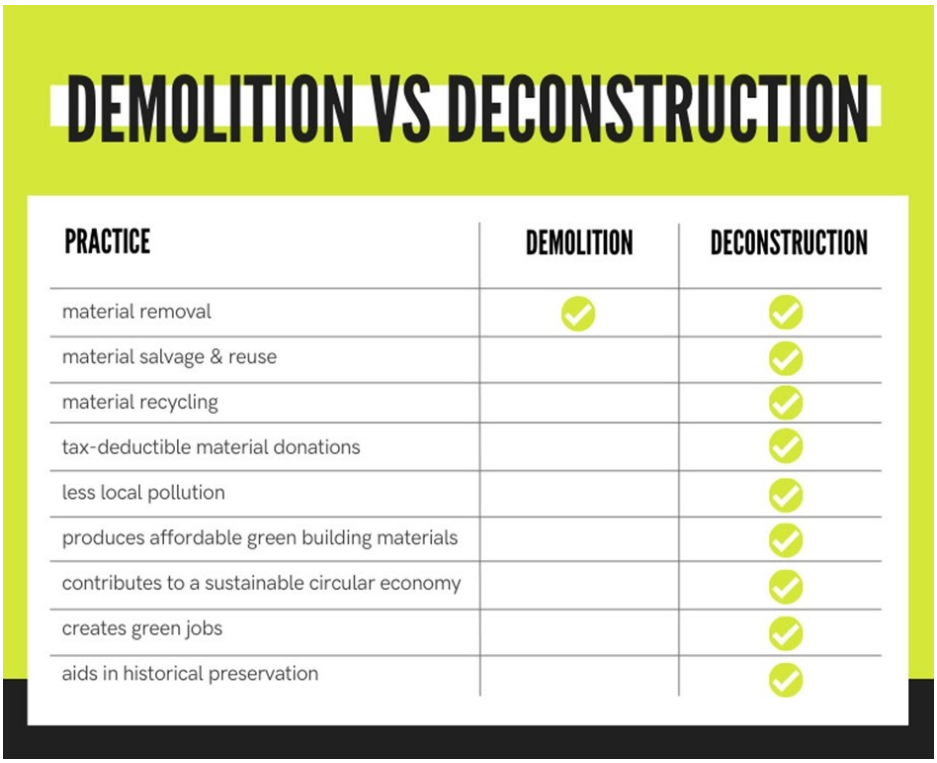


Figure 19: Demolition and Deconstruction Benefits Comparison, provided by NCC

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- NCC would like to have a facility that could house trainings, store materials to be processed, provide a retail space for purchase and individuals can drop-off of architectural salvage materials and appraise donations for tax reduction. Every student who wants to learn could come through the facility. Right now, students come to work on job sites as one-time activities.
- Schools generally pay for the transportation cost (often in buses) to the site, which limits how many students can participate. Additional funding for transportation would

help enable more students to participate, since busing can be close to $1,000 per trip and most students are within an hour of the site.
- NCC could also benefit from an AI nail remover and a 50 ft telehandler forklift.

West Highland Management Group

The STEPS project team met with President of West Highland Management Group on October 1, 2024.

Background

West Highland Management Group is a business focusing on greenfield waste management facilities. They are the developer of the High Plains Environmental Campus (HPEC), a conceptual project on private land in Weld County (east of Greeley) but are exploring other sites as well. The project is slated to include a landfill, materials recovery facility (MRF), yard trimmings and food scrap composting, construction and demolition materials (C&D) sorting, and household hazardous waste (HHW).

Key Learnings

- **Operations**: The current scope of the project would include a Class 1 compost facility for food scraps and yard trimmings, an HHW facility, and a MRF. The landfill and C&D components are not being considered now but could be in the future. There is an anticipated initial 100,000 tons capacity with a goal to scale up to 250,000 tons. HPEC is also considering a potential residential organics curbside hauling component.
- **Sites:** West Highland Management Group is looking for an 80 acres site. One site being explored is on private land east of Greeley, which may also include a transfer station in Windsor. Another site HPEC is exploring is 70,000 acres at Prospect and I-25. It is owned by CSU and is already permitted for a Class 1 compost facility. This would require a long-term lease of at least 10 years, and HPEC would consider buying the site if CSU's non-profit were open to the conversation.
- **Barriers:** Largest barriers are capital and location. HPEC is continuing to work through the site options, funding options, and which facilities and services they'd like to offer. They are currently planning to be operational for their compost facility by 2027.
- **Feedstock**: HPEC would prefer to focus on industrial and commercial materials for feedstock.

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- HPEC is primarily targeting compost, but plans to include components for many other materials such as HHW, single-stream recycling, C&D, and a landfill.

Municipalities in the Region

City of Longmont

The STEPS project team met with Waste Services Manager for the City of Longmont on September 20, 2024.

Background

Longmont has provided opt-in curbside combined food scraps and yard trimmings collection services for residential customers since 2017. The City of Longmont serves 41,000 homes and 3,000 multifamily units (of 8 units or less) with a pay-as-you-throw (PAYT) program. Longmont has been part of an ongoing conversation about the need for a regional compost facility. One driver is interest in being able to accept compostable products. Boulder County conducted a feasibility study with Burns & McDonnell consultants, completed in Q2 of 2025.

Key Learnings

- **Established curbside collection:** The City of Longmont offers an opt-in curbside collection that accepts yard trimmings and food scraps. Eight thousand customers opt into compost collection (27% of the city). The program collects an average of 3,000 tons per year, most of which is yard waste. The City also conducts annual curbside branch and leaf collection events.
- **Boulder County feasibility study:** Much of the conversation on future organics processing options will depend on Boulder County's feasibility study.
- **Advanced waste diversion systems:** The City of Longmont has advanced waste diversion options, including the Longmont Recycling Center and seasonal collection events. There are no fees for residents.

What service/facility/equipment/etc. would allow more waste diversion to be successful?

- Longmont would like to see a regional facility that is funded by many groups, serves everyone (residential and commercial), and processes hard-to-recycle materials, construction and demolition waste, and more. The Metro Central transfer station, which serves the Portland, Oregon metro area, is a great model. Taxes or fees would cover costs. The City of Longmont is not in favor of small-scale decentralized facilities because of startup challenges and customer confusion.

City of Loveland

The STEPS project team met with Solid Waste Division Superintendent for the City of Loveland, on September 17, 2024.

Background

The City of Loveland has developed a robust yard trimmings program. An essential component is that the program is funded through a mandatory Solid Waste Management fee of around $12

per household, amounting to $3.8 - 4 million per year, which helps sustain diversion initiatives.

Key Learnings

- **Drop-off access:** Loveland residents have unlimited access to a recycling drop-off center and yard trimmings collection site. Residents can opt for curbside collection for yard trimmings for an additional $9.25 per month, which has proven successful with over 50% of households subscribed.
- **Processor contract:** Loveland has a $750k/year contract with A1 Organics for processing yard trimmings. A1 comes to Loveland a couple times per month to grind the material and then truck the ground material to A1 Organics locations in Keenesburg, Buffalo Ridge, or Eaton.
- **Comingled organics:** Loveland has considered collecting food scraps and ideally would prefer allowing residents to include food scraps with their yard trimmings collection, however, Loveland is not sure that A1 Organics would allow or want this. Loveland has also considered a separate bunker for food scraps at its recycling center, however, adding a food scrap collection could potentially attract vermin and wildlife and emit smells which could upset nearby homeowners.
- **C&D Collection:** Loveland does not advertise that they accept C&D materials, however they accept kiln dried wood including pallets, dimensional lumber, and other building materials like concrete. The city does not advertise this as C&D recycling since they are out of space and cannot accommodate large construction equipment or trucks.
- **Potential compost facility site:** The City purchased a parcel of land from an old sugar beet factory which is adjacent to their current drop-off site which would thus allow the city to expand operations. The acreage, however, has environmental issues and needs land restoration which the city does not have money to pay for at this time.
- **Budget constraints:** Last year a ballot initiative resulted in removing the food tax on groceries, which equates to $12-13M less in sales tax revenue. Consequently, there is less money for public works and restoration of the former sugar beet site. The Public Works Dept. has been told it is likely 2-5 years out before approval to use the space.
- **Feasibility study:** Loveland commissioned a transfer station feasibility study and is reviewing its findings over the next two months. The study could lead to the city expanding services and infrastructure. Loveland expressed interest in being a regional collaborative partner. Since the city currently lacks the space for significant expansion it would consider managing a program for another community if the other community could provide land for site development.

Boulder County

The STEPS project team met with Zero Waste Strategic Advisor for Boulder County on October 11, 2024.

Background

Several different waste processing facilities operate in, by, and in partnership with Boulder County. Boulder County contracted with consultant Burns & McDonnell to conduct a feasibility study for a potential compost facility, completed in Q2 of 2025.[lxxi]

Key Learnings

- **Feasibility study:** Any decisions on how to pursue a compost facility will be voted on by the Boulder County Commissioners after the feasibility study is complete.
- **Partnerships:** Boulder County states they are open to any combination of public/private partnerships for a potential future compost facility as long as the project meets the County's goals.
- **C&D recycling:** While Boulder County has adopted C&D recycling policies, enforcement is mixed. Local waste hauler Western Disposal does some C&D sorting, and other reclaimed C&D materials are sold at Resource Central. There is currently no movement from the County to advance C&D recycling infrastructure or policy.
- **Previous projects:** Boulder County had a negative experience pursuing the development of a compost facility at the Rainbow Tree Nursery in 2020 and 2021. Boulder County Commissioners eventually withdrew consideration of developing a compost site due to public backlash. The County has expressed that they've learned from the challenges with the Rainbow Tree Nursery project as they pursue any potentially new compost facility.
- **Land issues:** Land use and compost facility siting continues to be a challenge, as it was with the Rainbow Tree Nursery project.

Appendix C: Population Projections

Table 57: Population Projections

	Fort Collins Population	Fort Collins Population Rate of Change	Larimer County Population	Larimer County Population Rate of Change
2019	169,810	-0.3%	356,800	
2020	168,538	-0.7%	359,920	1.8%
2021	169,249	0.4%	362,774	0.9%
2022	170,376	0.7%	366,843	0.8%
2023	170,507	0.1%	368,998	1.1%
2024	172,988	1.5%	374,792	0.6%
2025	175,468	1.4%	379,298	1.6%
2026	177,949	1.4%	384,302	1.2%
2027	180,429	1.4%	389,880	1.3%
2028	182,910	1.4%	395,392	1.5%
2029	185,390	1.4%	400,753	1.4%
2030	187,871	1.3%	406,062	1.4%
2031	190,351	1.3%	411,291	1.3%
2032	192,832	1.3%	416,389	1.3%
2033	195,312	1.3%	421,446	1.2%
2034	197,793	1.3%	426,398	1.2%
2035	200,273	1.3%	431,246	1.2%

Appendix D: Considerations on Greenhouse Gas Emissions

Negative emissions for landfilling

- Models of landfill emissions (including the WARM model) consider the decay rate of organic materials in the landfill. For materials that decay very slowly such as yard waste or dimensional lumber a portion of that organic carbon (biogenic carbon) may remain undecayed in the landfill over a very long time period. This carbon is considered stored or sequestered in the landfill. Slow decaying materials will also allow for the landfill gas recovery system to capture and treat more of the landfill gas (including methane). When these factors are greater than the GHG emissions of transporting the waste to the landfill, operating the landfill and uncaptured methane at the landfill the landfill impacts for a material can be negative.

Modeling the impact of recycling or composting

- Modeling recycling using lifecycle assessment (LCA) presents several challenges. Most notably, how to allocate the impacts and benefits across the original product and the secondary product without double counting. For example, should the first product get an environmental benefit for being recycled or should the second get the benefit of using recycled material. The WARM model uses the “avoided burden” approach which credits the material being recycled with the avoided environmental impacts of producing new materials from virgin resources. This encourages recycling by showing its benefits, however it may not be consistent with other methods of GHG accounting. For example, in GHG inventories the benefit of recycling may be noted as avoided emissions or may be captured when materials are purchased using recycled content. A more detailed discussion is outside the scope of this deliverable.

A brief note on GHG accounting

- The impacts of end of life treatment (Scope 3, category12) are included in municipal inventories only if they occur within the boundaries of the GHG inventory. Therefore, emissions are shifted from one location to another it may not reflect the benefit directly in the GHG inventory.

Appendix E: Composting Methods Comparison

Table 58: Comparison of Composting Methods

Method	Description	Advantage	Disadvantage
In-vessel	Enclosed composting system that accelerates decomposition.	Faster composting process, controlled environment, reduced odor, efficient use of space.	High initial cost, requires technical expertise, different sizes but not easily scalable.
Windrowing	Organic waste is piled into long rows and turned periodically to aerate.	Simple and low-cost, suitable for large volumes.	Requires significant space, potential odor and pest issues.
Vermicomposting	Use of worms to process organic waste into high-quality compost.	Produces high-quality compost, low maintenance, can be done on a small scale.	Slower process, sensitive to environmental conditions.
Static Pile	Organic waste is formed into piles	Low investment cost, simple to maintain.	Slower process, easily scalable, uneven composting may not reach optimal temperatures for stabilization, odors, and vectors.
Aerated Static Piles (ASP)	Controlled aeration of organic waste piles with covers to retain heat and control emissions.	Efficient decomposition due to forced air, reduces odors and emissions, scalable.	Requires infrastructure and management, higher initial cost compared to windrowing.
Anaerobic Digestion	Breakdown of organic material in the absence of oxygen, producing biogas.	Produces biogas, which can be used for renewable energy, good for low solid content, biodegradable waste.	High initial investment, requires careful management of digesters and effluent (digestate).

Appendix F: Land Prices Analysis

Table 59: Analysis of Local Land Prices

Location	Total Price	Total Acres	Cost per Acre
County Road 38 1/2 & Highway 85, Greeley, CO 80631 | Crexi.com	$6,000,000	54.5	$110,092
Charter Oak Ranch Rd, Fountain, CO 80817 | Crexi.com	$1,670,000	16.95	$98,525
NW O Street & W.C.R. 39 1/12, Greeley, CO 80631 | Crexi.com	$1,125,000	7.44	$151,210
4.27 Acres of Mixed-Use Land for Sale in Nunn, Colorado - LandSearch	$950,000	4.27	$222,482
2.36 Acres of Commercial Land for Sale in Platteville, Colorado - LandSearch	$652,612	2.36	$276,531
133 Acres of Land for Sale in Greeley, Colorado - LandSearch	$5,950,000	133	$44,737
230 John Deere Dr, Fort Collins, CO 80524 | Crexi.com	$431,000	0.68	$633,824
5351 E County Rd 48, Fort Collins, CO 80524 | Crexi.com	$5,988,007	18.96	$315,823
Average Fort Collins			$474,823
Average Surrounding Areas			$150,596
Total Average			$231,653
Assumption for Model			$150,000

Appendix G: Larimer County Landfill Tip Fees

Table 60: Tip Fees at the Larimer County Landfill

Supplier	Flat Fee	Assumption for Model
Compacted (Front, Side, and Rear Loaders) *Excludes Compacted Rolloff Container Plus Surcharge	$37.40/ton	$37/ton
Roll-off Waste including Loose and Compacted Rolloff Containers (1 ton minimum)	$58.43/ton	
Loose Green Waste trailer (<1000 lbs. /cy)	$13.00/CY	

Source: 2025 Approved Larimer County Landfill Fee Schedule (updated 12/16/2024)[lxxii]

Appendix H: Local Labor Rates for Full-Time Employees

Table 61: Labor Rates in Fort Collins

Occupation Code	Occupation Title	ASP Facility Equivalent Title	Mean Hourly Wage	Model Hourly Wage*
37-0000	Building and Grounds Cleaning and Maintenance Occupations	N/A	$19.76	N/A
11-3013	Facilities Managers	Facility Manager	$53.42	$74.79
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	N/A	$29.17	N/A
37-3011	Landscaping and Groundskeeping Workers	Equipment Operator	$20.58	$28.81
37-3019	Grounds Maintenance Workers, All Other	Laborer / Scale Operator	$18.27	$25.58
49-9043	Maintenance Workers, Machinery	Mechanic	$32.89	$46.05
49-9071	Maintenance and Repair Workers, General	Mechanic	$24.61	$46.05
53-7081	Refuse and Recyclable Material Collectors	N/A	$25.41	N/A

*Developed for model and includes salary, benefits, and overtime
Source: Source: Fort Collins, CO - May 2023 OEWS Occupational Employment and Wage Estimates (Metropolitan and Nonmetropolitan Areas)[lxxiii]

Appendix I: Local Compost Price Factors

Table 62: Local Finished Compost Prices

Supplier	Compost Type	Price ($/CY)
MV Landscape Materials	Dairy Compost	$35
	Green Thumb Mix	$55
Crystal Landscape Supplies	Screened Compost	$45
DLM Landscape Supply	Organic dairy compost	$25
Ewing Outdoor Supply	Dairy Compost	$45
	Eco Grow	$54
	Premium Compost	$45
Timber Rock	Planter's Mix (40% compost)	$52
	Dairy Compost	$45
Average bulk retail price		$46
Price used in the cost model (assumes cost sold at facility)		**$23**

Appendix J: Summary Findings of Operating Models for Municipal Organics Processing

Table 63: Comparison of Operating Models for Municipal Organics Processing

Operating Model	Ownership & Management	Key Insight	Additional Comments
Publicly Owned-Privately Operated	City of Phoenix, AZ, contracted with WeCare Denali.	The contract includes revenue share on sales of compost and landscape products, and free finished compost to the City.	Located on 'Resource Innovation Campus' adjacent to the transfer station, designed to develop partnerships with businesses to build circular economy and increase diversion from landfill.
Publicly Owned-Privately Operated	City of San Antonio, TX, contracted with Atlas.	An advanced Aerated Static Pile (ASP) composting system is utilized. The facility creates STA-certified compost.	The City is exploring code revisions to mandate compost use in municipal projects. Also, the City conducts community workshops, school programs, and public information campaigns to promote composting and waste reduction.
Publicly Owned-Privately Operated	City of Napa, CA, contracted with Napa Recycling & Waste Services (NRWS).	This facility has an integrated approach, which connects trash, recycling, and composting services under one umbrella to enhance continuity and cohesiveness.	The compost produced at the NRWS facility is OMRI (Organic Materials Review Institute)-certified for use in organic operations. Approximately 80% of the revenue comes from rates (curbside or tip fees), with the remaining 20% coming from compost sales.
Publicly Owned-Publicly Operated	Onondaga County Resource Recovery Agency (OCRRA) in Syracuse, NY, is a public benefit corporation created by New York State legislature under the state's public authorities law. It works with local governments through	Functions as an authority to consolidate and leverage contracts for services. Largest compost facility in New York State.	OCRRA is a self-funded, fully integrated resource recovery system. They have variable tip fees for distinct types of food scraps for composting.

Operating Model	Ownership & Management	Key Insight	Additional Comments
	intergovernmental agreements.		
Publicly Owned-Publicly Operated	Miramar Greenery operated by City of San Diego, CA.	San Diego plans to invest $77 million to replace the existing facility to reduce contamination, which has grown from 3-4% to 10-15% after implementing composting mandates.	Located at the Miramar landfill and utilizes in-vessel composting alongside open windrow systems.
Privately Owned-Privately Operated	Privately owned & operated WM, Rosemount, MN.	Publicly owned transfer station, private compost facility bolstered by county policy directives.	County Enterprise Funded, ambitious 75% recycling goal, food scrap tip fee incentive for haulers, decentralized yard trimmings composting to save on collection costs, centralized food scrap processing for better quality control.

Appendix K: Modeled Summary of Options

Table 64: Incoming Materials

Parameters	Units	25K TPY	50K TPY
Throughput (by weight)			
Yard waste	Tons/year	17,800	39,600
Food waste	Tons/year	7,200	10,400
Bulk density			
Yard waste	lbs./cy	700	700
Food waste	lbs./cy	1,300	1,300
Throughput (by volume)			
Yard waste	CY/year	50,857	113,143
Food waste	CY/year	11,077	16,000

Table 65: End Products

Parameters	Units	25K TPY	50K TPY
Production (by weight)			
Compost (fines)	Tons/year	11,325	22,650
Overs (100% re-composted)	Tons/year	3,883	7,766
Bulk density			
Compost (fines)	lbs./cy	1,000	1,000
Overs (100% re-composted)	lbs./cy	800	800
Production (by volume)			
Compost (fines)	CY/year	22,650	45,299
Overs (100% re-composted)	CY/year	9,707	19,414

Table 66: Aerated Static Pile (ASP) Information

Parameters	Units	25K TPY	50K TPY
Pile length	Feet	80	80
Pile width	Feet	30	30
Pile height	Feet	8	8
Biofilter cap (compost, overs)	Feet	1	1
Volume per pile	CY	586	586
Number of piles	Number	12	24
Total footprint (all piles)	Acres	1.1	2.1
Retention time	Weeks	6	6

Table 67: Approximate Areas Needed (in acres)

Facility Areas	25K TPY	50K TPY
Underground yard waste	1.9	4.1
Ground yard waste	0.5	1.0
Composting	1.1	2.1
Curing (before screening)	0.6	1.2
Overs storage	0.2	0.4
Compost storage	1.3	2.5
Subtotal: Operational area*	5.5	11.4
Perimeter road	1.1	1.6
Driveway, parking, access in/out	0.5	0.6
Maintenance equipment and parking	0.5	1.0
Mixing area	0.4	0.5
Stormwater pond	1.2	2.3
Total site area*	9	17
Total: Preliminary parcel size (2-4x site area)	18-37	34-39

Note: Totals may not add up due to rounding

Table 68: Maximum Volume Storage and Maximum Retention Times

Facility Areas	25K TPY		50K TPY	
	Storage (CY)	Time (days)	Storage (CY)	Time (days)
Underground yard waste	25,560	90	56,230	90
Ground yard waste	4,620	30	9,340	30
Composting	7,940	42	16,050	42
Curing	5,590	60	10,740	60
Overs storage	1,690	60	3,380	60
Compost storage	11,230	180	22,410	180

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