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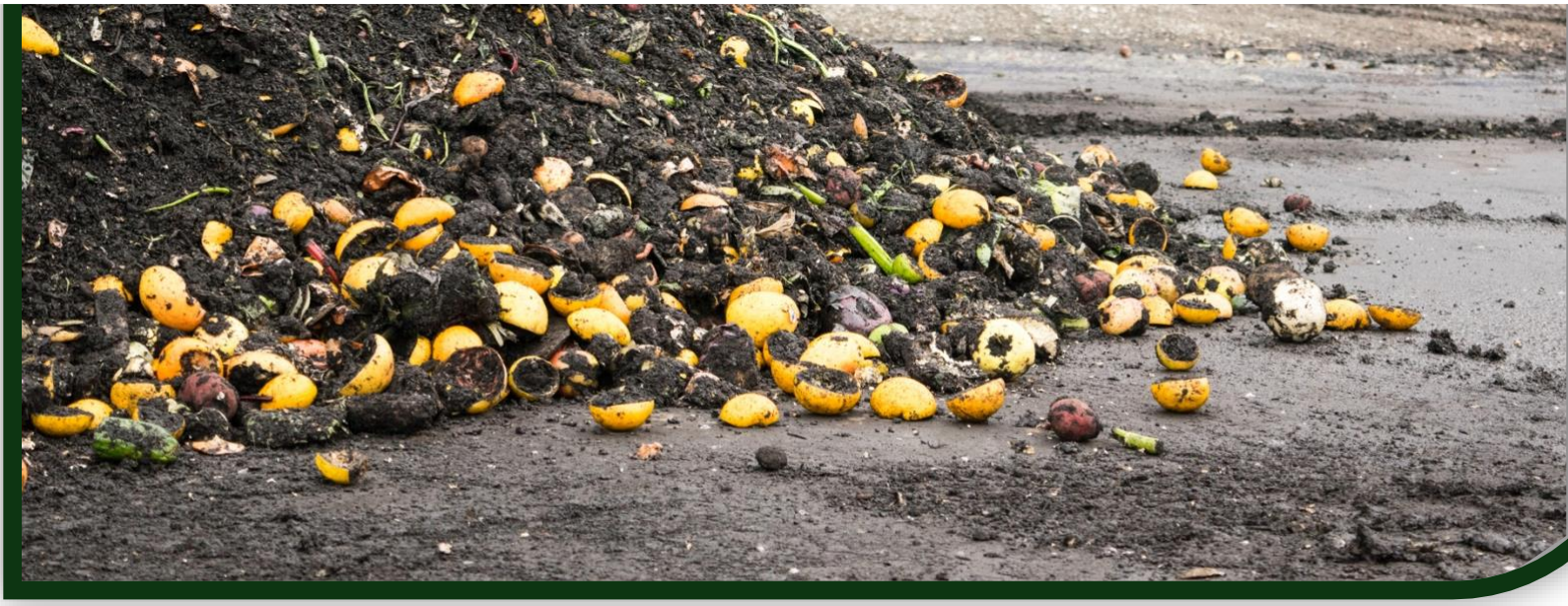
Small/Medium Composting Project Permitting



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Integrated Waste Management Consulting, LLC

State of California
Gavin Newsom
Governor

California Environmental Protection Agency
Yana Garcia
Secretary

Department of Resources Recycling and Recovery
Zoe Heller
Director

Public Affairs Office
1001 I Street (MS 22-B)
P.O. Box 4025
Sacramento, CA 95812-4025
www.calrecycle.ca.gov/Publications/
1-800-RECYCLE (California only) or (916) 341-6300

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Acknowledgments

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CalRecycle Staff

Alvin VoTran, Project Manager, and Senior Environmental Scientist of the Permitting and Assistance Branch, Training and Assistance Section

Martin Perez, Manager of the Permitting and Assistance Branch, Training and Assistance Section

Paulina Lawrence, Branch Chief of the Permitting and Assistance Branch

Mark de Bie, Deputy Director of the Waste, Permitting, Compliance and Mitigation Division

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Central Valley RWQCB

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Air Districts

Bay Area Air Quality Management District (AQMD)

Monterey Bay Air Resources District

San Joaquin Valley Air Pollution Control District

Sacramento Metropolitan AQMD

Yolo-Solano AQMD

Butte County AQMD

Northern Sierra AQMD

El Dorado County AQMD

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Abbreviations and Acronyms

AAPFCO	American Association of Plant Food Control Officials
ACP	Association of Compost Producers
ASP	Aerated Static Pile
ATC	Authority to Construct
ATS	Active Treatment Systems
AVAQMD	Antelope Valley Air Quality Management District
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BMP	Best Management Practices
CAA	Clean Air Act
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CASP	Covered Aerated Static Pile
C-CORP	Comprehensive Compost Odor Response Project
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CGO	Compost General Order
CO_2	Carbon Dioxide
CGP	Construction General Permit
CREF	Composting Research and Education Foundation
CUP	Conditional Use Permit
CWA	Clean Water Act
E&A	Edgar and Associates
EA	Enforcement Agency
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ERCs	Emission Reduction Credits

ESCP	Erosion and Sediment Control Plan
GIS	Geographic Information System
HDPE	High Density Polyethylene
HRA	Health Risk Assessment
IGP	Industrial General Permit
IS	Initial Study
IWMC	Integrated Waste Management Consulting
LEA	Local Enforcement Agency
LRP	Legally Responsible Person
MND	Mitigated Negative Declaration
MRF	Material Recovery Facility
NAAQS	National Ambient Air Quality Standards
ND	Negative Declaration
NDFE	Non-Disposal Facility Element
NEC	No Exposure Certification
NH3	Ammonia
NOI	Notice of Intent
NONA	Notice of Non-Applicability
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NSR	New Source Review
OIMP	Odor Impact Minimization Plan
PERP	Portable Equipment Registration Program
PFRP	Process to Further Reduce Pathogens
PTE	Potential to Emit
PTO	Permit to Operate
PRDs	Permit Registration Documents
RCSI	Report of Composting Site Information
RECLAIM	Regional Clean Air Incentives Market
ROG	Reactive Organic Gases

ROI	Return on Investment
ROWD	Report of Waste Discharge
RWQCB	Regional Water Quality Control Board
S2S	Surf to Snow Environmental Resource Management Inc.
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SIC	Standard Industrial Classification
SJVAPCD	San Joaquin Valley Air Pollution Control District
SMARTS	Stormwater Multiple Application and Report Tracking System
SWFP	Solid Waste Facility Permit
SWIS	Solid Waste Information System
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TACs	Toxic Air Contaminants
TPR	Transfer Processing Report
TPY	Tons Per Year
USCC	United States Composting Council
WDR	Waste Discharge Requirements
WWTP	Wastewater Treatment Plant
VOC	Volatile Organic Compounds
YSAQMD	Yolo-Solano Air Quality Management District

Definitions

The following definitions are used in this report:

Active Compost	The California Code of Regulations Title 14 (14 CCR) defines active compost as "compost feedstock that is in the process of being rapidly decomposed and is unstable. Active compost is generating temperatures of at least 50 degrees Celsius (122 degrees Fahrenheit) during decomposition; or is releasing carbon dioxide at a rate of at least 15 milligrams per gram of compost per day, or the equivalent of oxygen uptake."
Agricultural Waste	14 CCR defines agricultural waste as "wastes resulting from the production and processing of farm or agricultural products, including manures, prunings and crop residues wherever produced."
CalRecycle	Department of Resources Recycling and Recovery for the state of California.
Compost	According to the USCC, "Compost is the product manufactured through the controlled aerobic, biological decomposition of biodegradable materials. The product has undergone mesophilic and thermophilic temperatures, which significantly reduces the viability of pathogens and weed seeds (in accordance with EPA 40 CFR 503 standards) and stabilizes the carbon such that it is beneficial to plant growth. Compost is typically used as a soil amendment but may also contribute plant nutrients. (AAPFCO definition, official 2018) Finished compost is typically screened to reduce its particle size, to improve soil incorporation."
Compostable Materials	14 CCR defines compostable material as "any organic material that when accumulated will become active compost."
Compostable Material Handling Facility or Operation	14 CCR defines this to mean an operation or facility that processes, transfers, or stores compostable materials. Handling of compostable materials results in controlled biological decomposition. Handling includes composting, screening, chipping and grinding, and storage activities related to the product of compost, compost feedstocks, and chipped and ground materials. The use of the term "Facility" or "Operation" relates to the CalRecycle Regulatory Tiers as defined in CCR, Title 14, Section 17854.1. For the purposes of this report, a compostable material handling "activity" can be either a facility or an operation.

	However, outside of regulatory requirements, the use of "operations" is meant to reflect on-site composting activities (e.g., composting process parameters, labor and equipment requirements, operating costs).
Emission Factor	The U.S. EPA defines an emission factor as "a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant." Compost emission factors are commonly expressed as the weight of pollutant (in pounds) divided by the throughput (in tons). Emission factors are designed to be a representative average of facilities in the source category.
Food Material	14 CCR defines as "a waste material of plant or animal origin that results from the preparation or processing of food for animal or human consumption and that is separated from the municipal solid waste stream." Also, see Organic Waste below.
Green Waste	Biodegradable materials that can be composted including grass clippings, branches, wood chips, weeds, flower cuttings, etc. Also referred to as "Green Material," which 14 CCR defines as "any plant material except food material and vegetative food material that is separated at the point of generation, contains no greater than 1.0 percent of physical contaminants by dry weight," and meets the requirements of 14 CCR section 17868.5 (load checking and representative sampling to confirm contamination rates).
Medium Compost Sites	For the purposes of this study, CalRecycle defines medium compost sites as those with up to 12,500 cubic yards of material on site at any given time. These sites process feedstocks that include one or more of the following: agricultural material, green material, food material, and vegetative food material. They operate in compliance with Environmental Health Standards as described in 14 CCR, Division 7, Chapter 3.1, Article 7, and utilize a covered aerated static pile or equivalent system.
Organic Waste	The SB 1383 regulations define organic waste very broadly as: "solid wastes containing material originated from living organisms and their metabolic waste products including, but not limited to, food, green material, landscape and pruning waste, organic textiles and carpets, lumber, wood, paper products, printing and writing paper, manure, biosolids, digestate, and sludges." See also "Food Waste."

Small Compost Sites	For the purposes of this study, CalRecycle defines small compost sites as those with up to 5,000 cubic yards of material on site at any given time. These sites process feedstocks that include one or more of the following: agricultural material, green material, food material, and vegetative food material. They operate in compliance with Environmental Health Standards as described in 14 CCR, Division 7, Chapter 3.1, Article 7, and utilize a covered aerated static pile or equivalent system.
Vegetative Food Material	14 CCR defines vegetative food material as "that fraction of food material, defined above, that is a plant material and is separated from other food material and the municipal solid waste stream. Vegetative food material may be processed or cooked but must otherwise retain its essential natural character and no salts, preservatives, fats or oils, or adulterants shall have been added." In order for food material to be considered vegetative, it can contain no greater than 1.0 percent of physical contaminants by dry weight and must meet the requirements of 14 CCR section 17868.5 (load checking and representative sampling to confirm contamination rates).
VOC	Volatile Organic Compounds (VOCs), excluding carbon monoxide, carbon dioxide and related oxides of carbon, which have negligible photochemical reactivity as defined by the EPA.

I Executive Summary

Background

To achieve the goals of Senate Bill (SB) 1383 (Lara, Chapter 395 Statutes of 2016), the mandated diversion of organic waste from landfill disposal, CalRecycle estimates that California needs approximately 50 to 100 new or expanded organic waste recycling facilities.[1] It is expected that most of these materials will be handled by both the expansion of existing as well as new compost facilities.[2] However, the siting, permitting, and development of new large-scale commercial composting facilities can take years before becoming fully operational.

Many newly developed or expanded composting facilities in California anticipate utilizing mechanized aeration systems (instead of traditional turned windrow composting) to optimize the biological process and minimize emissions to meet air quality requirements. These systems are referred to as aerated static pile (ASP) composting systems. ASP composting systems use fans to deliver ambient air to or from the composting pile and can either be pipe-on-grade or constructed with subgrade aeration. A biocover (e.g., compost cap), geomembrane cover, or biofilter (or negative ASP) is often paired with these systems. ASP systems have been shown to have a reduced composting retention time and reduced emissions compared to windrow composting, as well to as require a smaller footprint. For the purposes of this Small and Medium Compost Project Permitting Study (Study), CalRecycle is focused on ASP composting activities, or the equivalent.

Purpose

CalRecycle retained the HDR Engineering, Inc. (HDR) Team, including subcontractors Integrated Waste Management Consulting, LLC (IWMC), Edgar and Associates (E&A), and Surf to Snow Environmental Resource Management Inc. (S2S), to develop a methodology for aggregating data to create tools and resources to help provide solutions and guidance to assist with the siting, permitting, development, and operation of small- and medium-sized composting activities.

As part of this Study, the HDR Team conducted statewide research, surveys, and analysis, in addition to pulling from the team's decades of experience working on the permitting and development of composting facilities in California to provide CalRecycle with industry Best Management Practices (BMPs) to help facilitate the development of new composting operations throughout the state of California. This report discusses the complex permitting and operational challenges that current and future composting

[1] Capacity Planning for Organic Waste Recycling - CalRecycle Home Page

[2] SB 1383 Infrastructure and Market Analysis, CalRecycle 2019.

activities may encounter and offers opportunities to clarify and navigate the site permitting requirements and processes.

Approach

The HDR Team developed a work plan with the following tasks and approach for this Study:

- Develop BMPs for identifying locations suitable for siting small- and medium-sized composting activities.
- Identify and list a summary of permitting requirements for each local or regional air and water permitting agency.
- Identify and list a summary of permitting challenges and solutions for each stage of the permitting process, including local government requirements regarding land use and California Environmental Quality Act (CEQA).
- Perform an economic analysis including a range of costs for the permitting and operation of small and medium composting activities.
- Identify best management practices for operating small and medium composting activities.

The HDR Team gathered data through various methods and from numerous sources including:

- Statewide surveys to cities and counties, compost facilities and operators, planning agencies, air districts, Regional Water Quality Control Boards (RWQCB), and the State Water Resources Control Board (SWRCB).
- Public databases (e.g., CalRecycle's Solid Waste Information System or SWIS).
- Google Earth.
- The HDR Team's combined decades of experience assisting in the development, permitting, and operations for composting activities across California.

This information was used to conduct an analysis of the permitting requirements, challenges, and opportunities, as well as capital and operational costs.

Siting Small and Medium Composting Activities

The HDR Team gathered relevant available information related to the land use entitlement and CEQA processes applicable to small- and medium-sized composting activities to recommend BMPs to help prospective operators and local governments:

- Identify locations for new composting activities,
- Improve local land use approval outcomes, and
- Streamline these activities' CEQA review.

The BMPs identified in this report are for consideration and guidance only and are not meant to be construed as a requirement for the permitting and development of composting activities.

Municipal Code Analysis

The HDR Team completed a desktop study of the land use requirements for siting composting activities in a select number of cities and counties to gain insight into a representative pool of jurisdictions across the state and of varying settings (e.g., rural and urban) and size (e.g., large and small). The research revealed that most county municipal codes included some specific reference to composting activities, whereas it was less likely to find expanded composting definitions in city municipal codes. It is important to note this may not be a trend across the state but was a trend in the jurisdictions sampled in this Study.

Land Use Approvals and Environmental Review

Next, the HDR Team used data from the CalRecycle SWIS database and Google Earth aerial photography to identify composting activities that met the definition of small and/or medium-sized activities relevant to this Study to assess facility-specific land use approvals and CEQA-clearance documents. This consisted of reviewing nearly 100 compost activities registered in SWIS and resulted in six (6) to nine (9) identified composting sites. This range of facilities reflects significant changes to the composting operation over time from its initial EA Notification Tier application, such as:

- A halt in operations,
- An expansion of the facility, or
- The activity is co-located with other solid waste activities and falls under a full Solid Waste Facility Permit (SWFP).

In most cases, SWIS did not include copies of land use approvals; however, common conditions included in these approvals required the project to comply with local standards such as noise ordinances, and any other requirements imposed by an agency having jurisdiction (such as air and water quality permits).

Of the small- and medium-sized composting activities identified, there was a mixture of CEQA clearance documents which included Statutory and Categorical Exemptions, Negative Declarations, and Mitigated Negative Declarations. It should be noted that the CEQA pathway could not be verified for all composting activities. Some small and medium composting operations operate without CEQA documentation, as they may have been deemed exempt, or are otherwise determined to not require a discretionary action from a permitting agency (which typically triggers the CEQA process). Mitigation measures were often applied to reduce impacts to a less than significant level as related to:

- Air Quality
- Geology
- Hydrology and Water Quality
- Noise
- Odor

Siting Recommendations

Leveraging the HDR Team's extensive experience with permitting compost operations and facilities, the following siting criteria was outlined for commercial compost sites:[3]

- Secluded land
- Vacant, relatively flat land/open field
- Sufficient size
- Proper zoning or land use designation
- Minimal environmental impacts
- Minimal cultural impacts
- Distant from sensitive populations
- Sufficient distance from airports
- Good truck access
- Proximity to feedstock sources and/or compost users
- Visual buffer
- Availability of water
- Availability of electricity (and other utilities) on site
- No drainage problems (need to manage stormwater)

Siting Considerations Toolkit Template

The HDR Team identified some key criteria and further broke it down into five categories, each with a detailed list of specific site considerations. It is important to note these are siting considerations and may not be required for a particular project, or similarly may not be all inclusive for what a proposed project needs to evaluate prior to permitting and development:

- Jurisdictional Criteria – relates to the parcel zoning designation and land use permitting requirements.
- Land Criteria – relates to the property specifications such as size and availability.
- Accessibility Criteria – relates to the vehicular accessibility of the site and utility availability.
- Feedstock Criteria – relates to the proximity of available feedstocks and the quality of such feedstocks.
- Environmental Factors – relates to the environmental factors, priority given to potential air quality and water quality impacts.

[3]Richard, T.L. and M. Chadsey. 1994. Environmental Impact Assessment. In: Composting Source Separated Organics. Edited by BioCycle staff. J.G. Press, Inc. Emmaus, PA. pp 232-237. Also published in 1990 as: Environmental monitoring at a yard waste composting facility. BioCycle. 31(4):42-46.

Air Quality and Water Quality Permitting Requirements

There are 35 local air pollution control districts in California, and nine (9) Regional Water Quality Control Boards (RWQCBs). The following is a high-level summary of the permitting requirements from these governing regulatory bodies.

Air Quality Permitting Requirements

Due to their ability to generate Volatile Organic Compounds (VOCs), which are precursors and active participants in the formation of ozone, composting activities can be subject to the air permitting process, whether through a compost-specific rule or through an air district's New Source Review (NSR). Through the permitting process, an air district determines the activity's Potential to Emit (PTE). This is the first step of the air permitting process, regardless of the size of the composting activity, unless the composting activity qualifies for a permit exemption. Even small operations may be required to go through a PTE evaluation to determine if it falls below the permitting threshold. The PTE is used to determine if the proposed activity exceeds the air district's threshold to require a Health Risk Assessment (HRA), use of a Best Available Control Technology (BACT) or obtain Emission Reduction Credits (ERCs) or offsets. The thresholds for an HRA, BACT, or ERCs vary by air district. The process to comply with HRA, BACT, and/or ERC requirements may be time-consuming and costly. For example, the most recent cost for VOC ERCs in the San Joaquin Valley Air Pollution Control District was $150,000 per ton of VOC ERCs, up from $5,000 per ton of VOC ERCs in prior years. This is not reflective of ERC costs in other air districts but does shed light on the low supply and potential high demand of ERCs that can significantly change the market.

The HDR Team surveyed all 35 air districts to assess barriers within the permitting process and obtain feedback from the air districts on their challenges and opportunities for air permitting and approvals. Of the air districts which responded to the survey regarding permitting challenges or opportunities for small- and medium-sized composting activities, the following key items were raised:

- There are limited available ERCs for VOCs for new facilities or existing facilities proposing expansions. If the company does not currently hold ERCs, the size of the facility would be limited to below the threshold for triggering ERCs.
- Some air districts provide no (or very specific) exemptions for these composting activities, which can create a challenge for prospective site development by imposing conditions that result in projects not being financially viable. This is seemingly in conflict with the need for increased processing capacity to meet the state's goal for organics diversion. Priorities need to be set at the state level (i.e., air quality vs. recycling).
- Air districts with no composting activities are expected to rely heavily on other air districts to provide guidance. Permitting these operations is complicated due to limited available emissions data from composting operations, the variability of how each facility is operated, and the difficulty in testing emissions.

- There are new National Ambient Air Quality Standards (NAAQS) for particulate matter that may adversely impact the permitting process for these types of activities.

Water Quality Permitting Requirements

The General Order for Waste Discharge Requirements (WDR) for Composting Operations (WQ 2020-0012-DWQ) (Compost General Order) was written by the SWRCB and implemented by the RWQCBs. The Compost General Order provides design and operational requirements for facilities that compost green material, manure, anaerobic digestate, biosolids, food material and paper products. Composting operations that are not covered by the Compost General Order may be covered by other permits such as the National Pollutant Discharge Elimination System General Permit (NPDES), Construction General Permit (CGP), and/or the Industrial General Permit (IGP).

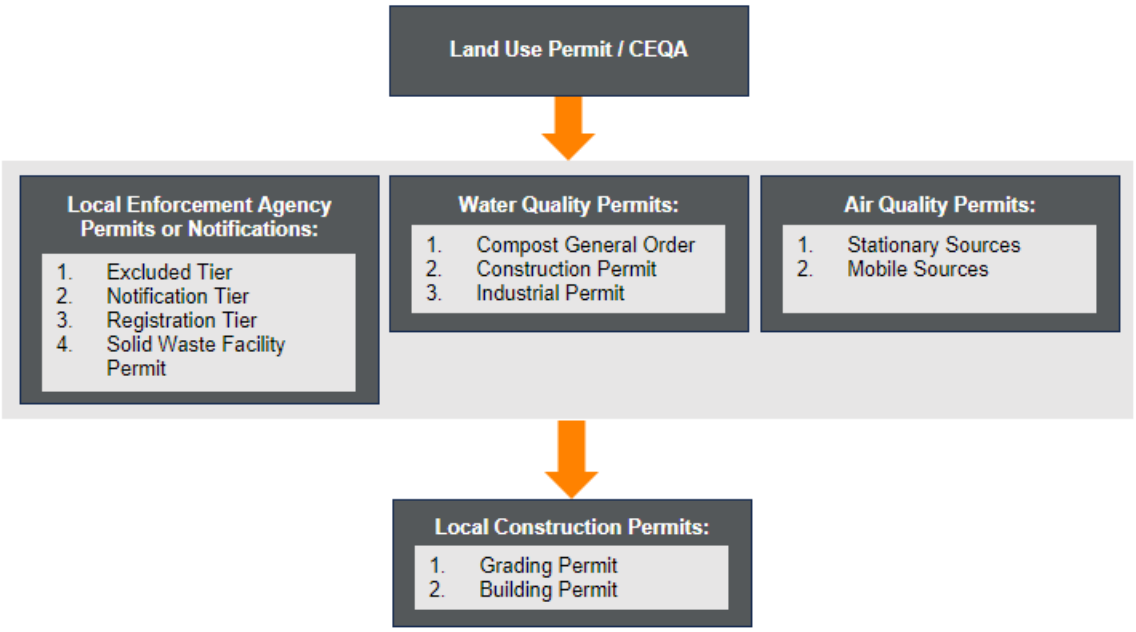
The HDR Team surveyed all nine (9) RWQCBs and the SWRCB to understand challenges and opportunities for permitting approvals related to stormwater management at composting operations from the water board perspective.

The survey results revealed that the biggest challenge with obtaining permit approval typically for projects that require more than a CalRecycle EA Notification Tier process, is the length of time that it takes to complete the permitting process. RWQCBs' permitting review and approval can take years to complete. It is recommended to submit applications as early as possible, at least 12 months before starting operations.

Summary of Permitting Challenges and Solutions

A new commercial (or municipal) composting facility is a significant piece of infrastructure and requires the coordination of many regulatory agencies early in the planning process to result in a successful facility. **Figure 1** outlines the permitting process flow for composting activities. The process is not always linear, and some activities can be completed concurrently, in an alternative order, or skipped depending on project and/or operator priorities.

Figure 1: Composting Activity Permitting Process Flow



The following sections summarize recommendations for streamlining the permitting process for small and medium composting activities. See **Appendix D** for a summary of permitting requirements and recommendations.

Land Use Approval and CEQA

Although there are numerous permits required to establish a composting operation, the local land use approval and CEQA process typically has the longest lead time and is a prerequisite to securing approvals from the various state agencies. It is imperative for the proponent to engage with the local jurisdiction/lead agency to have a pre-application meeting process, or equivalent meeting with the jurisdiction's planning department. The meeting is to verify the appropriate permitting pathway, such as a Conditional Use Permit, and anticipated CEQA needs, such as special studies.

It is important to understand the potential environmental impacts from the project, and to design the project in a way to mitigate as many of these potential impacts as possible during the project design. Recommendations for engaging with local jurisdictions/lead agencies to assist the proponent with the land use approval process include:

- Review property zoning designation and correspondence with the municipal code to assess permitting pathway.
- Download and review application forms to understand local permitting requested information.
- Facilitate a pre-application meeting with the authorizing local jurisdiction's planning department.

- Engage elected officials and key stakeholders to garner project support.

While some small- and medium-sized composting activities may not be subject to CEQA, it is still important for the local jurisdiction and the project proponent to understand the permitting requirements of all regulatory agencies prior to applying for permits so that the project is consistent. Doing so will reduce the potential for permit revisions or modifications as the project is further developed. Recommendations for engaging with local jurisdictions/lead agencies to streamline the permitting process include:

- Identify potential environmental impacts to design project components to mitigate to a lesser than significant impact.
- Identify key special studies that are likely required. For composting projects, these typically include air quality, traffic, hydrology/water quality, and cultural resources.
- Engage elected officials and key stakeholders to garner project support.

CalRecycle / LEA Permits and EA Notifications

In general, the Best Management Practices (BMPs) for CalRecycle/LEA permits and EA Notifications are similar across the permitting and approval tiers. Namely, the proponent should be prepared to:

- Perform a site suitability analysis to determine the composting activity's compatibility with the surrounding land uses.
- Prepare and implement an Odor Impact Minimization Plan.
- Prepare and implement a vector control plan, and mitigation against other potential public nuisances.
- Maintain appropriate recordkeeping to verify the composting activity's on-site cubic yard capacity and annual tonnage throughput.

Water Quality Permits

The Compost General Order outlines specific design specifications depending on the compost facility tier. In addition to meeting these requirements, the following are BMPs recommended to help obtain coverage and compliance with the Compost General Order:

- Meet with the RWQCB to understand region-specific requirements outside the Compost General Order (e.g., storm event requirements).
- Perform a geotechnical investigation to characterize soil and groundwater.
- Work with a licensed professional to design the drainage conveyances and containment structures.

A unique site-specific Stormwater Pollution Prevention Plan (SWPPP) is required for both the IGP and CGP. In addition to meeting the requirements of the SWPPP, the following are BMPs to help streamline the permitting process but most notably compliance with these stormwater permits:

- Inclusion of applicable minimum and advanced stormwater BMPs to minimize the potential impact to stormwater quality discharged from the site.
- Inclusion of applicable Compost General Order requirements as related to Construction Quality Assurance and drainage containment and conveyance systems.
- Engage a local firm to prepare and implement the site-specific SWPPP. A local company may also conduct stormwater sampling.

Air Quality Permits

The air quality permitting process is a complex process contingent on operator-provided information as well as local air district established rules and emissions factors. The following BMPs seek to assist operators with permit acquisition and compliance related to stationary and mobile sources.

Stationary sources are regulated by the local air districts, which each have unique requirements and thresholds, such as for BACT, ERCs, and an HRA. The following recommendations may help an operator navigate this process:

- Estimate the project's Potential to Emit (PTE) prior to applying for an air quality permit.
- Evaluate the potential ERCs required based on the PTE.
- Assume the composting activity meets BACT requirements if utilizing an aerated static pile (ASP) composting system, however, additional emissions reductions may be available depending on specific facility conditions.

For qualifying mobile sources, obtaining coverage from CARB through its Portable Equipment Registration Program (PERP) may be appropriate and is a straightforward process. The HDR Team recommends the following for an operator with mobile equipment that complies with PERP requirements:

- Work with the equipment vendor to obtain equipment specifications.
- Verify the vendor-provided information (such as equipment ID) matches the on-site equipment.

Local Construction Permits

Both local construction permits included in this report (a grading permit and a building permit), may be straightforward; however, requirements for the water permitting process should also be considered during design of the facility layout.

The recommended permitting BMPs for the grading and building permit processes include:

- Perform a topographic survey of the site to the level of detail needed to secure a grading permit (specific to local agency requirements).
- Prepare preliminary grading and drainage design (or building design for building permit) early on in the permitting process (e.g., land use approval process) to understand the requirements and site implications (e.g., proper on-site management of liquids).

- Contact the local jurisdictions having authority, generally the building and public works departments, to discuss their permitting requirements.
- Use a licensed professional (e.g., professional engineer) to prepare these plans.

Gap Analysis for Food Material Composting Activities

The lack of consistency across the permitting agencies for composting activities increases the complexity and difficulty for operators to understand, and comply with, the applicable regulations. The following is a brief summary of some of the permitting gaps or opportunities for improvement to help streamline the permitting and development of composting activities.

Feedstock Type

The only composting activities that can manage source-separated, nonvegetative food scraps indefinitely are facilities which obtain a full Solid Waste Facility Permit (SWFP). EA Notification Tier research composting operations are allowed to receive a wide variety of materials, including nonvegetative food scraps, but these approvals are limited in both on-site capacity and duration (i.e., two-year active approval as a Research Operation). The CalRecycle composting approval and permit tier flowchart illustrated on Figure 14 in Section XIII, shows the limited path for nonvegetative food scraps processing. See Section V for more detailed discussion regarding the additional requirements for securing a full SWFP.

Unlike the CalRecycle/LEA permit and approval process, the State Water Board's Compost General Order, as discussed in more detail in this report, takes the sources of the food material into consideration when assigning permitting tiers. For example, residentially co-collected or self-hauled food and green materials are acceptable for Tier 1 facilities. If a composting operation wants to accept source-separated, nonvegetative food scraps, it must comply with all Tier 2 facility requirements, which are significantly more intensive than Tier 1.

On-Site Capacity

Varying capacity thresholds between the SWRCB and RWQCB permitting and CalRecycle permitting levels and processes may create confusion for small and medium composting activities. For example, a full SWFP may either qualify as a Tier 1 or Tier 2 facility under the Compost General Order. While both Registration and EA Notification Tiers fall under the Tier 1 on-site capacity thresholds, depending on their feedstock they may be required to comply with Tier 2 requirements.

Annual Tonnage Throughput

The relationship between total on-site cubic yards at any one-time and annual tonnage throughput is complex to understand because a multitude of factors are involved, including compost retention time, product storage time, moisture content, and the changing bulk density of the material. While CalRecycle and the RWQCB use cubic yards in their determinations of permit levels, the air districts use tons per day, or tons

per year. The usage of units varies between CalRecycle, RWQCB, and air districts forces composting operations to track and estimate material both by weight and volume over time, adding to reporting efforts.

Economic Analysis for Permitting and Operations

The HDR Team conducted outreach to select local planning agencies to obtain cost information related to the land use and CEQA process, as well as compost facility operators and equipment vendors to gain insight into the capital and operational costs specific to small- and medium-sized composting activities.

Because of the vast differences in facilities in the EA Notification Tier, it can be challenging to understand the costs involved. A public sector transfer station adding a composting operation on land its already owns, and which is already entitled under the Land Use process (and possibly CEQA), may have considerably less costs than a new stand-alone site. The structure, business plan, existing infrastructure and permitting can have a significant impact on a project's cost.

Operators surveyed have a number of factors to consider related to the siting and development of the composting operations. Factors include: land costs, permitting and design costs, site preparation and equipment costs. No single factor is as important as securing feedstock (along with corresponding tipping fees) to a firm understanding of how it impacts the revenue modeling required for a comprehensive business plan.

Several ASP technology options are available to operators that are highly dependent on the volume and types of feedstock materials to be composted, the location (i.e. on an agricultural site or co-located at an existing landfill), the local air permitting requirements, and other factors discussed throughout this document. Whether the operations can be successful with low-cost, individual blowers and perforated pipe-on-grade systems or with a more sophisticated, below-grade aeration vault (or piping) system will be dictated by the revenue model (or operations proforma) developed as part of the business plan. Pipe-on-grade systems require less capital but have higher operating costs compared to below-grade aeration systems, which typically require more capital but have lower operating costs.

Financial Considerations

The following are the top financial considerations that should be thoroughly evaluated during the site pre-development efforts:

- Feedstock sourcing
- Site location, needed improvements, and permitting considerations.
- Equipment selection
- Product marketing

Site Evaluation, Engineering, and Design

The cost for this work is typically site-specific, highly dependent on the size and location of the operation and subject to a number of complex factors and available options, as

outlined throughout this report. A simple site plan and design can cost from $5,000 to $500,000 depending on the site requirements, of either a regulatory agency or prospective operator.

Permitting and Compliance

Permitting costs are also site-specific, highly dependent on the size and location of the operation, and subject to a number of complex factors and available options. Choosing a site with close sensitive receptors or challenging zoning in the more stringent air districts can increase costs and design decisions substantially.

Typical Capital Expenses

Capital startup costs become highly burdensome for small and/or medium composting activities once food materials are introduced due to increased environmental review, elevated permitting requirements, and other mitigation measures. **Table 1** includes a high-level planning estimate for typical capital expenses associated with the siting and development of small- and medium-sized composting activities as defined in this Study. There are unlimited site-specific and project-specific variables that could significantly impact the capital costs required for these operations. The HDR Team's goal was to provide a low and high range of costs for a mid-level project with key assumptions, outlined in the list below. The list assumes the following throughputs for a small and medium composting activity:

- 1) an annual throughput of 10,000 tons per year (TPY), representing a 5,000 cubic yard on-site capacity and the completion of four to five composting cycles per year, and
- 2) an annual throughput of 25,000 TPY, representing a 12,500 cubic yards on-site capacity also completing four to five composting cycles per year.

Key site assumptions:

- Located in a low-density urban or rural area;
- Site has moderate-to-poor soils;
- Five-acre parcel with four acres of lime-treated (low infiltration/permeability) operations working pad;
- Operation:
    - Accepts feedstocks allowable under the Compost General Order Tier 1 requirements;
    - Requires full grading and building permits;
    - Requires compliance with the CGP and IGP;
- Reputable contractor and construction compliance with use of prevailing wages for construction labor;
- Assumes a Compost General Order Tier 1 detention pond (i.e., includes a clay liner but not a High Density Polyethylene (HDPE) liner with lysimeter);
- Use of a pipe-on-grade positive aeration composting system with compost cap;
- Construction and installation of a truck scale and modular trailer; and
- Use of water truck or equivalent to comply with fire requirements.

For the higher range costs, the following could also apply:

- Larger on-site and/or throughput capacity; and
- Operation required to obtain an air permit and purchase ERCs.

Table 1: Typical Capital Expenses for Siting and Developing Composting Operations

Typical Start Up Capital Costs	Low Range (10,000 TPY)	High Range (25,000 TPY)
Land Acquisition		
Purchase	$3,650	$2,050,000
Lease	$13 per acre	$150,064 per acre
Engineering Costs		
Engineering Design	$5,000	$500,000 and up
Permitting	$50,000	$500,000 and up
Construction Costs		
Site Preparation	$200,000	$1,500,000
Utility Installation	$50,000	$500,000
Structural Improvements	$50,000	$250,000
Equipment		
Compost Aeration System	$50,000	$720,000
Grinder	$80,000	$500,000 and up
Loader	$75,000	$150,000
Moisture Addition / Water Truck	$20,000	$90,000
Screen	$75,000	$250,000
Temperature Probes	$500	$500
Mixers[a]	$40,000	$200,000
Sub-total[b]	**$699,163**	***$7,360,564 and up***
Contingency		
Conceptual Planning Contingency	$209,765	$1,938,246 and up
Total	**$908,928**	**$9,298,810 and up**

[a] Mixers are not necessary equipment at green waste only composting operations and are not common at smaller sites.

[b] Assumes a four-acre working pad and 5-acre parcel.

Sources: Rynk, Robert, et al, editors: The Composting Handbook: A How-to and why Manual for Farm, Municipal, Institutional and Commercial Composters. Elsevier, 2021.

Phone Interviews with Composting Technology Providers, Edgar & Associates, April 8-12, 2024.

Compost Operating Cost Estimates

Table 2 includes a high-level estimate for typical expenses associated with operating small- and medium-sized composting activities, as defined in this Study. There are site-specific and project-specific variables that also impact the operating costs required for these operations. The HDR Team's goal was to provide a range of costs for both a small operation representing the low range (assuming roughly 10,000 tons per year) and a medium-sized operation representing the high range (assuming roughly 25,000 tons per year).

Table 2: Estimated Operating and Maintenance (O&M) Expenses for Composting Operations

	Small Activities (10,000 TPY)		**Medium Activities (25,000 TPY)**	
O&M	**Range (per ton of incoming feedstock)**	**Annual Cost**	**Range (per ton of incoming feedstock)**	**Annual Cost**
Pre- and Post-Processing	$10-$15 per ton	~$100,000-$150,000	$10-$15 per ton	~$250,000-$375,000
Operations	$13-$20 per ton	~$130,000-$200,000	$20-$30 per ton	~$500,000-$750,000
Maintenance	$1-$2 per ton	~$10,000 to $20,000	$1-$2 per ton	~$25,000-$50,000
Total O&M Costs	**$24-$37 per ton**	**~$240,000-$370,000**	**$31-$47 per ton**	**~$775,000-$1,175,000**

Source: Phone interviews with operators of small/medium composting operations located in both Northern and Southern California, Edgar & Associates, April 22, 2024

Best Management Practices for Operating Small and Medium Composting Activities

One of the fundamental BMPs is to manage the composting process to avoid developing any nuisance level impacts such as odors, vectors, fires, or stormwater issues. The most basic way to do this is to optimize compost process parameters and implement BMPs, summarized below.

Moisture Content

- Moisture is hard to add, start on the high side.
- Regularly field check moisture using basic field methods.
- Add moisture at material transfer points (like grinding) and before or during turning.
- Take advantage of weather events to add moisture (turn while raining).
- Shape piles to capture moisture during the dry season and to shed during the wet season.
- Consider accepting nonhazardous liquids, if allowed by your permit, to offset moisture needs.

Oxygen/Aeration

- Ensure particle size allows for adequate bulk density.
- Measure porosity regularly to establish a baseline.
- Consider periodic measuring of oxygen or carbon dioxide.
- Verify ASP settings according to manufacturer's instructions.
- Do not exceed pile height recommendations.

Porosity and Free Air Space

- Measure bulk density periodically to establish a baseline and to ensure process settings are maintained.

Carbon to Nitrogen Ratio

- Verify C:N ratio periodically, and seasonally if feedstocks fluctuate.
- Add carbon sources as necessary.

Temperature

- Monitor temperature regularly.
- Establish set points.
- Make sure to hit the Process to Further Reduce Pathogens targets.
- Lower pile heights if elevated temperatures persist.

Operational Challenges

The most common challenges at small and medium compost activities include odor, truck traffic, pathogen reduction, recordkeeping, and managing throughput.

Community Benefits and Policies

Some composting activities may be required to participate in a public engagement effort as part of the activity's permitting process. If not required, the operator may determine the appropriate level of public involvement and education.

There are several BMPs to be a good nieghbor when conducting composting activities, whether directly or indirectly engaging with the public. The following are some examples:

- Optimize the compost process parameters to effectively manage the operation to minimize potential odors, vectors, and other public nuisances;
- Re-route vehicles that use the facility away from residential homes and other sensitive receptors during peak commute hours;
- Improve site security and perimeter aesthetics to compliment the surrounding architecture or culture;
- Adjust operations based on specific meteorological conditions to minimize impacts (e.g. noise, odor, dust);
- Plant visual and auditory buffers (e.g. trees, berms);
- Provide free compost and/or delivery to immediate neighbors and community groups;
- Host an annual open house (during International Compost Awareness Week, first week of May);
- Participate in events such as environmental educational fairs and festivals; and
- Be an asset to the community. Adopt a Community Benefits Agreement with a local organization to formalize community benefits offered by a facility such as job creation, job training, community garden support (through compost product donations), and assisting in community education events or campaigns.

Summary of Key Findings

The permitting process for and development of small- and medium-sized composting activities can be a complex and costly process depending on site location, permitting requirements, and operational requirements including site improvements and required equipment. To some extent, small compost operations that avoid local land use and/or CEQA review processes as well as air and water quality permitting can avoid some of the complexity of the permitting process. However, as noted, the limitation of these operations such as excluding food material, need to be considered when evaluating the benefit of the permitting tiers from the governing agencies.

Results Summary

As noted throughout this report, there is a wide range of variables that can impact the successful development of small and medium-sized composting activities across the state of California. These include, but are not limited to, design (e.g., feedstock type

and capacity), operational, and regulatory components (e.g., required permits and approvals). The following is a brief summary of the results of this Study.

Key Findings

Small and/or medium-sized composting activities may be exempt from many of the permits typically required or fall under a lower tier for approvals and requirements depending on their site location, site capacity and annual throughput, and feedstock type.

Alternatively, small and/or medium-sized composting activities may require additional permitting and be subject to the same stringent requirements as large-scale composting activities depending on their site location, site capacity and annual throughput, and feedstock type.

The capital costs for permitting and development of a small and/or medium-sized composting activity may range from roughly $1 million to over $8 million and up. Annual operating costs may range from $24 to $47 per ton of material received and is largely dependent on-site capacity.

Opportunities exist to develop tools to identify and inform to a prospective operator on site suitability criteria and permitting requirements.

Recommendations for Successful Compost Facility Development

While this report includes a variety of BMPs to help compost operators navigate these development components, the following are the key takeaways that any prospective compost operator should take into consideration before starting this process:

1. Business Plan
   Develop a business plan consisting of likely feedstock sources, operational requirements, product markets, financing needs, and other key components of a composting operation.
2. Site Suitability
   Identify candidate sites and confirm permitting pathway and related permitting requirements. Evaluate site characteristics prior to committing financial resources to site acquisition.
3. Land Use Conformity
   Check with local jurisdiction for site use consistency with surrounding land uses and communities.
4. Feedstock
   Assess hauling distances from feedstock sources, access to feedstock sources, and whether compost product markets are economical.

5. Local Air District Requirements

   Identify the applicability of NSR, BACT, and ERCs.

6. Water Quality Design Considerations

   Design facility site improvements to comply with groundwater, wastewater, and stormwater run-off requirements.

7. CalRecycle / Local Enforcement Agency (LEA) Approvals

   Coordinate operational requirements and approvals with your LEA.

8. Local Construction Permits

   Investigate the appropriate approvals for construction.

9. Capital Investment

   Secure financing for land, equipment, and construction capital expenses. Select and procure equipment.

10. Staff Training

    Identify staff responsibilities and training needs. Consider operator training.

11. Compost Product Markets

    Identify suitable product markets and obtain third-party certifications.

In addition to these recommendations for prospective operators, the HDR Team has the following recommendations for regulatory agencies which have jurisdiction over composting activities:

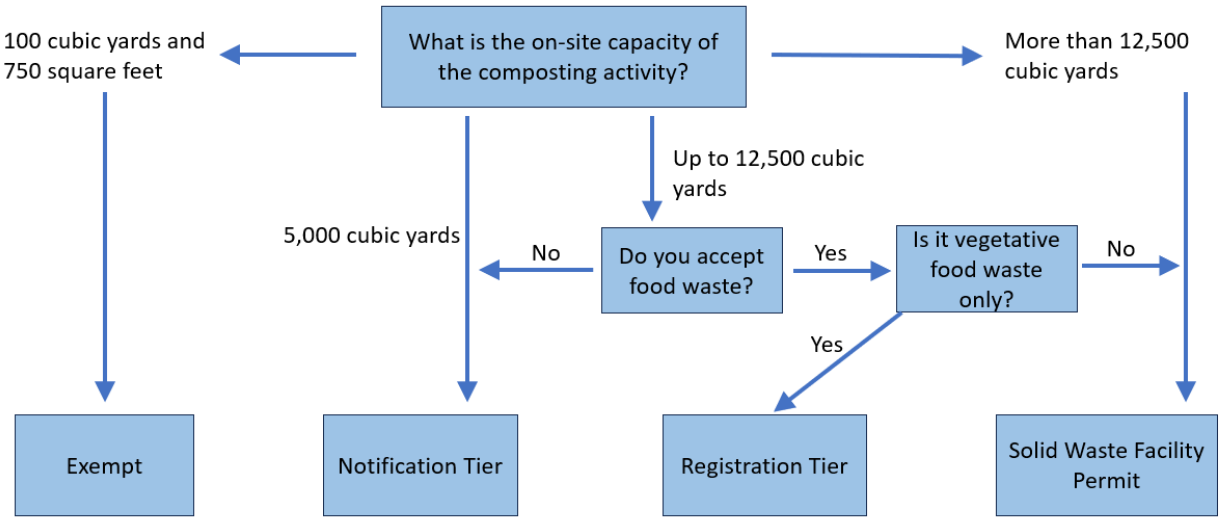
- Jurisdictions include compost-specific language in the municipal code to include the permitting pathway by size (small, medium, or large) and type (i.e., feedstock) to help clarify the land use permitting approval process. This can be supported by the development of a model ordinance.
- Regulatory agencies develop permitting checklists to clarify the permitting process and requirements applicable to composting activities.

Tool Opportunities

In addition, this report also identified opportunities for the development of a statewide tool to assist with navigating the permitting process for these activities. While the use of Geographic Information Systems (GIS) was explored, the main hurdle with GIS in this context, in a state the size of California, is the potential high cost to produce a publicly available database. Alternatively, a permitting matrix can be developed showing the flowchart of the various permitting layers for composting activities.

The following is an example highlighting the permitting flowchart as it relates to CalRecycle's current composting regulatory tiers. This flowchart can be combined with other regulatory requirements to develop a master permitting flowchart. Since most RWQCB and CalRecycle regulations are consistent throughout the state, the flowchart can be on a county, city, or air district basis.

Figure 2: CalRecycle Composting Approval and Permit Tier Flowchart



II Introduction

Background

SB 1383 is an aspirational piece of legislation that was signed into law in 2016 that mandates a 50% reduction of organic waste from landfill diversion by 2020, and a 75% reduction by 2025. The formal rulemaking process included several supporting requirements that span across several disciplines within the waste sector, and include, but are not limited to:

- Organic Waste Collection Services
- Public Education and Outreach
- Generators of Organic Waste
- Regulation of Waste Haulers
- Edible Food Recovery Programs
- Capacity Planning
- Recovered Organics Waste Products Procurement

Article 11 of SB 1383 outlines the organics capacity planning requirements for jurisdictions. Starting in 2022, jurisdictions were required to estimate the amount of organic waste that will be disposed of, identify the available amounts of existing organics recycling infrastructure capacity, and estimate the required new or expanded organics recycling infrastructure to comply with SB 1383. At the time of this report, there are 126 jurisdictions with CalRecycle-approved Correction Action Plans (CAPs). While all of these CAPs may not relate to a jurisdiction's lack of organics recycling infrastructure capacity, the lack of organics recycling infrastructure capacity has been identified as a potential hurdle for SB 1383 compliance.

Many newly developed and/or expanded composting facilities in California anticipate utilizing mechanized aeration systems (instead of traditional turned windrow composting) to enhance the biological process and minimize emissions to meet air quality requirements. These systems are referred to as aerated static pile (ASP) composting systems. ASP composting systems use fans to deliver ambient air to the composting pile and can either be pipe-on-grade or constructed with subgrade aeration.

A biocover (e.g., compost cap), geomembrane cover, or biofilter (for negative ASP, where air is pulled through the pile) is often paired with these systems. ASP systems have been shown to have a significantly reduced composting retention time compared to windrow composting, as well as require a smaller footprint. For the purposes of this Study, CalRecycle is only interested in ASP composting activities, or the equivalent.

[4] Capacity Planning for Organic Waste Recycling - CalRecycle Home Page

[5] SB 1383 Infrastructure and Market Analysis, CalRecycle 2019.

Purpose

Given the elongated timeline associated with large-scale commercial facilities, and the emerging processing technologies, CalRecycle seeks to understand the permitting pathways and barriers specifically for small- and medium-sized composting activities that utilize ASP systems or equivalent systems.

Approach

The HDR Team developed a work plan to outline the following tasks and approach for this study:

1. **Develop best management practices (BMPs) for identifying locations suitable for siting small- and medium- sized composting activities**. This involved reviewing all municipal codes for city- and county- specific information related to permitting composting activities and all available CEQA information available for small and medium composting activities. This desktop research is supplemented by the project team's knowledge of industry trends and examples of permitting barriers. Based on this research and team insight, the HDR Team developed land use recommendations to assist these composting activities in working with local planning agencies, streamlining the CEQA process, increasing public awareness, and streamlining the local land use permitting process. These recommendations contributed to a Siting BMP Template tool to assist developers in understanding the local land use and CEQA requirements.
2. **Identify and list a summary of permitting requirements for each local or regional air and water permitting agency.** This involved desktop research of attainment and nonattainment zones, compost specific rules, and Emission Reduction Credits (ERCs) for all air districts. The project team created and distributed surveys for all 35 air districts and nine (9) water boards.
3. **Identify and list a summary of permitting challenges and solutions.** This included a summary of the permitting process, challenges, and recommended solutions at all stages of permitting.
4. **Perform an economic analysis including a range of costs for the permitting and operation of small and medium composting activities.** This included survey creation, distribution, and analysis for 10 local planning agencies and 10 composting facilities and/or operations.
5. **Identify best management practices for operating small and medium composting activities.** The HDR Team identified operational challenges and methods for receiving, processing, and marketing at these sites. A summary of all permitting challenges and solutions is provided in addition to case study examples. Good neighbor policies are included as recommendations on how composting activities can demonstrate community benefit, specifically giving attention to the socioeconomic factors identified statewide for Disadvantaged Communities.

The HDR Team gathered data through various methods and from numerous sources including:

- Statewide surveys to cities and counties, compost operations and facilities, planning agencies, air districts, and RWQCBs.
- Public databases (SWIS).
- Google Earth.
- The HDR Team's combined decades of experience assisting in the development, permitting, and operations for composting activities across California.

This information was used to conduct an analysis of the permitting requirements, challenges, and opportunities, as well as capital costs and operational recommendations.

Siting Small- and Medium-Sized Composting Activities

The purpose of this task is to obtain relevant available information related to the land use entitlement and California Environmental Quality Act (CEQA) processes applicable to small- and medium-sized composting activities to identify and recommend BMPs to help prospective operators and local governments identify locations for these composting activities, improve the local land use approval outcomes, and streamline these activities' CEQA review. The BMPs identified in this technical memo are for consideration and guidance only, and not meant to be a requirement for the permitting and development of composting activities.

Defining Small- and Medium-Sized Composting Activities

For the purposes of this study, CalRecycle defines small and medium composting activities as follows:

- **Small Composting Activities:** Up to 5,000 cubic yards of material on site at any given time.
- **Medium Composting Activities:** Up to 12,500 cubic yards of material on site at any given time.
- **Both Small and Medium Composting Activities:**
    - Feedstocks include one or more of the following: agricultural material, green material, food material, and vegetative food material.
    - Operate in compliance with Environmental Health Standards as described in 14 CCR, Division 7, Chapter 3.1, Article 7, including:
        - Maximum metal concentrations and pathogen reduction pursuant to Title 14 Section 17868.3 and Section 17868.2.
        - Physical contamination limits pursuant to Title 14 Section 17868.3.1.
    - Utilize a covered aerated static pile (ASP) or equivalent system.
        - A composting system or technology that is equivalent system to an ASP system is one that provides the same or similar level of efficacy with regard to:
            - Compliance with the composting operating standards (i.e. odors, noise, vectors, etc.) pursuant to 14 CCR Section 17867.
            - Protection from potential harm to public health and safety, and the environment.
            - Time and resources.

How did CalRecycle come up with these size thresholds?

Under CalRecycle's Enforcement Agency (EA) Notification Tier regulations, "small" composting activities may fall under the Research Composting Operations category, whereas "medium" composting activities may fall under either: 1) agricultural material composting operations, 2) green material composting operations, or 3) vegetative food material composting facilities. Vegetative food material composting facilities fall under CalRecycle's Registration Permit Tier while other "medium" composting activities fall under an EA Notification.

More information about the CalRecycle permitting process can be found in Section V.

III Best Management Practices for Siting Small and Medium Composting Activities

Purpose

The purpose of this task is to obtain relevant available information related to the land use entitlement and CEQA processes — applicable to small- and medium-sized composting activities — to identify and recommend BMPs to help prospective operators and local governments:

- Identify locations for these composting activities,
- Improve local land use approval outcomes, and
- Streamline these activities' CEQA review.

The BMPs identified in this technical memo are for consideration and guidance only, and not meant to be a requirement for the permitting and development of composting activities.

To accomplish this, the HDR Team selected a variety of counties and cities throughout California to review current municipal codes and their inclusion, or exclusion, of compost-specific requirements. Next, we reviewed a number of small- and medium-sized composting activities as recorded by CalRecycle through its Solid Waste Information System (SWIS) to evaluate each activity's composting technology and applicable land use approvals, if any. In addition, the HDR Team pulled from its decades of experience siting, permitting, and helping others develop composting activities in California to draw on additional information that may not be publicly available.

Land Use Requirements Review

Municipal Code Review

County and City Selection Process

The following 12 counties and 12 cities, listed in **Table 3** and **Table 4** respectively, were selected to research the local land use permitting pathway for small- and medium-sized composting activities based on their diverse representation of the following criteria:

- Population density
- Geographic size and location
- Prevalence of existing organics processing activities
- Applicable air district
- Applicable regional water quality control board (RWQCB)

Table 3 and **Table 4** below summarize the research findings on permitting regulations for these selected counties and cities. The HDR project team deduced that the municipal codes either did not define composting activities or defined them in a general

definition or an expanded definition (e.g., included additional sub-categories for composting activities). Composting regulations for the cities and counties researched were categorized as:

- "Composting Defined, Expanded Definition," where composting was explicitly defined, and the regulations were specific to the size or type of composting operation.,
- "Composting Defined, General Definition" where composting was explicitly defined, and the regulations included compost zoning ordinances but were not specific to the size or type of composting operation., or
- "Composting Not Defined" where composting was not defined or mentioned in the city or county zoning code.

Table 3: Summary of Permitting Regulations in Select Counties

County	Permitting Regulations
Butte	Composting Defined; General Definition
Sonoma	Composting Defined; Expanded Definition
Sacramento	Composting Defined; General Definition
Santa Clara	Composting Defined; General Definition
Monterey	Composting Not Defined
Fresno	Composting Not Defined
Ventura	Composting Defined; Expanded Definition
Los Angeles	Composting Defined; Expanded Definition
San Bernardino	Composting Defined; General Definition
Riverside	Composting Defined; General Definition
Mono	Composting Defined; Expanded Definition
San Diego	Composting Defined; Expanded Definition

Table 4: Summary of Permitting Regulations in Select Cities

City	Permitting Regulations
Alameda	Composting Not Defined
Bishop	Composting Not Defined
Fresno	Composting Defined; General Definition
Los Angeles	Composting Defined; Expanded Definition
Ontario	Composting Defined; General Definition
Redding	Composting Not Defined
Riverside	Composting Defined; General Definition
Sacramento	Composting Defined; General Definition
San Diego	Composting Defined; Expanded Definition
San Jose	Composting Defined; Expanded Definition
Santa Barbara	Composting Not Defined
Ukiah	Composting Defined; General Definition

City and County Research Results

The research pertaining to permitting pathways for small- and medium-sized composting activities in the selected cities and counties revealed that most county municipal codes included some specific reference to composting activities, whereas it was less likely to find expanded composting definitions in city municipal codes. It is important to note this may not be a trend across the state but was a trend in the jurisdictions sampled in this study. The following sections explain our research findings in greater detail.

COUNTY MUNICIPAL CODE SUMMARY

The municipal codes for the 12 counties were researched to determine the land use permitting requirements for small and medium composting activities in each county. Within the municipal code, most counties clearly defined composting operations and provided some level of permitting and zoning requirements for such operations.

Several counties including Sonoma, Ventura, Los Angeles, Mono, and San Diego provided sufficient levels of detail in their code for composting and permit requirements. These counties are labeled as “Composting Defined, Expanded Definition” in **Table 3.** These counties defined composting and further classified it into more specific categories. For example, several counties including Sonoma, Ventura, and Mono, divided their permitting regulations into commercial and noncommercial (or “on-site”) composting operations with specific feedstock quantity limits for each. These quantity ranges and limits can be found in **Appendix A**. Similarly, counties like San Diego and Los Angeles provided further classification by separating zoning regulations by feedstock type. For example, Los Angeles county specifies permitting requirements for feedstock types such as green waste only, mixed waste, vermiculture, and in-vessel composting.

Several other counties had clear composting definitions in their code, but the zoning regulations only discussed composting operations in a general sense. These counties are defined as “Composted Defined, General Definition” in **Table 3**. Butte, Santa Clara, and San Bernardino counties all clearly define composting operations for their county but do not expand on that definition to identify certain tiers. For example, Butte County defines composting operations broadly, but does not refer to the type or quantity of feedstock encompassed within the definition. In addition to these three counties, Riverside County’s municipal code explicitly mentions composting operations and specifies permitting regulations for composting but does not actually define what the code considers to be a composting operation. This would make it difficult for a composting operation to determine which regulations apply to them.

Finally, some counties, including Monterey and Fresno, had no clear mention of composting operations in their zoning code. These counties are listed as “Composting Not Defined” in **Table 3**. While these counties did not explicitly mention composting, they did discuss regulations for similar facilities. For example, Fresno County broadly defines and outlines the regulations for “Solid Waste Facilities” which is likely where composting would fall in their code. Monterey County called out “Solid and Liquid

Disposal Sites" in their code but did not define what was included in that classification. Furthermore, there was only one zone in the code that allowed for use of that type of site. Because composting is not specifically called out in these codes, it is difficult to determine if composting operations are included in the adjacent classifications.

CITY MUNICIPAL CODE SUMMARY

Municipal codes for the 12 cities were researched to determine the level of permitting requirements for small and medium composting activities in each county. Each city's code presented various levels of compost regulations. Some cities defer to the county or state requirements, while others outline a city-level regulation standard on composting activities.

Similar to their respective counties, the city of Los Angeles, city of San Jose, and city of San Diego provided guidance on organic facility regulations within their city zoning codes. These cities are listed as "Composting Defined, Expanded Definition" in **Table 4**. The city of San Jose defines the recovery requirements of High Diversion Organic Waste Processing Facilities established in the California State Requirements for Transfers/Processors. The municipal code outlines regulations for composting facilities under the recycling facilities section, providing best practices to be followed in landscaping, noise, drainage, and nuisance (i.e., pests) aspects. The city of San Diego's municipal code describes the agricultural and residential zoning regulations for a green material composting facility and a mixed organic composting facility. Agriculturally zoned green material composting facilities involve permit requirements for on-site composting, regulations on what materials can be composted and composting location limitations. Residentially zoned green material composting facilities require a neighborhood use permit defined in the city of San Diego's municipal code. Mixed organic composting facilities are required to obtain a conditional use permit whether agriculturally or residentially zoned. The city of Los Angeles has specific definitions for commercial composting and chipping and grinding operations. These cities provide clear zoning uses for various types of composting activities.

The city of Ukiah, city of Santa Barbara, city of Sacramento, city of Riverside, and the city of Ontario, provided definitions of composting and composting or recycling facilities. These cities are listed as "Composting Defined, General Definition" in **Table 4**. The city of Ukiah defines community composting, organics, and various recycling or solid waste processing facilities, but not a composting facility directly. There is a permitted use for "Refuse disposal/recycling areas and refuse transfer stations and similar uses" which can be interpreted as a potential site for a compost facility, but it is not clear which composting activities this applies to. The city of Ontario defines community composting, urban farms, and general waste treatment or disposal for permitting but does not expand on these definitions into certain tiers. The city of Sacramento includes a green waste facilities definition within its recycling facilities definition, providing slightly more direction for green waste processors.

Several cities including Alameda, Bishop, Santa Barbara, and Redding did not have designated regulations for composting. These cities are listed as "Composting Not

Defined" in **Table 4**. These cities often have zoning uses for general solid waste, recycling, or utilities facilities but do not specifically identify or define any composting activities.

Land Use Approvals and Environmental Review

Land Use Process Overview

The HDR project team assessed the potential additional land use requirements applied to small- and medium- sized composting operations and facilities by reviewing adopted CEQA documents for the identified small- and medium-sized composting activities. This review compiled commonly identified environmental impacts and associated mitigation measures.

Initial Facility Assessment

The HDR Team compiled a list from CalRecycle's SWIS of the Excluded Tier, EA Notification Tier, and Registration Tier (vegetative food material composting facilities) composting operations. The EA Notification Tier composting activities included research composting operations, green material composting operations, and agricultural composting operations. In total there were 249 composting activities that fell in the above categories, with most being described as an agricultural composting operation. Most excluded and agricultural composting operations predominantly handled manure.

Through review of the documents included on SWIS, as well as research through investigation of company websites and reviewing Google Earth aerials, after review of nearly 100 composting activities, few EA Notification Tier composting activities were identified as using an ASP system or equivalent. This range of composting activities reflects significant changes to the composting operation over time from its initial EA Notification Tier application, such as a halt in operations, an expansion of the activity, or the activity is co-located with other solid waste activities and falls under a full SWFP. All other EA Notification Tier and Registration Tier composting activities reviewed from SWIS appeared to utilize windrow composting (i.e., static piles). Stand-alone facilities were easy to identify, however, composting activities integrated with other solid waste activities were less readily distinguishable.

ASP Facility Land Use Review

The following is an overview of the land use process and environmental review applicable to each identified small- and medium-sized composting operation, as publicly available.

LAND USE APPROVALS

Although composting of smaller volumes may be an allowable use in some zoning classifications, the municipal zoning code may require project-specific discretionary approval typically in the form of a Land Use Approval. This can vary depending on the jurisdiction, site location, zoning code, the allowed uses in the jurisdiction, etc. It is common for a facility to have to apply for a Conditional Use Permit (CUP) or other land

use entitlement. The application for the land use entitlement (a discretionary action) is typically what triggers the CEQA process.

Of the few EA Notification Tier composting activities identified, most did not have copies of their land use permits documented on SWIS. In some cases, supporting documents referred to a site's land use permit, such as a CUP, but the permits themselves were not available for review. In some cases, no mention of the land use permitting process was confirmed nor included in their SWIS document repository.

Similar to the CEQA review process, the adoption of a CUP grants the operator a permit to operate with specific conditions the activity must comply with. These conditions may coincide with the BMPs outlined in a Negative Declaration or the mitigation measures incorporated in a Mitigated Negative Declaration (MND) or Environmental Impact Report (EIR). They may also be viewed as standalone conditions, as they typically relate to compliance with administrative and regulatory requirements rather than mitigating potential environmental impacts, although there is often some overlap. For example, a condition of the permit may be to obtain the necessary approvals from local, state, and federal agencies which typically include air, waste, and water agencies. Whereas, in a CEQA document the mitigation measure may be more specific to an environmental impact, not a permit, and require the project use Best Available Control Technology (BACT) to mitigate air emissions or control and manage the 25-year, 24-hour storm event.

Some examples of permit conditions identified in this research are as follows:

- Applicant shall contact the regional air district and obtain all necessary permits prior to commencement of composting operations.
- The project is subject to applicable noise standards in the General Plan.
- Existing buildings as well as any new building shall comply with the local fire code.
- The application along with supplemental exhibits and related material shall be considered elements of this entitlement and compliance therewith shall be mandatory unless the lead agency has approved a modification.

This permit is subject to the securing of all necessary permits for the proposed development and eventual use from the jurisdiction, state, and federal agencies having jurisdiction. Any requirements imposed by an agency having jurisdiction shall be considered a condition of this permit.

ENVIRONMENTAL REVIEW

Depending on the size and scope of the composting project, a jurisdiction with lead agency authority under CEQA may conduct an Initial Study, the first step of a CEQA process unless the project is exempt. The Initial Study often concludes in a Negative Declaration (ND), MND, or other CEQA project declaration that will be necessary for the study. Some large projects require additional levels of CEQA analysis, namely an Environmental Impact Report (EIR), but MNDs are the most common for most small-

and medium-sized composting activities. Complying with CEQA is typically a costly and time-consuming process.

One of the critical differences between the EA Notification Tier and obtaining higher tier CalRecycle permits such as the Registration Tier or full SWFP is whether or not there is a discretionary action at the state level. If CalRecycle or another state agency takes a discretionary action, such as approving a permit, for the composting operation, the final CEQA document is required to be sent to the state clearinghouse for circulation to all state agencies to perform an additional review. This may further complicate and lengthen the time of a project's CEQA review compared to only local circulation of the CEQA document to the other lead agency (i.e., jurisdiction) departments.

Of the small- and medium-sized composting activities identified, there was a mixture of CEQA clearance documents which included Statutory and Categorical Exemptions, Negative Declarations, and MND. It should be noted that the CEQA pathway could not be verified for all composting activities.

1. *Statutory and Categorical Exemptions*

Title 14 California Code of Regulations (CCR) Chapter 3, Article 18, allows for a variety of Statutory Exemptions and Article 19 allows a variety of Categorical Exemptions from CEQA. Based on the information from SWIS, two types of exemptions were selected for approval of small and/or medium composting activities. In no particular order, one deemed the project a ministerial project. From Section 15268:

> *"a) Ministerial projects are exempt from the requirements of CEQA. The determination of what is "ministerial" can most appropriately be made by the particular public agency involved based upon its analysis of its own laws, and each public agency should make such determination either as a part of its implementing regulations or on a case-by-case basis."*

The statement of reason for this particular ministerial exemption is that the operation is defined and authorized by state regulation Title 14 CCR, and the processing of the notification is a ministerial action by the Local Enforcement Agency (LEA). Based on the HDR Team's experience, a ministerial exemption is often used for very small projects.

Another composting activity was deemed to be exempt as a Class 1 Existing Facility. From Section 15301:

> *"Class 1 consists of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographic features, involving negligible or no expansion of existing or former use."*

This particular composting activity was already composting, and this exemption was to increase the activity's daily tonnage throughput while staying within the CalRecycle EA Notification Tier overall capacity limits of 12,500 cubic yards on-site at any time. In cases such as this one, the operation would still need to contact the LEA regarding

the planned change in operation and follow the LEA's procedures for written notification and obtaining applicable local, state, or federal approvals.

2. *Negative Declaration*

The Negative Declaration did not include any project-specific mitigation measures but required regulatory oversight by CalRecycle and the LEA and required the site to adhere to BMPs as they apply to air quality. These BMPs pertain mostly to dust control, but also emissions minimization from vehicles, and signage for the public should they want to file a complaint. An excerpt of these BMPs are as follows:

- All exposed surfaces (e.g., parking areas, staging areas, graded areas, and access roads) shall be watered to reduce dust at least twice each day except during rainy weather.
- Pave, apply water three times daily, or apply nontoxic soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites.
- All haul trucks transporting loose material off-site shall be covered.
- All nonelectric powered equipment shall meet local air district requirements for diesel emissions.
- A publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints shall be posted at the main entrance. This person shall respond and take corrective action within 48 hours. The air district's phone number shall also be visible to ensure compliance with applicable regulations.

3. *Mitigated Negative Declaration*

The purpose of the MND is for when a proposed project could have a significant impact on the environment, project-specific mitigation measures are incorporated into the project for the project to have a less than significant impact. The MNDs provided a series of mitigation measures which are sorted by category. Some of the notable measures are as follows:

Air Quality:

- Applicant must comply with all applicable air quality regulation requirements including those from but not limited to the local air district, CalRecycle, and the LEA.

Geology:

- The applicant must submit detailed grading and drainage plans. In addition, the applicant must comply with any applicable regulations from the Public Works Department.

Hydrology and Water Quality:

- The applicant must submit detailed wastewater discharge and drainage plans to the Public Works Department. In addition, the applicant must comply with any applicable regulations from the Public Works Department.
- The applicant and facility must comply with RWQCB regulatory requirements.

Noise:

- Heavy equipment operations such as chipping, grinding, or the use of front-loaders or truck activities such as deliveries related to the project shall occur between the hours of 6:00 a.m.-6:00 p.m. Monday-Saturday, with none of the previously mentioned activities occurring on Sundays.
- The applicant will comply with the lead agency's noise ordinance.

Odor:

- It is also common for facilities to adopt an Odor Impact Minimization Plan as a measure of the MND. Such plans usually contain operating procedures with respect to aeration, moisture content, temperature of the pile, and other potential sources of odor. Examples of these procedures include taking temperature readings, maintaining the pad drainage, and proper dispersal of new material to allow drying. These procedures are not standardized and vary from facility to facility.

Industry Trends

Common Trends

Composting operations are often an adjunct to another business. Some composting operations have been successful by siting near or adjacent to these existing activities. To note, there are five commonly observed approaches to developing composting activities.

1. Expand or improve an existing composting facility.
2. Expand or modify a site that is already permitted to handle similar materials, such as:
   A farm. Many composting operations are located on farms. Typically, composting materials are generated on-site, but these operations may also compost off-site feedstocks.
   A wastewater treatment plant (WWTP). Composting on the same site as a WWTP is granted the lowest permit tier – an EA Notification. So, composting even large quantities of biosolids can be done at a lower tier, if it's on the same property as the WWTP.
   A permitted solid waste facility. Many medium-sized composting facilities are located at or adjacent to existing solid waste facilities,. This includes landfills,

transfer stations and/or Material Recovery Facilities. Similar to a WWTP, a compost facility co-located at an existing, permitted facility may have a lower permitting threshold and may be able to share some of the existing infrastructure.

A landscape yard. Landscapers generate lots of organic material as part of everyday operations. Landscaping business' yards can be co-located with a composting operation. In addition, the landscaping business may be able to utilize the product in its daily operations.

3. Certain agricultural lands. Certain agricultural lands are ideal for composting, but local zoning may encourage or discourage their use. The majority of compost produced in California is sold to agriculture, so composting on agricultural land is typically seen as a compatible land use activity.
4. A confined animal feeding facility or facilities. Dairies and feedlots are a major source of manure, and this material is increasingly composted on site.
5. Remote, industrially zoned land. Often siting physically far from sensitive receptors on industrial land has been a successful strategy.

Opportunities

The EA Notification Tier has been successfully used in the development of numerous composting operations in California. Numerically it is the most common level of entitlement for composting operations. An EA Notification Tier is not the same as a permit. By streamlining some of the entitlement processes, the EA Notification Tier has allowed a number of facilities to get up and running in a relatively short amount of time and with minimal investment in the entitlement process. Several fully permitted facilities initially started as EA Notification Tier operations and as volumes increased over time the operation obtained a full SWFP. But many operations also find they can exist at the EA Notification Tier level quite successfully.

Barriers

Siting a composting facility can be challenging in California, granted siting various types of other processing facilities in California also can be challenging. While composting sites are necessary infrastructure for communities in California (especially under SB 1383) most planning and other regulatory agencies still do not have much familiarity with these activities and sometimes struggle with the appropriate level of oversight.

There are numerous examples of potential sites encountering considerable barriers to being developed as a composting operation in California. These include sites with a history of failure, located in the wrong zoning code or perceived zoning code, encountering overwhelming opposition, lack of critical utilities (like access to water) excessive hauling costs, floodplain or proximity to water sources, inadequate roads, unbuildable soils, and land use compatibility.

History of Failure. Several companies have tried to develop composting operations on a site where a compost facility has failed previously (for a variety of reasons). While it is difficult to ascertain why, this has typically not been a successful strategy. The memory of neighbors may be long, even if the new company had nothing to do with the previous operation.

Located in the wrong zoning code. Zoning is a somewhat fickle condition and, as shown above, most jurisdictions do not have composting specific allowances in their zoning code. Therefore, the use of a zoning designation can be open to some interpretation whether a proposed operation can be considered compatible with existing uses. Some cities have a vision for that jurisdiction that may be subject to interpretation but is used as a means of excluding composting operations, which, it must be said, while functional, are not locally popular land uses.

Overwhelming Opposition. Some sites encounter overwhelming opposition before the project even gets started. At times, just a public notice of a proposed project can bring out opposition. This is usually in the form of neighbors, who can organize quickly and effectively. Each community has its own standards of what land uses are and are not compatible with that community. Organized opposition can be very difficult to overcome and has successfully stopped some composting projects.

Lack of Access to Utilities. Composting operations need a sufficient source of water. Electrical and telephone service can be optional, but decent roads and sufficient water are critical. Sites without on-site sources of water are unlikely to get developed. For example, the site shown in **Figure 3** at a publicly owned landfill might have been a good composting site but lacked any usable water source.

Figure 3. Example of Site Lacking Access to Utilities

Excessive haul distances. Successful composting operations can be sited near the source of feedstock or near the end market, or somewhere in between. Compost operations are often sited on the fringe of urban/suburban development. In some cases, really good candidate sites are just too far away to make the economics work. This issue can be particularly acute in some of the mountainous parts of California where materials may need to be hauled to lower, flatter elevations, but that can make the economics of the project unworkable.

Floodplain or proximity to water sources. Being located in the 100-year floodplain isn't a fatal flaw in most cases but may incur increased costs depending on the jurisdiction. Similarly, the RWQCB can't prohibit a facility from being located in a 100-year floodplain, but the need for ditch berms, and other control structures may strain the project economics. Compost operations should be located as far as possible from water sourses, which may further constrain operations. Unless the operation is under a roof, it will also need to manage stormwater. Most compost operations should seek coverage under the National Pollutant Discharge Elimination System process. In most cases this means preparing a Stormwater Pollution Prevention Plan and collecting quarterly samples of any stormwater runoff. If possible, it can be advantageous to try to have zero discharge of stormwater from the site. There is an entire universe of BMPs both structural and nonstructural that can be employed from other industries to help manage stormwater on a compost site. But avoiding sites with steep slopes and challenging drainages goes a long way.

Inadequate roads. Even smaller composting operations need adequate roads to handle the delivery of feedstock and the output of finished compost. Some roads are not designed for this and bringing an inadequate road up to standard may be prohibitively expensive. Similarly, the traffic load may necessitate improvements like deceleration lanes or traffic lights which add to the cost of developing an operation.

Unbuildable soils. Most EA Notification Tier composting operations are constructed on native soil and that soil must be able to withstand all-season operations and lots of heavy truck and equipment movement. Not all soils are made for this. While there may be engineered mitigations for this, having inadequate site soil may add to the cost of the project.

Land Use Compatibility. This can be a challenging criterion to understand as land use changes over time and compatibility can be in the eye of the beholder. But certain land uses — especially those housing sensitive receptors — are best left for other projects. These include large concentrations of people — lots of houses, hospitals and clinics, schools, sports stadiums, and similar. Several California projects have been located next to prisons and jails and have not been successful at co-existing.

Municipal Code Recommendations

As noted from the municipal code analysis, often local jurisdictions do not have compost-specific language in their individual municipal codes. This opens the door to jurisdictions having significant leeway for interpretation. Having the appropriate, compost-specific language and zoning information in a jurisdiction's municipal code is critical to streamlining the land use process. Although a jurisdiction may require a Conditional Use Permit and appropriate CEQA review such as a MND or even an EIR which may require a significant amount of time, it helps the proposed project tremendously to have the permitting pathway clearly outlined.

The HDR Team's recommendation related to jurisdiction's municipal code is to update its code to include compost-specific language. Ideally this inclusion of compost-specific language will specify the permitting pathway by size (small, medium, or large) and type (typically categorized by feedstock type).

Siting Recommendations

Based on the data collected and the HDR Team's siting and permitting experience, the following considerations will assist small- and medium-sized composting activities to better identify suitable locations for these activities. Selecting an appropriate property is key to a successful project, and in turn helps with the local land use permitting process. The following BMPs address how a composting activity can improve its permitting strategies. However, it is important to note that these are recommendations for consideration. Finding a successful site for a composting operation can be very site specific, and rarely does a "perfect" site exist.

Siting Considerations

> *"Choosing the location of a composting facility is perhaps the most consequential decision one can make regarding the sustainability of the composting efforts."*
>
> Chapter 10
> The Composting Handbook

Siting Criteria for Commercial Compost Sites[6]:

- Secluded land
- Vacant, relatively flat land/Open field
- Sufficient size
- Proper zoning or land use designation
- Minimal environmental impacts
- Minimal cultural impacts
- Distant from sensitive populations
- Sufficient distance from airports
- Good truck access
- Close proximity to feedstock sources and/or compost users
- Visual buffer
- Availability of water
- Availability of electricity (and other utilities) on site
- No drainage problems (need to manage stormwater)

There are several criteria that may be used to evaluate site suitability for composting activities. The HDR Team identified some key criteria and further broke these down into five categories. Again, it is important to note these are siting considerations and may not be required for a particular project, or similarly may not be all inclusive for what a proposed project needs to evaluate prior to permitting and development:

Categories of Site Suitability Criteria:

- **Jurisdictional Criteria** – relates to the parcel zoning designation and land use permitting requirements;
- **Land Criteria** – relates to the property specifications such as size and availability;
- **Accessibility Criteria –** relates to the vehicular accessibility of the site and utility availability;
- **Feedstock Criteria** – relates to the proximity of available feedstocks and the quality of such feedstocks;

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[6] Richard, T.L. and M. Chadsey. 1994. Environmental Impact Assessment. In: *Composting Source Separated Organics.* Edited by BioCycle staff. J.G. Press, Inc. Emmaus, PA. pp 232-237. Also published in 1990 as: Environmental monitoring at a yard waste composting facility. *BioCycle.* 31(4):42-46.

- **Environmental Factors** – relates to environmental factors, with priority given to potential air quality and water quality impacts.

Jurisdictional Criteria

Proper Zoning Designation. As detailed above, the local jurisdiction may or may not have specific zoning designations (or limitations) on the ability to site a compost facility on a given parcel of land. Most composting sites are located on agriculturally or industrially zoned land, although exceptions exist. Despite proper zoning a composting operation may or may not require a conditional use permit or may need to comply with certain zoning requirements.

Land Use Compatibility. Successful composting must be compatible with its current and future neighbors. Tools like Google Maps/Earth and county GIS mapping systems can provide valuable information about the surrounding community to understand the surrounding land use and compatibility. These tools can be used to visualize the proximity to roads, bodies of water, airports, schools, and other uses that may need to be avoided.

Land Use Criteria

Existing Uses. Siting a composting activity on a new property, or greenfield site, can be more difficult than siting this activity on a property that is already developed and used as a waste processing facility. This is one reason why existing facilities that have other waste handling activities may be able to more easily add a small- or medium-sized composting facility than a site that has not yet been developed. This is not always the case, however, and depends on a variety of other considerations as discussed in this section.

Land Availability. Compost operations need space for parking, equipment, equipment maintenance, storage, and office space as well as areas for all of the functions of a typical facility including receiving, preprocessing, water on-site capture and treatment, and screening as well as the composting process itself and areas for storage and loadout of finished compost prior to sale, donation or transport to other final destination.

Location. Ideally the site is secluded to the maximum extent possible. To some extent, the truism of out of sight is out of mind is true for composting sites. Sites that are out of public view are sometimes easier to site and operate than sites that can be seen for miles. Trees and other visual barriers can be a real asset.

Distance from sensitive receptors. Sensitive receptors include homes, schools, places of business, hospitals, jails and any place with large concentrations of people, especially if they are outdoors. Ideally a compost site is located far enough away from sensitive receptors such that the impacts of the composting activity do not become a nuisance for surrounding residents, businesses or activities. As stated earlier, composting is often an adjunct to another primary business, but that doesn't mean that the best place to site a composting activity is adjacent to that adjunct activity. The scale

of the activity, and the feedstocks and the way in which they are processed all contribute to how close the neighbors should be. Further is always better.

In other words, the more putrescible the feedstocks, the further receptors should be to avoid potential external issues at the site. The ability to manage feedstocks well and optimize compost process parameters will also contribute to frequency of odor complaints.

It is important to note that if subject to a local land use and CEQA approval process, the operation may be subject to a discretionary public hearing and public comment period. If this were to happen, it is critical for the facility to gain public support either through local community groups, neighboring businesses or homes, and elected officials. Engaging early with the public will help increase public awareness and help foster a positive experience during the public review and approval process.

Accessibility Criteria

Good Truck Access. Regardless of where the site is located it will need truck access whether delivering feedstock or delivering finished products. A good site will allow for all-weather access to the largest trucks anticipated by the facility.

Utility Availability (especially water, but also electric). Almost all compost sites require water, typically a large source of water. This can be a well, a public source, or even reclaimed water. Water is mostly used for process needs, but also for dust control and fire-fighting needs (though compost fires are often better fought with earth-moving equipment). Some sites are able to operate with an off-site water source, but that complicates the economics of the project.

Feedstock Criteria

Feedstock Availability. Ideally feedstock sources are close to the facility (unless the site is near the sources of end uses). Most compost feedstocks are bulky and excessive hauling can make or break the economics. Composting sites should also be sited closer to the alternative disposal sources (unless legislation mandates composting).

Service Area. Consider the tributary geographical area that will utilize the facility. Identify the locations of other compositing facilities to understand the need for a facility. Outing a Service Area will help analyze the feedstock that the facility will serve.

Environmental Factors

Floodplain Determination. Development in the 100-year floodplain is not prohibited but may cause the local jurisdiction or the RWQCB to require expensive mitigations like berms, and other flood control devices.

Proximity to Water Bodies. Ideally compost operations are located some distance from natural or man-made water sources. Even if the site is held to a zero-discharge standard for stormwater.

Depth to Groundwater. The RWQCB will determine what an appropriate percolation test is for a medium facility, but the greater the depth to groundwater the better.

Soil Permeability. The SWRCBs General Waste Discharge Requirements for Composting Operations dictates a certain permeability for the composting pads and in some cases for the retention pond, if required. In general, a composting site should have an all-weather surface and a surface that will not allow contact water to seep into groundwater or discharge off-site to surface water.

Site Topography. In general, a compost operation is ideally situated on a large piece of land that is vacant and has flat terrain. Small amounts of grade can be tolerated but will add to operational costs.

Siting Considerations Toolkit Template

The following is a recommended format for CalRecycle to develop a Siting BMP Toolkit that can be used for conducting a simplified study to help developers understand what makes a suitable compost facility based on combing many factors including local land use data, CEQA requirements, and take in the consideration of situational factors that impact the site positively and negatively. It is important to note this is only a suggested template based on the findings of the HDR Team's research described in this technical memo, and that this tool can be modified to perform potentially limitless possibilities.

Geographic Information Systems (GIS) Sample

GIS is a comprehensive mapping tool that is able to store, manage, and analyze various types of data. It is often used by jurisdictions to display their land use zoning designations throughout their municipality through the use of a GIS property map viewer. Using these applications, users can search and scroll over a parcel to learn property-specific information.

For this project, the HDR Team envisions that a Site Suitability Considerations Tool (Siting Tool) can be created using GIS technology. This tool will showcase key land use information related to the parcel, the appropriate land use permitting pathway based on that land designation and identify if the property falls within the other site suitability considerations outlined in Section 5.1 of this Technical Memo.

Site Suitability Analysis is a GIS-based process used to determine the appropriateness of a particular area for a specific use, in this case composting activities. This involves analyzing multiple layers of data to assess the compatibility of a site with proposed development, considering various factors including environmental conditions, regulatory requirements, accessibility, and potential impacts on surrounding areas.

When developing GIS applications for different counties in California, particularly for tasks like Site Suitability Analysis, the variability in local data structures present significant challenges. Below, we discuss three approaches to address this issue:

- 1) Developing customized applications for each county,
- 2) Utilizing a standardized statewide data resource available from third-party commercial aggregators that routinely update county level data to identify parcel level candidates, or

- 3) Utilizing a GIS system

These approaches aim to facilitate identifying Site Suitability at a higher level and collect localized (parcel and zoning) information from participants.

Approach 1: Developing Customized Applications for Each County

This approach involves creating separate GIS applications tailored to the specific data structures and needs of each county in California. This could mean developing unique data models, interfaces, and analysis tools for each county to ensure compatibility with local data formats, regulations, and data access.

Pros:

Local Optimization: Offers solutions that are precisely tailored to the specific requirements and existing data structures of each county, ensuring optimal functionality for each unique county. Can be optimized for local workflows and data processing needs, potentially improving efficiency for county-specific tasks.

Cons:

Time-Consuming: Developing customized applications for each county is time-intensive, requiring significant resources for design, development, testing, and maintenance. There are 58 counties in the state that need to be researched independently.

High Costs: Custom development, especially across many counties, incurs high costs in terms of research, technology, and ongoing record keeping for individual workflows.

Inconsistency: Different data standards and workflows across counties can complicate systematic canvasing of potential sites.

Approach 2: Utilizing a Single GIS Site Suitability Tool with Standardized Statewide Data Resources

This approach involves using a centralized data resource (available through third-party data aggregators) that provides standardized parcel and land use/zoning data across almost all of the counties across the state of California.

Pros:

Ease of Use: Users only need to familiarize themselves with one system, enhancing user experience and training efficiency.

Standardization: Offers consistent data structures and formats across counties, simplifying application development and statewide analysis at the parcel level.

Efficiency: Reduces the time and resources needed to develop and maintain multiple county-specific GIS applications.

Cons:

Costs: Accessing a centralized data resource can be expensive, particularly for organizations with limited budgets.

Licensing Agreements: Depending on the needs of licensing, coordinating with another organization for data accessibility could take time and resources. Users of the system would be limited to the organization that purchased the license agreement which would prohibit public use or use by third-party organizations (outside of CalRecycle).

Flexibility: Standardized data may not meet the unique needs or capture the nuances of individual counties.

Approach 3: Utilizing a GIS system as a tool to analyze, retrieve, and collect information from CalRecycle users on a map.

This approach includes the creation of a state-wide mapping system that would display and combine jurisdictional information (air districts, water boards, county boundaries) along with environmental factors (flood plains, water bodies, ground water depth, terrain type), and accessibility factors (road network, population), as well as locate existing composting facilities and areal/satellite imagery. U.S. Census and business/economic data may also be included to locate and measure feedstock. However, the system would not include comprehensive parcel-level data and zoning data. The system can be designed to collect information about individual parcels by sharing this to the system in a variety of ways (e.g., upload parcel boundary, coordinates, or sketching on the map). As real estate agents or scouting individuals find candidates, this information can be collected in the application to perform analysis.

Pros:

Ease of Use: Users of the mapping system could gain instant access to information that otherwise would need to be sourced individually and repeatably. Users can visualize pertinent layers of data in a single system. Users can contribute information and perform a site suitable scoring (on the limited layers) to evaluate the potential locations.

Flexibility: The system can serve users on a variety of levels by supporting instant access to geographical data that needs to be referenced routinely.

Resource Center: the system would support consistent jurisdictional and environmental data layers, to eliminate questionable resources.

Data Updates: would be minimized for jurisdictional and environmental data as this data is typically stable (not requiring frequent updates). Further, the system can utilize hosted data layers that are maintained by the authoring agencies (USGS, CARB, the California State Geoportal)

Con:

Local Level Analysis: This system would not be suitable for evaluating across all parcels, but only a single (shared) parcel in relation to the area at large. Collecting user information would involve validation practices to review user inputs. This solution requires local-level knowledge and utilizing other resources for parcels and zoning information.

Participation: This system would require involvement from participants, and it would need to be monitored consistently.

Development: Development of a GIS system would require substantial funding. The GIS developers would need expertise in developing collaborative applications.

Ultimately, the choice between these approaches depends on the specific needs, resources, and objectives of the organization and the users of the system. By comparing the three approaches, budget, usability, timeframe, and the organization's long-term goals may be considered in the decision making.

After the central collection of sourcing information from regional and local data structures into a system, the process of defining the criteria and weighting system begins.

Analysis and Weighting

Using GIS tools, each layer of data can be analyzed according to its importance to the overall suitability of a site. For example, proximity to feedstock sources may be more important than other factors and thus assigned a higher weight by the proposed operator and/or developer. GIS software allows for the application of weighted overlay analysis, where each factor is assigned a weight according to its importance, and a cumulative score is calculated for each location. This process assists with interactively filtering, scoring, and ranking candidate sites or areas based on compounding selection criteria.

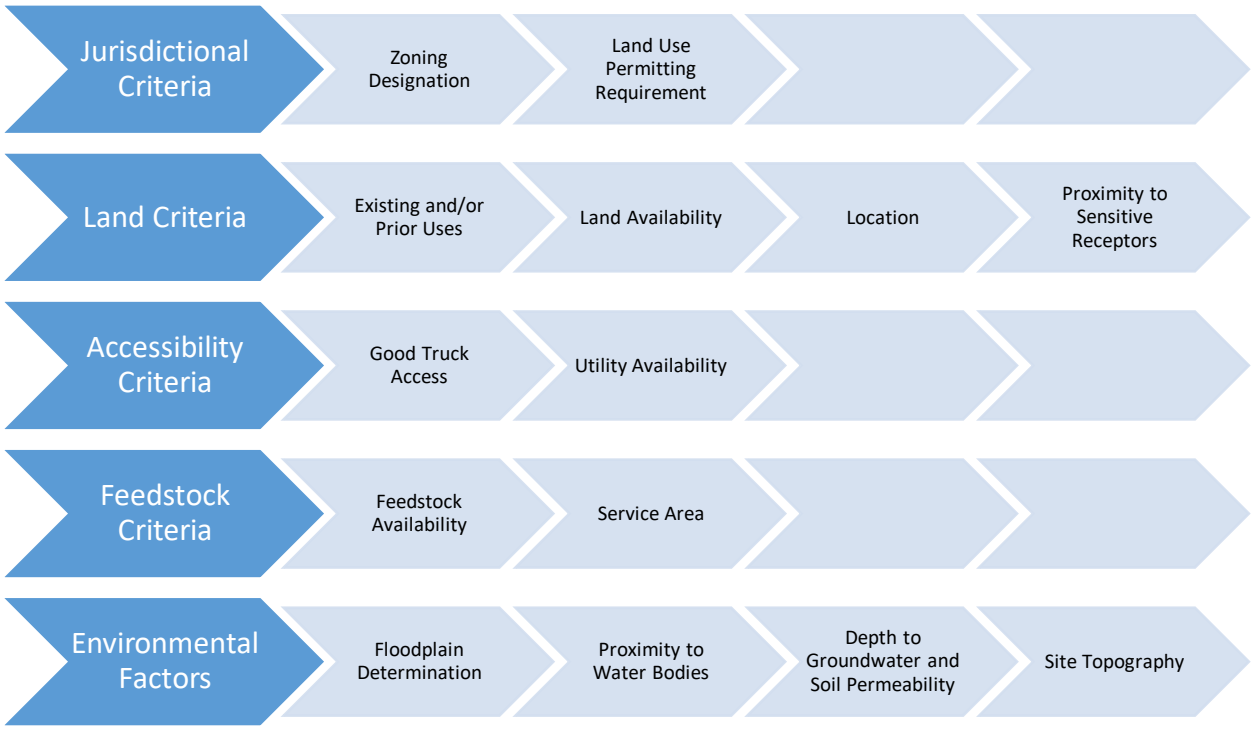
Developing an application to support a Siting Tool

A GIS application designed to support site suitability must be easy to use, data-driven, and optimized to produce important insights. It should provide robust analytical tools and clear visualization to aid in decision-making. The analysis tools should incorporate interfaces and algorithms that will be used for conducting the site suitability analysis, including overlays, buffering, and weighted criteria analysis. Designing a GIS application to support site suitability involves several steps, from initial concept to implementation and user interface design.

The following flow chart summarizes the information that could be available in this GIS tool.

Note: GIS systems typically approach site suitability from the top level (geography) downward to eliminate large areas quickly and prioritize the remaining areas, while a realtor/land finders would evaluate from the bottom (smallest level of geography) up.

Figure 4: GIS Siting Tool Flow Chart



Detailed GIS Tool Inputs

Jurisdictional Criteria

The following is an example of the type of information the user could obtain under the Jurisdictional Criteria. Depending on the utilized GIS system (county sponsored or aggregated resource), the user would be able to identify the individual parcel zoning designation and the appropriate permitting pathway for a small- and medium-sized composting activity.

Table 5: Jurisdictional Criteria GIS Input Example

Jurisdiction	GIS & Planning Data	Parameters
Butte County	Zoning (parcels highlighted)	Land Use Approval Required (pops up when parcel selected)
	Heavy Industrial (HI)	Permitted Use, Subject to Zoning Clearance
	Agriculture (AG), Agriculture Services (AS), Neal Road	Minor Use Permit

Jurisdiction	GIS & Planning Data	Parameters
	Recycling, Energy, and Waste Facility Overlay Zone (RW)	
	General Industrial (GI)	Conditional Use Permit
	All other zones	Use not allowed
Sacramento County	Zoning (parcels highlighted)	Land Use Approval Required (pops up when parcel selected)
Solid Waste Facilities	Heavy Industrial (M-2)	Conditional Use Permit
	All other zones	Use not allowed
Green waste Facilities	Agricultural (AG), Urban Reserve (UR, Interim Agricultural Reserve (IR), Light Industrial (M-1), Heavy Industrial (M-2)	Conditional Use Permit
	All other zones	Use not allowed

Other Siting Criteria

The following tables represent the various siting criteria discussed above, with assigning the ranking value through a user defined ranking system. This allows the user of the Site Suitability Application to assign values based on their site priorities. These ranges will need to be modified on a case-by-case basis depending on the specific project design criteria and development needs. Unacceptable values can be quickly eliminated as a candidate. The Ranking Value is a weighted value to prioritize the criteria with a score that can be further combined with other scores to provide a final site suitability score that is comprehensive in considering all factors. The GIS system should guide the user with standard Ranking Values; however, it may also be built to provide further input from the users while also documenting these inputs.

Table 6: Land Use Criteria GIS Input Example

Using GIS tools, users can analyze each potential site's surrounding landscape such as land use and identifying built-up areas.

Siting Criteria	Suggested Criteria to Change	Ranking Value (to be filled out by operator)
Existing Uses		
	Currently in-use and/or developed with similar activity such as Agricultural or Industrial	
	Currently in-use and/or developed with less intensive activity	
	Currently in-use and/or developed with more intensive activity	
	Currently not in use / not developed	
Land Availability		
	Less than 1 acre	
	1 to 5 acres	
	5 to 20 acres	
	More than 20 acres	

Table 7: Accessibility Criteria GIS Input Example

Using GIS tools, users can analyze each potential site's access to roads, urban areas, and users of the facility.

Siting Criteria	Suggested Criteria to Change	Ranking Value (to be filled out by operator)
Site Access		
	Nearby Highway / Freeway	
	Nearby Metropolitan / Urban Area	
	Nearby Potential Site Users	
Utility Availability		
	Potable Water Access	

Siting Criteria	Suggested Criteria to Change	Ranking Value (to be filled out by operator)
	Non-Potable Water Access	
	Electricity Access	

Table 8: Feedstock Criteria GIS Input Example

Using GIS tools, Feedstock can be measured using census and business/economic data. The following buffer distances can add value by ranking the proximity.

Siting Criteria	Suggested Criteria to Change	Ranking Value (to be filled out by operator)
Feedstock Availability		
	Available within 5 miles	
	Available within 10 miles	
	Available within 20 miles	
	Greater than 20 miles	

Table 9: Environmental Factors GIS Input Example

Using authoritative environmental resources, GIS systems can provide the consistency in resources. Tools can be developed to measure the proximity of parcel's location to sensitive receptors, floodplains, and bodies of water while ranking each category.

Siting Criteria	Suggested Criteria to Change	Ranking Value (to be filled out by operator)
Proximity to sensitive receptors		
	Less than 500 feet	
	500 to 1,000 feet	
	1,000 feet to half-mile	
	Half-mile to one mile	
	Greater than one mile	
Floodplain		
	Yes, located in floodplain	
	No, not located in floodplain	

Siting Criteria	Suggested Criteria to Change	Ranking Value (to be filled out by operator)
Nearest Water Body		
	Less than 100 feet	
	100 to 1,000 feet	
	1,000 feet to half-mile	
	Half-mile to one mile	
	Greater than one mile	

IV Air and Water Permitting Requirements

Composting activities in California are subject to regulations related to land use and general environmental impacts (e.g. CEQA) as described in Section III, and specific environmental regulations (i.e., waste, air, and water). The focus of this section is to summarize the permitting requirements as they relate to air and water permitting. There are 35 local air pollution control districts throughout the state of California, and nine (9) RWQCBs.

The local air districts independently develop, implement, and enforce their region-specific rules based on how their district plans to comply with the requirements of the Federal Clean Air Act. These rules primarily relate to stationary sources, such as an ASP composting system or a piece of large diesel-powered processing equipment that does not move like a grinder. The California Air Resources Board (CARB) is responsible for statewide climate change programs and oversees all air pollution control efforts within the state. While CARB maintains a relationship with the local air districts, CARB does not determine the region-specific air rules a district must adopt. In the composting industry, CARB is predominately used to register portable, or mobile, equipment through their PERP. A piece of mobile equipment could be a vehicle or a piece of equipment that moves from one location to another (composters often permit grinders under the PERP).

Unlike CARB's relationship with the local air districts, the SWRCB may develop statewide general orders that specify minimum standards for the RWQCBs to implement. While each Regional Water Board may have slight variations in their implementation of a specific State Water Board rule and may require more stringent standards on a site-specific basis than the State Water Board's General Orders, this relationship results in most regulations related to water quality following the same approach statewide.

The HDR Team performed a desktop study of general air quality regulations as they relate to composting operations, compost-specific rules, and general water regulations that commonly apply to these activities. The general air quality information summarized in this memo includes consideration of attainment and non-attainment zones for criteria pollutants of concern, and the potential costs associated with Emission Reduction Credits (ERCs), or off-sets. It is only fairly recently that some air districts, with particular air quality challenges, have adopted compost facility-specific rules. Similarly, in 2015 the State Water Board adopted its first compost-specific General Order. The compost-specific rules reviewed in this desktop study include the San Joaquin Valley Air Pollution Control Board (SJVAPCD) and South Coast Air Quality Management District (SCAQMD), compost-specific air permitting rules as well as the SWRCB General Waste Discharge Requirements for Commercial Composting Operations (Compost General Order). The general water regulations for review include the Construction General Permit (CGP) and Industrial General Permit (IGP), both of which govern stormwater run-off quality. One way to understand these overlapping programs is that

the Compost General Order primarily is concerned with protecting groundwater and the Construction General Permit and Industrial General Permit primarily are concerned with protecting surface water. Most composting operations will be required to comply with both of these programs.

Air Permitting Requirements

As stated, CARB is the statewide air agency responsible for protecting public health from air pollution and developing programs to combat climate change. CARB oversees efforts to attain and maintain air quality standards in California. However, it is the local air districts who develop, implement, and enforce their region-specific rules as they relate to stationary sources, such as a composting operation.

Local Air Pollution Control Districts Overview

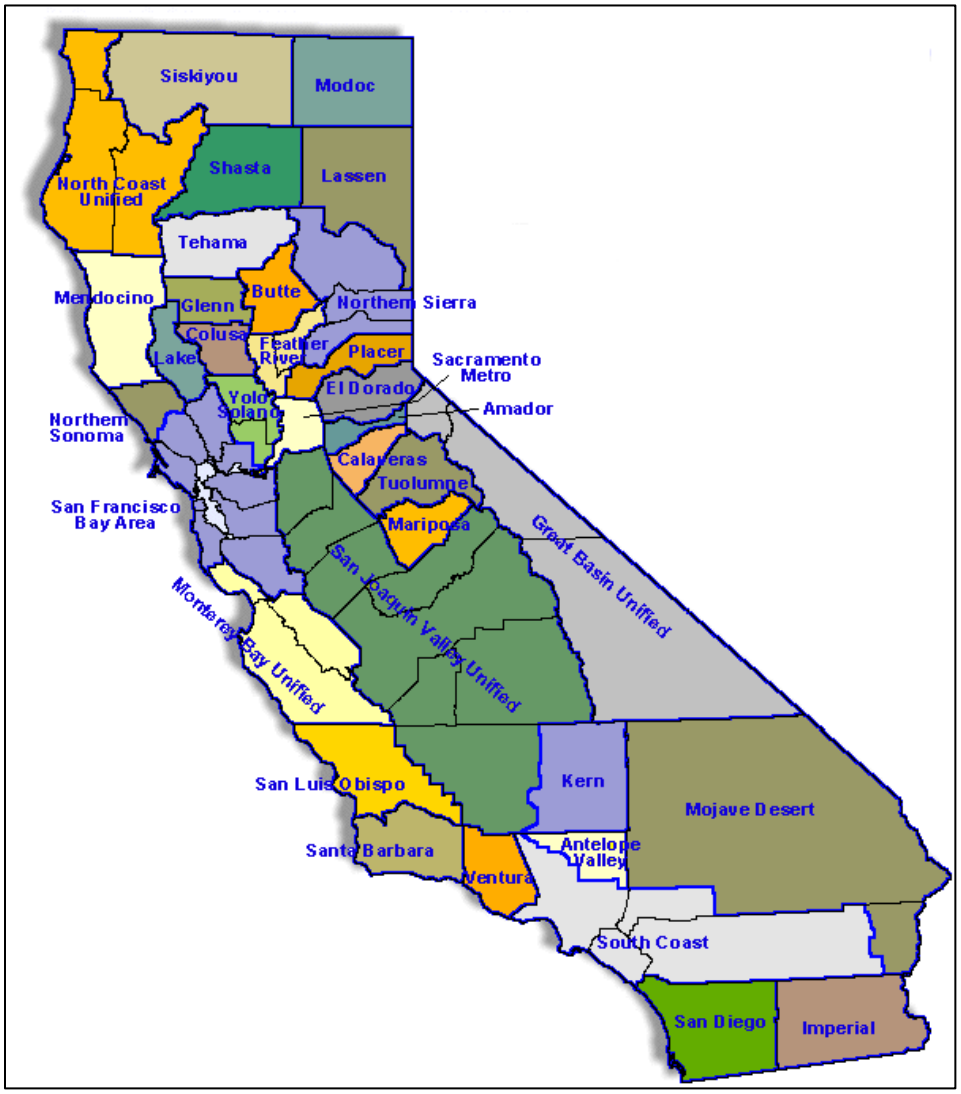
California has 35 local air pollution control districts, or air districts, which are responsible for air quality planning, monitoring, and stationary source and facility permitting. Air districts administer air quality improvement grant programs. In some areas, air districts are defined by county boundaries, but some districts are multi-county, regional entities. California's air districts are shown in **Figure 5**. Air districts are required to implement plans to reduce emissions of air pollutants that exceed federal National Ambient Air Quality Standards (NAAQs). Air districts have regulatory authority over stationary sources. Mobile sources (e.g., cars, trucks, mobile equipment) fall under the authority of CARB.

California's air districts have the authority to implement air quality-related permitting requirements for their areas. In 2018, CalRecycle convened a working group with CARB, the California Air Pollution Control Officers Association (CAPCOA), and representatives from the 35 air districts to identify challenges faced by composting facilities when applying for air permits. Compost facilities can emit Volatile Organic Compounds (VOCs), which can react with nitrogen oxides (NO_x) to make ground-level ozone. Ozone is a criteria pollutant with both state and federal attainment standards. VOCs can also react with ammonia (NH_3) to create fine particulates. Therefore, some composting facilities have been subject to additional permitting requirements based upon combinations of facility size, feedstock, and control technologies, along with specific local air quality concerns.

Attainment and Nonattainment Zones

Both the state of California and the U.S. EPA monitor concentrations of criteria air pollutants to assess whether certain regions of California comply or are out of compliance with federal air quality standards. Attainment areas are regions that meet the national primary or secondary air quality standard, and nonattainment areas are regions that do not meet (or contribute to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for a NAAQs.

Figure 5: California Air Districts



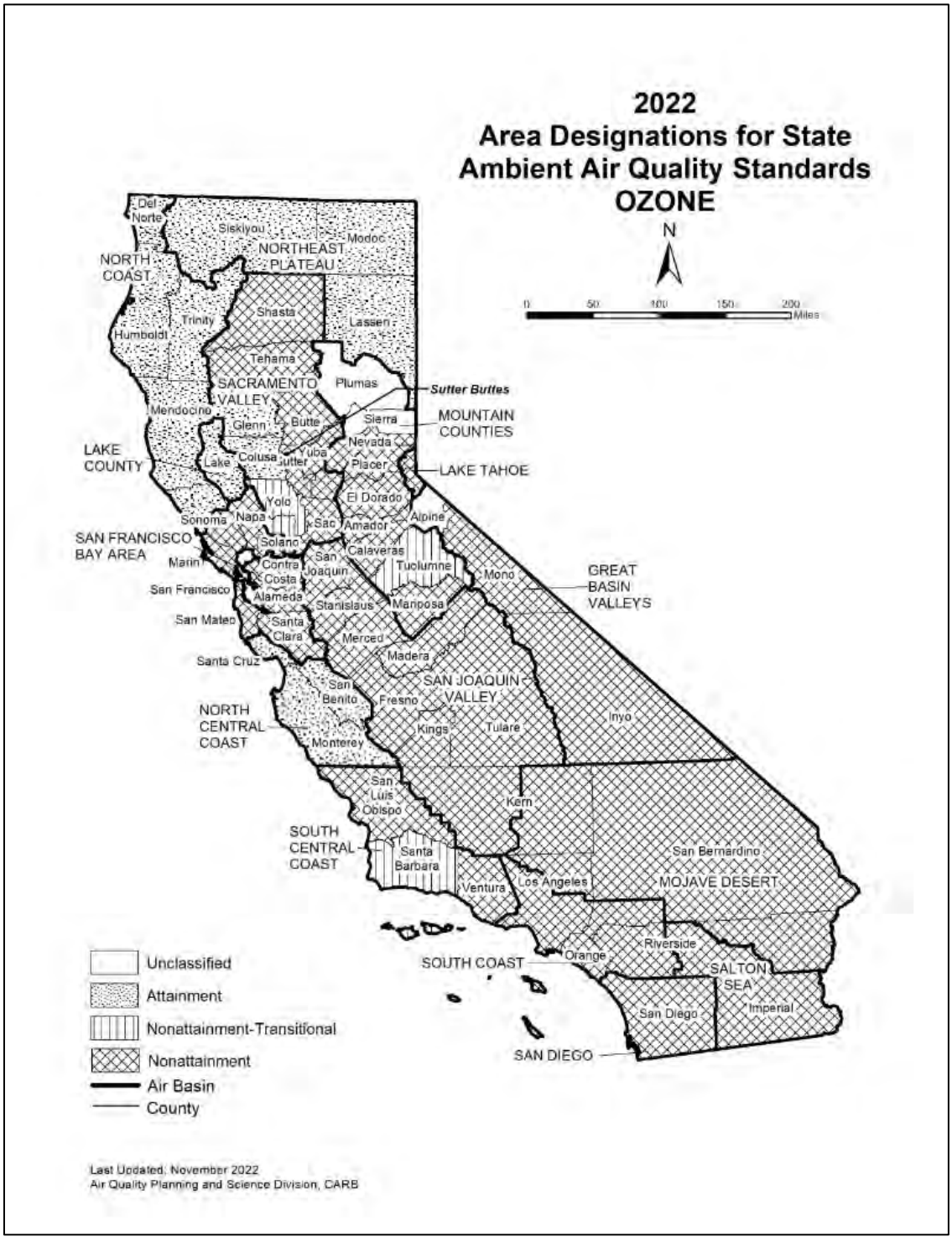
Source: //ww2.arb.ca.gov/california-map-local-air-district-websites

As shown in **Figure 6**, many areas of California are classified as nonattainment areas for ozone, a criteria air pollutant, based on the most recent evaluation completed in 2022. Southern and Central California are currently classified as being in extreme nonattainment for ozone. However, the North Coast, Northeast Plateau, and the North Central Coast are in attainment with ambient air quality standards for ozone at the most recent evaluation.

VOCs are generated at composting facilities as a natural part of the decomposition process. VOCs can react in the atmosphere with oxides of nitrogen (NOx) to produce ground-level ozone. Therefore, compost facilities are a focus area for some air districts as potential locations to reduce emissions of ozone. Typically districts with compost-

related VOC rules are in extreme or severe nonattainment of their obligations under the Clean Air Act.

Figure 6: 2022 Air Designations for State Ambient Air Quality Standards - Ozone



Source: ww2.arb.ca.gov/sites/default/files/2023-02/State_2022_O3.pdf

Compost-Specific Air Quality Rules

The HDR Team reviewed existing regulations and permitting requirements and compiled information on exemptions to these permitting requirements. When the composting rules referenced other rules regarding permitting requirements or exemptions, those other rules were also reviewed. Information on exemptions was documented and included in this memo.

Under Section 181 of the Clean Air Act (CAA) , the EPA classifies ozone nonattainment areas as "Marginal," "Moderate," "Serious," "Severe," or "Extreme." Currently, the only two air districts that have compost-specific regulations applicable to this study, the San Joaquin Valley Air Pollution Control District (SJVAPCD) and the South Coast Air Quality Management District (SCAQMD), are both classified as Extreme nonattainment areas for ozone. The Antelope Valley Air Quality Management District (AVAQMD) also has a compost-specific rule, but it is only applicable to chipping and grinding operations and co-composting (composting with biosolids) so it is not included in this study. A detailed description of applicable existing composting regulations is summarized below.

Not only those air districts in Extreme nonattainment for ozone have been able to adopt compost-specific rules. Some air districts are moving forward with enforcing compost-specific VOC reductions through their BACT rules, regardless of their Clean Air Act status.

San Joaquin Valley Air Pollution Control District

SJVAPCD is made up of eight counties in California's Central Valley: San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and a portion of Kern County (see Figure 1). The SJVAPCD is in Extreme nonattainment for ozone based on both California state standards and federal NAAQS. SJVAPCD has two compost-specific air quality regulations:

- Rule 4565: Biosolids, Animal Manure, and Poultry Litter Operations[7] and
- Rule 4566: Organic Material Composting Operations.[8]

RULE 4565: BIOSOLIDS, ANIMAL MANURE, AND POULTRY LITTER OPERATIONS

Rule 4565 applies to facilities whose throughput consists entirely or in part of biosolids, animal manure, or poultry litter. The Rule has the following exemptions:

- Facilities subject to *Rule 4570: Confined Animal Facilities.*
- Composting/co-composting facilities whose throughput includes a total of less than 100 wet tons per year (TPY) of biosolids, animal manure, and poultry litter.

[7] https://www.valleyair.org/rules/currntrules/r4565.pdf

[8] https://www.valleyair.org/rules/currntrules/rule4566cleanrule.pdf

- Operators who land-apply biosolids, animal manure, or poultry litter and who meet all of the following criteria: a) receive less than 10,000 wet TPY of biosolids, animal manure, or poultry litter; b) are not intentionally conducting pathogen reduction; c) are not subject to the regulations of the CalRecycle, and d) do not receive or collect tip fees.
- Facilities that place material in airtight bags or packages for sale as a soil amendment or fertilizer.

The composting of biosolids is not included in this evaluation.

RULE 4566: ORGANIC MATERIAL COMPOSTING OPERATIONS AND ASSOCIATED RULES AND EXEMPTIONS

Rule 4566 defines a composting facility as "*a facility that is required to obtain a District (air district) permit for composting operations in accordance with Rule 2010 (Permits Required) which are not specifically exempt pursuant to Rule 2020 (Exemptions) or a Compostable Materials Handling Facility Permit in accordance with Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 2, Section 17857.1.*"

Rule 2010: Permits Required[9] states that any entity "*constructing, altering, replacing or operating any source operation which emits, may emit, or may reduce emissions*" is required to obtain an Authority to Construct (ATC) or a Permit to Operate (PTO). Rule 2010 does not include a minimum facility size or minimum potential to emit (PTE).

Rule 2020: Exemptions[10] modifies Rule 2010 by listing emissions units that are not required to obtain an Authority to Construct (ATC) or Permit to Operate (PTO). Compost is not specifically listed as an exemption in Sections 6.0 and 7.0 of Rule 2020. However, Rule 2020, Section 6.19 does state that Low Emitting Units are not required to obtain an ATC or PTO. Low emitting units have an uncontrolled emissions rate of each air contaminant less than or equal to two (2) pounds per day or less than or equal to 75 lb./year (Rule 2020, Section 3.10). Rule 2020 does *not* have exemptions for low-emitting facilities, only low-emitting emission units.

However, based on the SJVAPCD Compost Emission Factor Report[11], composting at a small (up to 5,000 cubic yards) or medium (up to 12,500 cubic yards) operation is unlikely to qualify as a low emitter. The VOC emission factor for organic material composting is 3.58 lb./wet ton, as shown on **Figure 7**. The emission factors represent the entirety of the composting cycle, from the start of the active phase through the completion of the curing phase. If a composting facility stayed below the low emitter

[9] https://www.valleyair.org/rules/currntrules/r2010.pdf

[10] https://ww2.valleyair.org/media/afydweme/rule-2020.pdf

[11] https://ww2.valleyair.org/media/hdsoobtp/criteria-compost-emission-factors-report-final-voc-nh3-3-21-23.pdf

exemption of 75 lb./year, it would have to accept approximately 20 wet TPY, well below the thresholds for a small or medium composting facility. It is important to note that the emissions data used to develop these composting-specific emission factors has not been updated to account for increased adoption of advancements made in composting technology and operations, such as ASP composting systems with forced aeration. For example, an ASP system has been shown to achieve an 80% to over 90% reduction for VOC emissions compared to the windrow composting emission factor shown on **Figure 7.**

Figure 7: Summary of Composting Emission Factors - SJVAPCD Compost Emission Factor Report

Table 1: Summary of District Composting EFs.

Operation Type	Emission Factors	
	VOC	NH_3
Organic Material Stockpile*	0.2 lb/wet ton/day	0.02 lb/wet ton/day
Biosolids, Manure, Poultry Litter, and Co-Compost Stockpile	0.02 lb/wet ton/day	0.001 lb/wet ton/day
Organic Material Composting**	3.58 lb/wet ton	0.78 lb/wet ton
Biosolids, Manure, and Poultry Litter, and Co-Composting**	1.78 lb/wet ton	2.93 lb/wet ton
Manure Only – Separated Solids***	0.041 lb/wet ton	0.011 lb/wet ton
Manure Only – Corral Scrapings***	0.25 lb/wet ton	1.53 lb/wet ton

* The organic material stockpile EF shall be used for the following types of organic material stockpiles: green waste, 15% food waste, and grape pomace.
**Emission Factors represent the entirety of the composting cycle, i.e. start of the active phase through completion of the curing phase.
***Emission Factors are applicable to manure-only composting operations. See Section III.E.1 and 2 for additional context.

There are some facilities and activities that are exempt from Rule 4566. Stockpiling organic materials, including wood, finished compost, overs, and other organic material, is not considered composting and is not subject to the Rule. However, these activities would fall under the air district's Rule 2201 New and Modified Stationary Source Review. The following types of composting are also exempt:

- Composting operations that are subject to Rule 4565.
- Agricultural composting: Composting of agricultural materials at an agricultural operation site, which were generated on site and will be used on site.
- Community composting: Composting conducted by a residential neighborhood association using feedstock generated within the residential neighborhood to produce compost for the neighborhood's use.
- Household composting: Composting conducted by a household, including but not limited to, single family residences, duplexes or apartment buildings, using organic materials that are generated on site to produce compost that will be used on site.

- Nursery composting: Composting conducted at a plant nursery using materials generated on site to produce compost for on-site use.
- Recreational facilities composting: Composting conducted at parks, arboretums and other recreational facilities using feedstock generated on site to produce compost for on-site use.

Rule 4566 does not include permit exemptions based on facility size. However, there are permit requirements based on facility size. The designations listed in this Rule include the following:

- less than 100,000 wet TPY of organic material;
- greater than or equal to 100,000 wet TPY of organic material;
- less than or equal to 200,000 wet TPY of organic material;
- greater than or equal to 200,000 wet TPY and less than 750,000 wet TPY of organic material; and
- greater than 750,000 wet TPY.

These designations are significantly larger than for small or medium composting activities, as defined by CalRecycle (up to 5,000 cubic yards of material on site at any given time and up to 12,500 cubic yards of material on site at any given time, respectively).

Based on an evaluation of Rules 2010, 2020, 4565, and 4566, there are no exemptions that apply to small or medium commercial composting activities in the SJVAPCD.

South Coast Air Quality Management District

SCAQMD is responsible for air permitting in Los Angeles County except for areas covered by the AVAQMD, Orange County, and the western portion of San Bernardino and Riverside counties. The SCAQMD is in Extreme nonattainment for ozone based on both California's state standards and federal NAAQS. SCAQMD has four compost-specific air quality regulations:

- Rule 1133: Composting and Related Operations – General Administrative Requirements[12],
- Rule 1133.1: Chipping and Grinding Activities[13],
- Rule 1133.2: Emission Reductions from Co-Composting Operations[14], and
- Rule 1133.3: Emission Reductions from Green Waste Composting Operations.[15]

SCAQMD also has Rule 306: Plan Fees, that addresses filing fees for composting.[16]

[12] https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1133.pdf

[13] https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1133-1.pdf

[14] https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1133-2.pdf

[15] https://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1133-3.pdf

[16] https://www.aqmd.gov/docs/default-source/rule-book/reg-iii/rule-306.pdf

RULE 1133: COMPOSTING AND RELATED OPERATIONS – GENERAL ADMINISTRATIVE REQUIREMENTS

Rule 1133 applies to owners or operators of composting operations. The purpose of this rule is to create an informational database on composting emissions through a registration process.[17] The Rule requires that composting operations register with the SCAQMD by submitting an application and providing the air district with annual updates.[18]

The information included in the application includes basic facility location and contact information; number of employees; type and amount of materials received; type and amount of products produced; facility design capacity; facility actual throughput; feedstock description; process description; tipping fee schedule, and number of air quality and odor-related enforcement actions issued in writing against the facility.[19] The registration process also includes a one-time fee equivalent to the plan submittal fee in accordance with *Rule 306*.[20]

The following facility types are exempt from this Rule:

- Portable chipping and grinding: Chipping and grinding utilizing equipment with a manufacturer's rating of 170 brake horsepower or less.
- Community composting: Composting conducted by a residential neighborhood association using feedstock generated within the residential neighborhood to produce compost for the neighborhood's use.
- Agricultural composting: Composting conducted in agricultural settings where the feedstock consists of waste generated on-site by the production and processing of farm or agricultural products.
- Nursery composting: Composting conducted at a nursery to produce compost for on-site use.
- Recreational facilities composting: Composting conducted at parks, arboretums and other recreational facilities using feedstock generated on-site to produce compost for on-site use.
- Backyard composting: Composting conducted by a household including, but not limited to, single family residences, duplexes, or apartment buildings.
- Woodwaste chipping and grinding facilities.

There are no exemptions for composting activities based on facility size.

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[17] Rule 1133(a).

[18] Rule 1133(d).

[19] Rule 1133(e).

[20] Rule 1133(f).

RULE 1133.1: CHIPPING AND GRINDING ACTIVITIES

Rule 1133.1 does not apply to activities that produce compost.

RULE 1133.2: EMISSION REDUCTIONS FROM CO-COMPOSTING OPERATIONS

Rule 1133.2 applies to co-composting operations where biosolids and/or manure are mixed with bulking agents to produce compost. Biosolids are not included in this evaluation. Manure is included in the definition of agricultural composting but is not the focus of this evaluation. Part j(1) of Rule 1133.2 specifically exempts agricultural composting operations, green waste composting operations, woodwaste composting operations, co-composting operations with a design capacity of less than 1,000 tons of throughput per year, and existing co-composting operations with a design capacity of less than 35,000 tons of throughput per year containing no more than 20% biosolids, by volume.

RULE 1133.3: EMISSION REDUCTIONS FROM GREEN WASTE COMPOSTING OPERATIONS

Rule 1133.3 applies to operators of green waste compost operations that produce compost from green waste by itself or green waste in combination with manure or food waste. It contains operational requirements that are intended to reduce fugitive emissions of VOCs and ammonia from composting operations.

Rule 1133.3 has separate requirements by facility size. Operators of green waste compost operations processing green waste only or up to 20% manure, by volume, or up to 5,000 tons per year of food waste throughput have reduced requirements compared to operators of green waste composting operations processing more than 5,000 tons of food waste.

Rule 1133.3 has the following exemptions:

- Composting operations and facilities subject to Rule 1133.2 (see above) are exempt.
  - If the operator of a green waste composting operation installs an emission control device, in accordance with paragraphs (d)(3) through (d)(6) of Rule 1133.3, the provisions of paragraph (d)(2) do not apply. An ASP composting system is considered an emission control device in SCAQMD.
- The following facility and operation types are exempt if the operation is *not* subject to the Enforcement Agency Notification or Permit regulations pursuant to Title 14 Division 7, Chapter 3.1, Section 17857.1 of the California Code of Regulations.
  - Community composting (as defined by SCAQMD Rule 1133)
  - Nursery composting
  - Backyard composting
  - Recreational facility composting

RULE 306: PLAN FEES

Rule 306 lists a fee schedule for approval of plans that covers the costs of review, planning, inspection, and monitoring. Rule 1133 states that the compost registration process also includes a one-time fee equivalent to the plan submittal fee in accordance with Rule 306. Permitted Title V facilities are required to pay higher filing fees compared to nonTitle V facilities. Small or medium composting activities may be subject to reduced fees, provided that their potential to emit (PTE) is below Title V thresholds.

The Rule also has a small business discount. The fees assessed for small businesses are 50% of the amounts specified in subdivisions (c), (d), (f), and (g) of the Rule. Businesses that have up to 100 employees or with annual gross revenues up to $5 million are eligible for the small business discount.[21]

General Air District Approach to Development of Compost-Specific Rules

Historically, composting facilities were only subject to rules relating to the operation of large diesel-powered processing equipment. Starting in the early 2000s, the SCAQMD and the SJVAPCD, facing penalties for being in extreme nonattainment, created a novel approach to regulating naturally occurring VOCs from composting facilities. These Rules do not consider what would happen to the naturally occurring VOCs if the materials were not composted (such as being landfilled). The air districts have limited authority over the sources they can regulate in order to meet their Clean Air Act requirements. Emissions from cars and trucks, for example, are regulated at the state level through CARB. Due to the efforts of these two large air districts with extreme nonattainment status, several other local air districts have explored developing compost-specific VOC rules, but as of this writing, these rules have been abandoned or put on hold. A few districts without compost-specific rules do require permits and place VOC reduction requirements on composting facilities. However, operating data from modern facilities across the state have shown that VOC emissions from a modern, well-run and optimized aerated static pile composting system can achieve much lower VOC emissions than are represented in the original source tests which most established emission factors are based. CalRecycle is currently finalizing a report which investigated the hypothesis that optimizing process conditions can minimize VOC production.

Emission Reduction Credits

As part of the air permitting process, whether through a compost-specific rule or through an air district's New Source Review, an air district determines the activity's PTE. The PTE is then used to determine if the proposed activity exceeds the air district's threshold to require a Health Risk Assessment (HRA), use of a Best Available Control Technology (BACT) or obtain Emission Reduction Credits (ERCs) or offsets. ~~The PTE is~~

[21] https://www.aqmd.gov/docs/default-source/small-business-assistance/sba-frequently-asked-questions.pdf?sfvrsn=6

based on emission factors either adopted by the air district, obtained from another air district, or based on available public data. While facilities may be required to source test after the start of operations, the use of potentially outdated emission factors may overestimate the facility's PTE and can prematurely trigger a HRA, BACT, or ERCs. California state law requires air districts to adopt ERC banking programs. Air districts are responsible for tracking the price paid (in dollars per ton), the pollutant traded, the amount traded, and the year of the transaction. Districts are required to provide this information to CARB annually, and CARB compiles the information from all air districts to assemble a statewide report.[22] The purchase of ERCs may be a significant investment for a proposed composting activity, hence the use of a BACT system such as an ASP composting system may reduce the ERCs required by the air district. The following is a summary of current ERC costs by pollutant, although it is important to note typically only VOC ERCs are required for composting activities.

The transactions are typically valid for the lifetime of the permitted source, which contrasts with other types of credits (e.g., the Regional Clean Air Incentives Market (RECLAIM) trading credits are valid for one year).

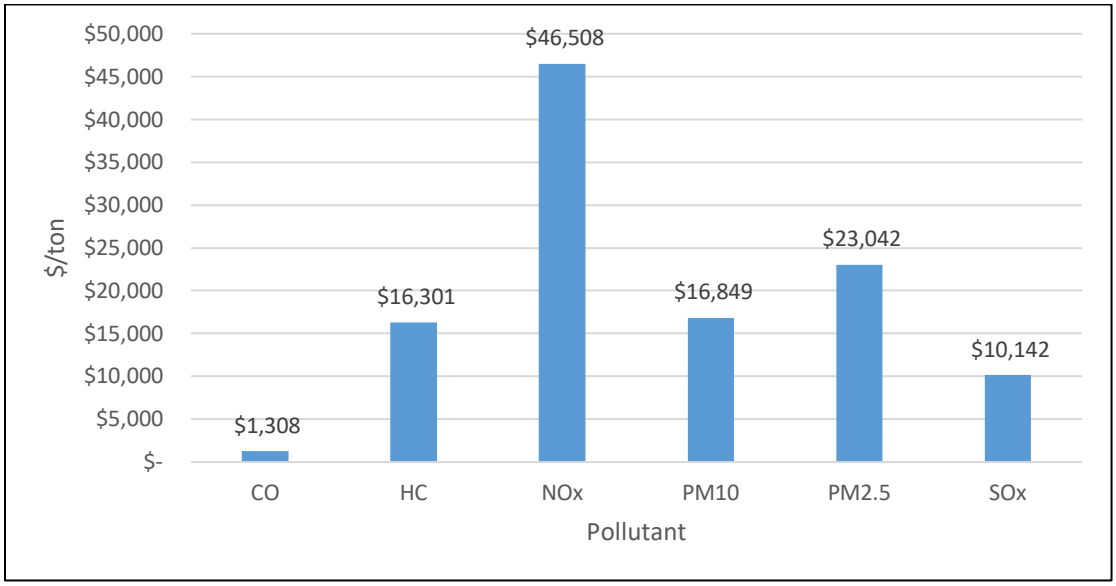
2018 ERC Transaction Costs

The most recent statewide report includes transaction cost summaries from 2018.[23] The 2018 cost per ton by pollutant and by air district are shown on **Figure 8** and **Figure 9.** Some air districts did not report offset transactions in 2018. Districts that are not required to submit a plan for attainment of California ambient air quality standards and those that also meet federal air quality standards are exempt from the requirement to collect information on offset transactions.

[22] https://ww2.arb.ca.gov/new-source-review-emission-reduction-credit-offsets

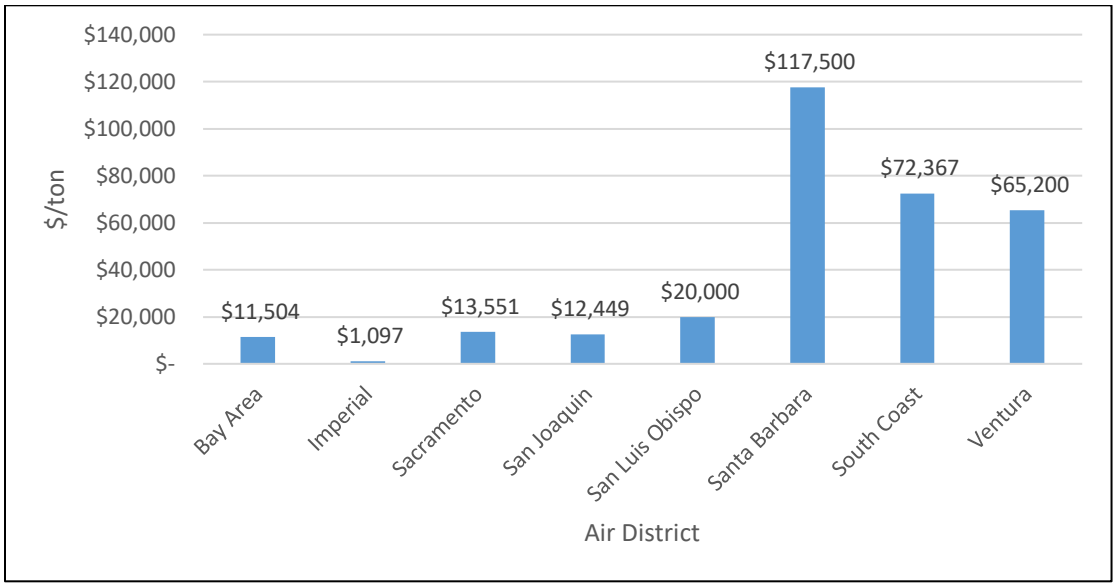
[23] https://ww2.arb.ca.gov/sites/default/files/2020-05/2018_erc_report.pdf

Figure 8: ERC Cost per Ton by Criteria Pollutant (2018)



Source: Table V-1 of Emission Reduction Offset Transaction Costs Summary Report for 2018.

Figure 9: ERC Cost per Ton by Air District (2018)



Source: Table V-1 of Emission Reduction Offset Transaction Costs Summary Report for 2018.

Recent ERC Transaction Costs

It is difficult to evaluate the current cost and frequency of ERC transactions statewide, as most air districts do not publish recent ERC transactions on their own websites, and instead link to CARB's website, which currently only includes transactions through 2018.[24] However, some air districts publish ERC transactions on their own websites. SCAQMD's website lists ERC transactions since 2004.[25] The most recently available data is from 2022.[26] In 2022, there were 30 ERC transactions in the air district that included 24 purchases of reactive organic gases (ROG or VOC). The average ROG transaction cost for was roughly $16,000 per ton per year.

SJVAPCD publishes its ERC transactions since 2001.[27] In 2023, there were four ERC transactions in the air district: two for NO_X and two for VOCs. The average transaction cost for VOCs was approximately $174,800 per ton per year.[28] In 2020, SJVAPCD modified its ERC program in response to a CARB report, *Review of San Joaquin Valley Air Pollution Control District Emission Reduction Credit System.* CARB recommended that SJVAPCD increase transparency and rigor, upgrade implementation procedures and policies, and review and revise assumptions used to demonstrate equivalency with federal rules.[29] The changes to SJVAPCD resulted in VOC ERCs going from roughly $5,000 to $15,000 per ton of VOC ERCs to upwards of $100,000 to over $150,000 per ton of VOC ERCs.

Approximate average transaction costs for each pollutant type by air district are summarized in **Table 10** below.

Table 10: Recent ERC Transaction Costs ($/ton/year)

Pollutant	SCAQMD (2022)	SJVAPCD (2023)
NOx	$356,300	$56,500
PM_{10}	$140,200	-
ROG	$16,000	-
SOX	$1,200	-
VOC	-	$174,800

[24] https://ww2.arb.ca.gov/new-source-review-emission-reduction-credit-offsets

[25] https://www.aqmd.gov/home/research/documents-reports/erc-transaction-report-archive

[26] https://www.aqmd.gov/docs/default-source/permitting/40709-5-reports/chscode_sec40709-5_cy2022report.pdf?sfvrsn=6

[27] https://ww2.valleyair.org/permitting/emission-reduction-credits-erc/cost-of-emission-reduction-credits/

[28] https://www.valleyair.org/busind/pto/erc/ERCCost2023.pdf

[29] https://ww2.arb.ca.gov/sites/default/files/2020-06/SJV_ERC_FINAL_20200604.pdf

Water Permitting Summary

The State Water Board sets statewide water quality standards, issues statewide general permits, conducts statewide surface and groundwater monitoring and assessment, and issues orders for remediating contaminated sites.[30] The State Water Board works with the nine (9) Regional Water Boards as well as other federal, state and local agencies to protect, preserve, enhance, and restore water quality.

Regional Water Quality Control Boards (RWQCB) Overview

California has nine (9) Regional Water Boards, which are responsible for setting water quality standards, issuing waste discharge requirements, and enforcing compliance requirements. Regional boundaries are based on watersheds and water quality requirements that are affected by the local geographic differences in each region. The Regional Water Boards issue the majority of NPDES permits in the state to ensure they are within compliance with the State Water Board. **Figure 10** shows a map of the nine (9) regional water boards.

Compost General Order

The General Order for Waste Discharge Requirements for Composting Operations (WQ 2020-0012-DWQ) (Compost General Order) covers the nine (9) Regional Water Boards controlled by the State Water Board. The General Order provides design and operational requirements for facilities that compost green waste, manure, anaerobic digestate, biosolids, food scraps and scrap paper products. Compost facilities are classified into one of two tiers, based on operation size, feedstock, and site conditions. Specific types of facilities are exempt. A Tier 1 facility is limited to receiving, processing, and storing less than 25,000 cubic yards of a combination of allowable feedstock on site at any time and meeting percolation rate standards located in **Table 11**. Tier 2 facilities receive, process, and store more than 25,000 cubic yards of the allowable feedstock; and due to the site-specific hydrogeological conditions, do not meet the percolation rate and depth to groundwater standards listed for Tier 1 facilities. Tier 1 and 2 facilities are determined by the allowable feedstock as shown in **Table 12.**

[30] https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/boardoverview.pdf

Figure 10: Regional Water Quality Control Boards of California

Source: https://www.waterboards.ca.gov/tribal_affairs/regional_tbu_updates.html

Table 11: Tier 1 Percolation Rate and Depth to Groundwater Standards

Soil Percolation Rate	Depth to Groundwater (Minimum)
< 1 minutes per inch	50 feet
1 to 5 minutes per inch	20 feet
> 5 to 30 minutes per inch	8 feet
> 30 minutes per inch	5 feet

Table 12: Feedstocks Accepted by Tier 1 and Tier 2 Facilities

Tier 1	Tier 2
Vegetative agricultural materials	Food materials (nonvegetative)
Green materials	Biosolids (Class A, B, and/or Exceptional Quality (EQ))
Paper materials	Anaerobic digestate derived from allowable Tier 2 feedstocks
Vegetative food materials	A combination of allowable Tier 1 and Tier 2 feedstocks
Anaerobic digestate derived from allowable Tier 1 feedstocks	-
Residentially co-collected or self-hauled food and green materials	-
Manure	-

All composting facilities are required to seek coverage by submitting a Notice of Intent (NOI) with the appropriate filing fee, and a technical report to inform the Regional Water Board with the requested information prior to the commencement of compost operation. Individual Waste Discharge Requirements (WDRs) typically require more protective measures due to siting considerations and/or materials accepted than a WDR which falls under a General Order. Some operations are in the process of submitting a Notice of Non-Applicability (NONA) to determine if they are exempt from the Compost General Order. The current composting facilities with individual WDRs or operating under another General Order WDR may be co-located at landfills or confined animal facilities where compostable materials handling is incorporated in the larger operation. Generally, the NOI and/or technical report needs to specify the boundaries of operations to prohibit any feedstock, additive, storage or processing of compost outside the designated areas.

Composting operations that are not covered by the Compost General Order may be covered by other permits as appropriate and as determined by the Regional Water Boards. More information on exempt facilities can be found under the **Regional Water Quality Control Board Survey section**. Some of them may be regulated through the NPDES General Permit. Under the federal NPDES program, there are three different types of permits required to regulate and manage stormwater: construction, industrial,

and municipal.[31] The Construction and Industrial permit (explained in more detail below) programs apply to all nine regions.

Stormwater Quality Permits

The Federal Clean Water Act (CWA) prohibits certain discharges of stormwater containing pollutants, except in compliance with a NPDES permit. The NPDES stormwater program regulates some stormwater discharges from three potential sources: municipal separate storm sewer systems, construction activities, and industrial activities. The municipal stormwater program falls under a particular jurisdiction's responsibility, therefore is not included in this desktop study of regulations applicable to small- and medium-sized composting activities.

Construction General Permit

A Construction General Permit (CGP) is required for construction activities or "dischargers" that, "Disturb one (1) or more acres of soil or whose projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres."[32] Dischargers are required to obtain coverage under the CGP for Dischargers of stormwater associated with construction activity. Construction activity subject to this permit includes clearing, grading, and disturbances to the ground such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. Under the CGP, the Legally Responsible Person (LRP) must submit all standard Permit Registration Documents (PRDs) prior to beginning construction. PRDs include a Notice of Intent (NOI), risk assessment (standard or site-specific), site map, construction schedule, Stormwater Pollution Prevention Plan (SWPPP), annual fee, and an Active Treatment Systems (ATS) design document and certification, if used. There also are additional PRD requirements depending on the construction type. This includes dischargers that are located in unincorporated areas of the state or are nonlinear projects, proposing to implement ATS, or proposing an alternate Risk Justification.[33]

Industrial General Permit

The Industrial General Permit (IGP) regulates industrial stormwater discharges and authorized nonstorm water discharges from industrial facilities in California. The Regional Water Boards implement and enforce the IGP. The only exemption to requiring an industrial permit are those that have industrial materials that are not

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[31] https://www.waterboards.ca.gov/northcoast/water_issues/programs/npdes_stormwater/

[32] https://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.html

[33] https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/wqo2009_0009_dwq.pdf

exposed to rain (wastes, products, machinery, roof exhausts, etc.).[34] The IGP regulates discharges associated with nine federally defined categories of industrial activities. Composting activities typically fall under Standard Industrial Classification (SIC) code 2875 (Fertilizer, Mixing Only) which falls under the Manufacturing Facilities category in the IGP.35 The industrial site or "discharger" seeking coverage under the IGP must have its LRP file for either a NOI or No Exposure Certification (NEC), which have slightly different PRDs. Under NOI coverage, dischargers are required to meet all requirements of the IGP. The NOI coverage requires an NOI, site map, annual fee, and a SWPPP, including the monitoring implementation plan. The IGP SWPPP must contain the following:

- Facility Name and Contact Information;
- Site Map;
- List of Industrial Materials;
- Description of Potential Pollutant Sources;
- Assessment of Potential Pollutant Sources;
- Minimum BMPs;
- Advanced BMPs, if applicable;
- Monitoring Implementation Plan;
- Annual Comprehensive Facility Compliance Evaluation; and
- Date that SWPPP was initially prepared and the date of each SWPPP amendment, if applicable.

In 2018, the State Water Board amended the IGP to include the following additional requirements:

- Sufficiently Sensitive Test Method Ruling
- Total Maximum Daily Load Implementation Requirements
- Statewide Options Incentivizing On-Site or Regional Storm Water Capture and Use

Under the NEC coverage, dischargers are not required to comply with the SWPPP or monitoring requirements of the IGP, given that the facility has no exposure of industrial activities or materials to stormwater in accordance with Section XVII of the IGP Order. This is highly unlikely for a composting activity to meet the NEC requirements unless the facility is completely indoors.

Survey Approach and Results

The HDR Team prepared a separate survey for the local air districts and Regional Water Boards which are presented in **Appendix B** and **Appendix C**. The HDR Team

[34] https://www.waterboards.ca.gov/northcoast/water_issues/programs/npdes_stormwater/

[35] https://www.waterboards.ca.gov/water_issues/programs/stormwater/industrial.html

outreached to all 35 air districts and the nine (9) RWQCBs to assess the various impacts these agencies have on the permitting process as it relates to small and/or medium composting activities. The survey results also provided insight into the challenges and opportunities that can be used by an operator to help facilitate obtaining the appropriate approvals from each regulatory agency.

Air Districts Survey Results

The survey was distributed to all 35 air districts, seeking to identify the various ways air district rules impact the permitting process and BMPs for expediting and obtaining air permits within each district. The air districts also had the opportunity to provide their perspective on challenges or opportunities for air permitting and approvals.

Compost Air Permitting Process

Of the 15 survey responses received, two air districts reported having one small composting activity each and one reported having a medium sized composting activity. Another air district reported having composting operations, but that the sites within their air district did not meet the definitions of a small- or medium-sized composting activity for this study.

The majority of air districts that responded to the survey either 1) did not have a permitting process specific to composting activities, and thus the proposed activity would follow the air districts' New Source Review permitting process, or 2) do not permit composting activities. One air district reported that while composting activities are not permitted, the equipment associated with the composting activity may require a permit. There was no difference between the air permitting process for small or medium-sized composting activities subject to New Source Review.

Aside from the SJVAPCD and SCAQMD compost-specific regulations summarized earlier in this report, no other air district has a compost-specific rule for the composting activities of interest for this study. Therefore, the air districts that do permit composting activities provided a general summary of their New Source Review process. In summary, the following steps would occur:

- Applicant submits an Authority to Construct application, filing fees, design details, and process rates to the air district for review. Additional components of the application may include, but are not limited to:
    - A plot plan;
    - A block flow diagram;
    - Written description of processes;
    - Processes and associated control equipment, including make, model, rating and capacity, and the power source;
    - Operating schedule;
    - Maximum daily and annual process throughput and fuel use;
    - Emissions estimates including fugitive emissions such as:
        - Storage piles;
        - Material loading and unloading;

        - Vehicle miles traveled;
        - Cleaning equipment, materials, and procedures; and
        - Any process which might result in odor causing emissions.
- If the facility triggers BACT or ERCs, then compliance with these regulations would be required; and
- If the facility triggers an HRA, then an HRA including emissions dispersion modeling would need to be prepared to determine acute and chronic cancer risk for Toxic Air Contaminants (TACs), as applicable. It is important to note that most of the air districts that responded to the survey reported that they believed an HRA would most likely be required, although it would depend on the project-specific impact.

Of the air districts that would permit composting facilities, the common exemptions to obtaining a permit were:

- Qualifying as a low-emitter (i.e., daily and annual potential-to-emit falling below an established threshold).
- Agricultural composting (this typically refers to the composting of materials produced and used onsite).
- Composting for residential use.

Emission Reduction Credit (ERC) Thresholds

Based on the responses obtained from the surveys, the trigger to require ERCs varied amongst the air districts, and were provided as daily, quarterly, and annually. Triggers varied as greatly as 10 tons of VOCs per year to 100 tons of VOCs per year. It should be noted some air districts that did not respond to the survey are as low as 5 tons of VOCs per year.

Air Permitting Initial and Annual Fees

Fees also varied among air districts and were difficult to estimate, as application processing fees depend on review time and annual facility dues depend on a facility's annual emissions.

Initial permit application fees were provided from $75 to $2,316 depending on the air district. Most air districts have a base fee in the $100 to $500 range plus an hourly processing fee that is usually around $100 per hour. Annual renewal fees start with a base rate, with added fees that are based on the PTE. Base rates range anywhere from $125 to $1,158. One air district reports an annual renewable fee of roughly $4,000 for what they consider a "small" composting activity. Annual renewal fees start with a base rate, with added fees that are based on the potential to emit (PTE). Base rates range anywhere from $125 to $1,158.

Air Permitting Challenges and Opportunities

A few of the air districts did respond to our survey question about any permitting challenges or opportunities for small- and medium-sized composting activities. The following were the key items raised:

- There are limited available ERCs for VOCs for new facilities or existing facilities proposing expansions. If the company does not currently hold ERCs, the size of the facility would be limited to below the threshold for triggering ERCs.
- There are limited exemptions for composting activities by some air districts, which may conflict with supporting SB 1383's goal for organic waste diversion. There is not a clear direction from the state level on what to do when these priorities (e.g. air quality vs recycling) seem in conflict with each other.
- Air districts with no composting activities would rely heavily on other air districts to provide guidance. Permitting these operations is complicated due to limited available emission data from composting operations, the variability of how each facility is operated, and the difficulty in testing emissions.
- There are new NAAQS for particulate matter that may adversely impact the permitting process for these types of activities.

Regional Water Quality Control Board Survey

The survey was delivered to all nine (9) RWQCBs, seeking to clarify the process for water permitting and approvals as it relates to stormwater, construction, and groundwater, as well as identify any permitting barriers or opportunities from the regulatory agency perspective. The HDR Team also received data from the State Water Board.

The HDR Team received six (6) responses to the survey, which indicated most Regional Water Boards do have small- or medium-sized composting activities. The number of documented operations ranges from one (1) to eight (8) per region, the vast majority being medium-sized composting activities. Most of these operations do not utilize ASP. All RWQCBs have at least a couple facilities under the Compost General Order. Some of the activities are exempt from the Compost General Order and instead have an individual WDR or other permit coverage. Of the facilities under the Compost General Order, there is a similar number of Tier 1 and Tier 2. It is common for Regional Water Boards to keep track of facilities who are exempt, but some RWQCBs do not keep a formal list.

<u>General Order Water Discharge Requirements</u>

The State Water Board's Division of Water Quality collects statewide data for enrollees under the General Waste Discharge Requirements for Commercial Composting Operations (Compost General Order). The data is collected via survey and includes all small (sites with less than 5,000 cubic yards) and medium operations (sites with less than 12,500 cubic yards) by region, tiers, capacities on-site, composting methods, and feedstocks. This data is provided in **Table 13**. The majority of these sized composting facilities are located in Region 5 and Region 8.

Table 13: Compost Facilities Enrolled under the Composting General Order

Facilities Information				Composting General Order Allowable Feedstocks							
Region	Tier	Method	Capacity (yd^3)	Agricultural Materials	Green Materials	Paper	Vegetative Food Materials	Resident Co-collected Food	Manure	Non-Vegetative	Bio-solids
2	1	ASP	12,500	-	X	-	-	-	-	-	-
3	1	windrow	7,800	X			X	-	-	-	-
3	2	covered ASP	12,000	-	X		X	X		X	-
4	2	ASP	2,400	-	X	-	-	-	X	-	X
4	2	Windrow or covered ASP	10,000	-	X	X	X	-	-	X	-
4	1	windrow	12,500	X	X	-	-	-	-	-	-
5-S	1	windrow	10,000	-	X	-	-	-	-	-	-
5-S	1	windrow	4,000	X	X	-	-	-	-	-	-
5-F	1	windrow	12,500	X	-	-	-	-	X		
5-F	1	windrow	12,500	-	-	-	-	-	X	-	-
5-F	1	windrow	12,500	-	X	-	-	-	-	-	-
8	1	windrow	12,500	-	X	-	-	-		-	-
8	1	windrow or ASP	12,500	-	X	-	-	-	-	-	-
8	1	windrow	12,500	-	X	-	-	-	-	-	-
8	1	windrow	12,500	X	X	-	X	-	-	-	
8	1	windrow	12,500	-	X	-	-	-	-	-	-
8	1	windrow	12,500	-	X	-	-	-	-	-	-
8	1	windrow	12,500	-	X	-	-	-	-	-	-
8	1	windrow	12,500	-	X	-	-	-	-	-	-
8	1	windrow	12,500	-	X	-	-	-	-	-	-
9	2	windrow	12,500	-	X	-	-	-	X	-	-

Source: Email correspondence with the State Water Board on March 14, 2024.

Composting activities that are not covered by the Compost General Order may be covered by other permits as appropriate and as determined by the Regional Water Boards. Exemption from the Compost General Order doesn't mean exemption from regulation. The operations listed in **Table 14** are exempt from the Compost General Order; however, some of them may be regulated through the NPDES for Storm Water Discharges Associated with Industrial Activities, Order 2014-0057-DWQ, amended in 2015 and 2018 (IGP) according to the Division of Water Quality.

Table 14: Composting Activities Exempt from Composting General Order

Region/Location	Exemption	Details
Region 5-Redding	Exemption under Finding 31(c)	Fully enclosed; composting takes place in ag bags atop an asphalt surface; green waste; regulated through the Industrial General Permit
Region 5-Redding	Exemption under Finding 31(e)	Less than 5,000 cubic yards annual throughput and implements BMPs; green waste
Region 5-Fresno	Exemption under Finding 31(e)	Less than 5,000 cubic yards annual throughput and implements BMPs
Region 5-Fresno	Exemption under Finding 31(c)	Fully enclosed; aerated static piles in concrete containers; cured via aerated static piles in building
Region 8	Exemption under Finding 31(c)	Fully enclosed; aerated static piles in concrete bunkers with leachate control and synthetic fabric covers
Region 8	Exemption under Finding 31(d)	Less than 500 cubic yards on site at any given time
Region 8	Consideration of Finding 13	Regulated through the Industrial General Permit; paved working surfaces

Source: Email correspondence with the State Water Board on March 25, 2024.

The process to approve a small composting facility in all Water Board Regions starts by determining eligibility for the Compost General Order, another General Order, or any applicable waiver. Submitting the Compost General Order application involves submitting a NOI, Technical Report, and filing fee. These three documents are equivalent to a Report of Waste Discharge (ROWD). If the operation is ineligible for a General Order or applicable waiver, the facility will start an individual WDR. A Notice of Applicability will need to be issued. In some cases, for small-sized composting activities,

the first step is just to submit a Notice of Non-Applicability (NONA). If it is accepted, then it is conditionally exempt from the Compost General Order. If not, then the operation would proceed with preparation and submittal of a ROWD and NOI. The process is generally the same for green material, agricultural, and food waste feedstocks. However, agricultural operations have more opportunities to become conditionally exempt depending on certain variables such as the amount of feedstock the site stores, feedstock composition, and the amount of it that is given away or sold. In almost every case, CEQA compliance is required, and it would be required to be performed by the lead agency. For a medium-sized composting operation, the process is generally the same, but would not initially submit a NONA for a bigger operation.

The initial application fee for the Compost General Order is $3,746. The annual fee starts at a base cost of $3,746 for Tier I facilities but can be made more expensive depending on the discharge's threat to water quality, complexity rating, and applicable surcharges. The annual base cost for Tier II facilities is $8,431.

Construction General Permit

Less than one (1) acre of land disturbance is exempt from the Construction General Permit, though an Erosion and Sediment Control Plan waiver may be required by permitting agencies for construction below one acre. Operations greater than one acre should apply by submitting Permit Registration Documents (PRDs) to the Stormwater Multiple Application and Report Tracking System (SMARTS). Examples of PRDs are the NOI, Risk Assessment, post-construction calculations, a site map, the construction schedule, the SWPPP, a signed certification statement by the legally responsible person, and the first annual fee.

Industrial General Permit

Industrial facilities that fall under specific Standard Industrial Classification (SIC) codes are required to enroll in the IGP. Composting facilities are often classified under the SIC code of 2875 which requires compliance with the IGP. The facility operator must submit an NOI for each facility that is required by the EPA to obtain a stormwater permit. A scaled site map must be submitted with the application. The application and fee for coverage is submitted through SMARTS.

At least one Regional Water Board responded that a facility not subject to the CGP or IGP may require additional permitting with the Regional Water Board to comply with the applicable NPDES requirements.

Water Permitting Challenges and Opportunities

Per the survey, the biggest challenge to permitting is the length of time that it takes to complete the process. Agency permitting review can take years to complete. It is recommended to submit applications as early as possible, at least 12 months before starting operations. Additional time is required for CEQA review and application revisions. In addition to this, at least one Regional Water Board responded saying that

they do not have dedicated staff for composting due to program cuts or office reorganization.

Another challenge specific to Tier I facilities is cost effectiveness. The capital investment associated with constructing, permitting, and operating a Tier I facility requires most facilities to maintain at least 25,000 cubic yards of material on site at a time.

The biggest opportunity of permitting is to address the water quality issues that have caused prior compliance issues for composting operations. One method is to treat stormwater and/or process water, which reduces the likelihood of current or future environmental regulations adding costs or disrupting workflows. Another opportunity could be the use of recycled water, either through access from a “purple pipe” or recycled through an on-site treatment system.

V Permitting Challenges and Solutions

Compost Activity Permitting Process Overview

Developing a composting activity in California is a highly regulated process and typically requires permits and approvals from different state, regional, and local agencies. This memo will provide a summary of the major environmental and operational permits required for small- and medium-sized composting activities, and identify the potential challenges and solutions associated with each permit. **Section III: Siting Best Management Practices** of this study provided more in-depth analysis on the land use and CEQA requirements, which is often the first step of the permitting process. **Section IV: Air and Water Permitting Requirements** covered the various air quality and water quality permits required for these operations. In this memo, the HDR Team will also highlight the permitting process with the LEA and CalRecycle, and other local construction permits often required by a jurisdiction. In addition, the permitting process for composting activities becomes more robust for facilities accepting and processing food waste — one of the main expected outcomes of SB 1383; therefore, a high-level summary of the permitting differences between accepting source-separated food waste will also be included.

Local Land Use and CEQA

Land Use Approval Overview

Although composting of smaller volumes may be an allowable use in some zoning classifications, most large regional composting facilities require project-specific discretionary approval typically in the form of a land use approval. This approval process can vary depending on the jurisdiction, site location, zoning code, allowed uses in the jurisdiction, etc. Land use approval may be required at the city or county level. Common land use approvals for a composting facility are in the form of a Site Plan Review or Conditional Use Permit. The application for the land use approval is typically what triggers the CEQA process.

In **Section III: Siting Best Management Practices**, the HDR Team summarized the land use approval and CEQA pathways and potential mitigation measures commonly applied to composting facilities. This included a municipal code analysis for several cities and counties in California. The HDR Team's research pertaining to permitting pathways for small- and medium-sized composting activities in the selected cities and counties revealed that most county municipal codes included some specific reference to composting activities, whereas it was less likely to find expanded composting definitions in city municipal codes. It is important to note this may not be a trend across the state but was a trend in the jurisdictions sampled in this study. These findings imply that it is currently more challenging to permit a composting activity at the city level; however, counties may be able to facilitate an easier permitting process for a potential site. Without distinct composting activity definitions, the zoning code is up to interpretation and this lack of definition may be used as a means to exclude composting operations. It

was the HDR Team's recommendation that compost-specific language be included in local municipal codes to clarify the local land use process for these types of activities.

California Environmental Quality Act (CEQA) Overview

Depending on the local jurisdiction's land approval process, CEQA may be triggered and require the development of an Initial Study (IS. This is the first step of the CEQA process to review the project across several environmental factors to determine if there will be, or will not be, a potential significant impact from the project. The IS will conclude in either a Negative Declaration (ND, a Mitigated Negative Declaration (MND, or other Environmental Impact Report (EIR. The ND is prepared for a project when there is no substantial evidence that the project or any of its aspects could result in significant adverse environmental impacts, and typically focuses on BMPs. The purpose of the MND is to recommend project-specific mitigation measures that can be incorporated into the project in order to have a less than significant impact on the environment. An EIR is typically only required for larger projects, as this type of CEQA clearance document is for projects that have a significant impact on the environment and cannot be mitigated. MNDs are the most common for composting activities.

Complying with CEQA is a costly and time-consuming process. Small and medium composting activities may fall under Statutory and Categorical Exemptions; however, the SWIS database shows that there is a mixture of exemptions, NDs, and MNDs. It should be noted that the CEQA pathway is not always documented in SWIS.

Land Use Approval Challenges

The most difficult part about obtaining land use approval for small- and medium-sized composting activities is identifying the proper permitting pathway. This is due to some jurisdictions not including compost-specific language in their municipal code. Without this clarifying language adopted into the municipal code, it leaves interpretation up to the local planning department to determine what land use approval is required, if any. If the project is approved by-right (e.g., does not require a site-specific approval due to the jurisdiction's General Plan, or similar, then there is often no documentation of this approval. This can lead to issues in the future as regulatory requirements change. Without an advocate at the local planning level, an operator may not be aware if their status changes and they are required an approval in the future either due to a regulatory change or, even more complicated, a different interpretation of the code.

CEQA Challenges

There are several challenges when a project is subject to a discretionary permit, such as CEQA, for permit approval. Aside from the length of time this process may take, it is often up to the local elected officials of a city council or county board of supervisors to approve or deny a project. If a project is subject to this discretionary approval, it is imperative to start gathering support for the project as early as possible. Not only from elected officials but also from key stakeholders who have an influence on these elected bodies and will hopefully advocate for the project.

Focusing more on the land use and CEQA process, often times a project description will be modified several times during a project's review to further refine the scope, capacity, technology, and potential environmental impacts. Developing a detailed project description at the time of application is helpful to streamline the permitting process to minimize these potential delays for additional clarification.

In addition, often times for CEQA there are required special studies for environmental impacts that may not be thoroughly evaluated during the IS, or first step of the CEQA process. For composting activities, typically required special studies include an air quality assessment, a traffic study, and a hydrological study. Depending on the type and size of equipment, the project also may need a noise study. Preparing these special studies earlier in the project review, prior to completion of the IS, will help reduce potential delays compared to if they are provided after the IS is completed.

CalRecycle/Local Enforcement Agency Permit and EA Notification Tiers

CalRecycle delegates the primary responsibility for ensuring the correct operation of composting activities to LEAs which are designated by local government and certified by CalRecycle. CalRecycle divides composting into four regulatory tiers: Excluded Tier, EA Notification Tier, Registration Tier, and full SWFP. A high-level summary of the permit types and the relative feedstock and quantity limits as it relates to this project is provided in **Table 15**.

Table 15: CalRecycle/LEA Permit Types[36]

Excluded Tier	EA Notification Tier	Registration Tier	Full SWFP
All materials ≤ 100 cubic yards and 750 square feet	Agricultural Composting (all)	-	Composting (all)
	Green Material Composting ≤ 12,500 cubic yards	Vegetative Food ≤ 12,500 cubic yards	Green Material > 12,500 cubic yards
See 14 CCR §17855 for additional exclusions.	Research Composting Operations ≤ 5,000 cubic yards Within-vessel > 5,000 cubic yards with EA determination	-	Vegetative Food > 12,500 cubic yards

[36] CalRecycle. "Permitting Compostable Material Handling Facilities and Operations." *CA.gov.* https://calrecycle.ca.gov/swfacilities/permitting/facilitytype/compost. Accessed April 2024.

Excluded Tier

Small composting activities may be excluded if they do not exceed 100 cubic yards and 750 square feet of any combination of materials (green, agricultural, food, vegetative food) on site at a given time. The full list of Excluded activities can be found in Section 17855 of Title 14 of the California Code of Regulations (14 CCR §17855).

EA Notification and Registration Tiers

The small and medium composting activities which are the focus of this Study often fall under the EA Notification or Registration Tiers, which apply to activities that have up to 12,500 cubic yards of feedstock, chipped and ground material, amendments, additives, active compost, and stabilized compost on-site at any one time. Operations processing green material only fall under the EA Notification Tier, and facilities that also include vegetative food in their feedstock fall under the Registration Tier.

Research Composting Operations

Within the EA Notification Tier, a research composting operation, or "Research Notification," can be established for sites with no more than 5,000 cubic yards of material on site at any time. The Research Notification is the most applicable permit type for the purposes of understanding the permitting pathway for small composting activities for food waste. In vessel processing may exceed the quantity limit if the EA determines there is no additional risk to the environment. Section 17862 of Title 14 of the California Code of Regulations (14 CCR §17862) defines the conditions under which a Research Notification operates:

- In addition to the EA Notification requirements set forth in Title 14, California Code of Regulations, Division 7, Chapter 5.0, Article 3.0, Section 18103.1 (a)(3), the operator shall provide a description of the research to be performed, research objectives, methodology/protocol to be employed, data to be gathered, analysis to be performed, how the requirements of this subchapter will be met, and the projected timeframe for completion of the research operation.
- After no more than a two-year period of operation, the operator of a research composting operation shall submit to the EA a report that includes the results and conclusions drawn from the research. If the EA determines based on the report that there are further research objectives to be met or data to be gathered, the EA may extend the research for a specified time period not to exceed two years. If the EA determines based on the report that there are no further research objectives to be met or data to be gathered, the operator shall conduct site restoration at the operation or facility pursuant to Section 17870 or obtain other appropriate authorization pursuant to Article 2 of this Chapter prior to continuing operations.
- Research composting operations that will be using unprocessed mammalian tissue as a feedstock for the purpose of obtaining data on pathogen reduction or other public health, animal health, safety, or environmental protection concern, shall satisfy the following additional requirements:

- Unprocessed mammalian tissue used as feedstock shall be generated from on-site agricultural operations, and all products derived from unprocessed mammalian tissue shall be beneficially used on-site.
- The operator shall prepare, implement, and maintain a site-specific, research composting operation site security plan. The research composting site security plan shall include a description of the methods and facilities to be employed for the purpose of limiting site access and preventing the movement of unauthorized material on to or off the site.
- After no more than a 6-month period of operation, the operator of a research composting operation using unprocessed mammalian tissue as feedstock shall submit to the EA a report that includes the results and conclusions drawn from the research and documentation of additional requirements of this Section. If the EA determines based on the report that there are further research objectives to be met or data to be gathered, the EA may extend the research for a specified time period not to exceed two years. If the EA determines based on the report that there are no further research objectives to be met or data to be gathered, the operator shall conduct site restoration at the operation or facility pursuant to Section 17870 or obtain other appropriate authorization pursuant to Article 2 of this Chapter prior to continuing operations.

Solid Waste Facility Permit (SWFP)

Depending on size, feedstocks, and scope, a new compost facility may require a SWFP, issued by the LEA. In the case of a "Full" permit, the permit must be concurred upon by CalRecycle. The application form for a SWFP (CalRecycle Form E-1-177), must be accompanied by a more detailed Report of Composting Site Information (RCSI) and an Odor Impact Minimization Plan (OIMP). The RCSI and OIMP serve as the operating plan for the facility and often go through several rounds of review with the LEA to ensure the operation meets state minimum standards. The small and medium composting activities do not fall under this permitting tier unless they are processing nonvegetative food material; therefore, those activities with limited feedstocks will have less barriers to face throughout this permitting process.

CalRecycle / LEA Challenges

Composting facilities tend to be somewhat unique and have their own unique challenges. Many EA Notification Tier operations have operated for years without any operational or regulatory challenges. Although there is no published data on this, it is likely that the biggest challenge to an EA Notification Tier composting operation is changing land use/land use compatibility. After that, composting facilities may experience challenges from odor issues, stormwater issues, and a lack of record keeping.

<u>Compatible Land Use</u>

Composting operations are often on the urban or suburban fringe — the first land that gets developed when a city grows. California cities often grow outwards and envelop composting sites which were surrounded by previously compatible land uses.

An increased number of receptors in the project area tends to lead to off-site odor issues, where once there were none. There is not much an operator can do about changing land use — with the exception of planning their site very well and tracking changing land use as it occurs.

Odors

Even the most well-run composting operation can have off-site odor impacts just from the simple act of processing material or turning windrows. Typically, these are mitigated to where they are an occasional occurrence not an off-site nuisance. CalRecycle has published excellent guidance on odors via the Comprehensive Compost Odor Response Project (C-CORP).[37]

Stormwater Discharges

While there is no published data on compost operations with stormwater problems, the authors know that several composting operations have been closed due to the inability to manage stormwater discharges. It is critical for a EA Notification operation to comply with the applicable water quality permits for stormwater and prepare and implement a Stormwater Pollution Prevention Plan (SWPPP). Most EA Notification Tier sites can implement relatively low cost structural and nonstructural stormwater controls. Often it is a lack of familiarity with the NPDES process or a belief that it does not apply which leads to compliance issues.

Recordkeeping

This category can describe a number of challenges for the EA Notification Tier composter. One issue is the limitation of 12,500 cubic yards of material on-site at any one time. This can be a challenge for both regulators and operators to determine. Feedstocks are often delivered in tons but managed and often sold in cubic yards. The fact that some feedstocks can be seasonal adds an additional challenge. Some composters also struggle with sticking with the feedstocks they described in the EA Notification application, and with documenting the Process to Further Reduce Pathogens (PFRP) or other temperature records. The amount of recordkeeping required for even a small or medium activity has increased significantly with the passage of SB1383 as well, with composters now required to report incoming and outgoing tonnages via the RDRS process, as well as document the weight of organics disposed of in their refuse streams.

Air Quality Permits

Air quality permitting is a complex process for composting activities as their operations typically include both stationary and mobile sources. As discussed in **Section IV: Air and Water Permitting**, stationary sources are regulated by the local air districts and mobile sources are regulated by CARB. It is important to note the varying level of

[37] https://www2.calrecycle.ca.gov/Publications/Details/1241

regulatory requirements per air district, and that some air districts may result in a more favorable permitting process and less expensive design requirements (i.e., ASP composting systems versus other composting systems). Only two local air districts, the SCAQMD and SJVAPCD, have compost-specific rules for stationary sources applicable to the small- and medium-sized composting activities included in this study. A number of other districts have considered and even entered into draft compost-specific rule-making stages, and several air districts require new or expanded facilities to comply with BACT requirements. However, new windrow composting operations are still able to come online in some areas of the state. A handful of composting activities are considered to be "major facilities" under the Clean Air Act's Title V program and are also subject to EPA regulatory oversight.

Stationary Sources

Compliance or approval may vary from district to district, but if a permit is required for the stationary source, most air districts will follow their New Source Review process and assess the project for applicability to their BACT and Emission Reduction Credits (ERCs) requirements. The New Source Review process could potentially have an additional requirement for a Health Risk Assessment (HRA).

Best Available Control Technology Challenges

If a composting activity is subject to BACT, then the typical requirement is the project must achieve at least an 80% reduction in Volatile Organic Compounds (VOCs) and 50% reduction in ammonia (NH_3). Some air districts refer to VOCs as Reactive Organic Compounds (ROGs) or Precursor Organic Compounds (POCs), but for the purposes of this study, the term VOCs will be used to cover this parameter. These levels of reductions were "Achieved in Practice" at a composting facility located in SCAQMD that uses an ASP composting system. Therefore, ASP is seen as complying with the BACT requirements.

Some ASP composting operations and facilities have shown to achieve greater emissions reduction than the BACT requirements; however, the BACT requirements have not been updated. BACT requirements are updated by the local air district, but the same requirements are often used by multiple air districts with the same attainment or nonattainment status to regulate similar industries, such as composting.

Since the focus of this study is composting activities utilizing an ASP system, it can be reasonable to assume these operations will comply with BACT requirements, if the project's PTE exceeds the threshold to require BACT.

Emission Reduction Credits Challenges

As discussed at length in Section IV, ERCs are required when a project exceeds an air district's offset threshold. For composting activities, the air pollutant of concern is VOCs, a precursor to ozone which most of the California is designated as nonattainment status. For the two air districts with compost-specific rules, the VOC offset threshold for their non-attainment areas is 20,000 pounds of VOCs per year (or 10 tons of VOCs per

year). Using the "Compost Emission Factor Report" revised by SJVAPCD in March 2023[38], the baseline emission factor for organic material composting is 3.58 pounds of VOCs per wet ton of material. The following is a simple calculation to estimate the annual and daily tonnage capacity for active and curing composting activities compliant with BACT to stay below the ERC VOC threshold.

$$3.58 \frac{\text{pounds of VOC}}{\text{wet ton of material}} \times (1 - 0.80)\text{percent reduction} = 0.716 \frac{\text{pounds of VOC}}{\text{wet ton of material}}$$

$$20{,}000 \frac{\text{pounds of VOC}}{\text{year}} \div 0.716 \frac{\text{wet ton of material}}{\text{pounds of VOC}} = 27{,}933 \frac{\text{wet ton of material}}{\text{year}}$$

$$27{,}933 \frac{\text{wet ton of material}}{\text{year}} \div 365 \frac{\text{year}}{\text{days}} = 76.5 \frac{\text{wet ton of material}}{\text{days}}$$

As shown in this simple calculation, a BACT-compliance composting facility could potentially compost up to 76.5 wet tons of material per day and stay beneath the ERC VOC threshold for SJVAPCD. However, it is important to note the above calculation only considers the active and curing composting activities, and does not include the material receiving, stockpiling, mixing, grinding, screening, or finished product load-out. Including these additional activities would significantly lower the composting throughput capacity to stay below the ERC VOC threshold.

ERCs for VOCs in SJVAPCD were as high as $174,800 per ton in 2023. Although ERCs are a one-time purchase, depending on the activity's Potential-to-Emit (PTE), the requirement to purchase ERCs could pose a significant financial hurdle on the facility. In addition, not all air districts have available ERCs for purchase, creating an even bigger financial hurdle to purchase ERCs from a different air district to attempt to satisfy this requirement.

Health Risk Assessment Challenges

Depending on a facility's PTE, a HRA may be required to analyze the project's acute and chronic cancer risk. The PTE typically includes all stationary sources of potential air pollutants. A project must pass the HRA to obtain permit coverage. Even if a project complies with other regulatory requirements such as CEQA, and air quality requirements such as BACT and ERCs, additional project modifications may be required to pass the HRA.

[38] San Joaquin Valley Air Pollution Control District. Compost Emission Factor Report. Revised March 21, 2023. Available at https://ww2.valleyair.org/media/hdsoobtp/criteria-compost-emission-factors-report-final-voc-nh3-3-21-23.pdf.

For small- and medium-sized composting activities, this may not be a significant financial hurdle, but it is heavily dependent on the project's PTE and site location. If the project is located near sensitive receptors, such as a school, hospital, or residential homes, then it will pose a higher health risk than if it is located in a remote area. This consideration of project siting was discussed in **Section III**.

Mobile Sources

CARB is predominately used to register portable, or mobile, equipment through PERP. This is a fairly straightforward process for the operator, with minimal hurdles to obtain the necessary approvals. However, if a piece of equipment is not considered "mobile", then it may be considered a stationary source and would need to obtain a Permit to Operate (PTO) from the local air district. The definition of "portable" as defined in section 2452 (dd) of the PERP regulation states the piece of equipment may not stay at the same location (e.g., facility) for longer than 12 consecutive months. Typically, all stationary sources contribute to a facility's PTE which will dictate the applicability of BACT, ERCs, or HRA as explained above.

Water Quality Permits

Water Quality Permits Overview

As discussed in **Section IV: Air and Water Permitting**, composting activities are typically subject to the following NPDES permits under the federal CWA:

- General Waste Discharge Requirements (WDR) for Composting Operations (Compost General Order)
- Industrial General Permit (IGP)
- Construction General Permit (CGP)

This may not be an inclusive list as the RWQCBs can require site-specific water quality permits such as an individual WDR. Please refer to **Section IV: Air and Water Permitting** to learn more about the water quality permitting requirements for composting activities.

Compost General Order

The Compost General Order requires compost operators to implement numerous requirements related to drainage for protection of groundwater and stormwater. While the RWQCBs cannot be less restrictive than the Compost General Order, the RWQCBs may require additional requirements for water quality protections based on site-specific information. These requirements include working surface permeability or hydraulic conductivity requirements, as well as drainage design specifications for stormwater and leachate. The Compost General Order contains essentially two tiers of facilities. While one can compost a relatively small volume of certain sources of food waste in a Tier 1 facility, most facilities taking food waste will end up meeting Tier 2 requirements (either

due to volume or feedstock source). Please see **Section IV** for a more detailed description of the Compost General Order permitting requirements.

Compost General Order Challenges

As stated, the Compost General Order dictates specific design requirements related to the site's working pad permeability and drainage conveyance structures and containment systems. A small- or medium-sized composting activity, depending on feedstock, may qualify as a Tier 1 composting facility which is less stringent than a Tier 2 composting facility; however, they must still meet certain project parameters such as specific depth to groundwater requirements and soil percolation rates. While these are less stringent, there is still a cost associated with these improvements, especially if a site does not meet these requirements as-is.

For a Tier 2 composting facility, the Compost General Order requires a lined detention pond with a leak detection device, as well as relatively impermeable drainage conveyance systems. Of these requirements, the pond is the largest financial investment. While the Compost General Order requires the site be able to contain all run-off from the 25-year 24-hour storm event, it has become increasingly common for the RWQCBs to require containment of the 100-year 24-hour storm event, or for the site to qualify as no discharge. This means that that site would need to hold all stormwater and process water (e.g., leachate, wash water, etc.) generated from the facility. Not only is this a significant land requirement that can take away from acreage needed to perform the composting-related activities, but the engineering design, construction, and construction quality assurance documents required for these large ponds can prohibit a facility from moving forward with a particular project. Some composting sites have reduced or modified their operations in response to this requirement.

IGP and CGP Stormwater Permits

Industrial General Permit (IGP)

As part of the federally required stormwater regulations, the IGP regulates industrial stormwater discharges and authorized nonstorm water discharges from industrial facilities in California. The RWQCBs implement and enforce the IGP. Industrial facilities that fall under specific Standard Industrial Classification (SIC) codes are required to enroll in the IGP. Composting activities typically fall under SIC 2875 for Fertilizers, Mixing Only.

IGP Challenges

While the IGP requires development and implementation of a site-specific SWPPP, the biggest potential challenge with this permit is compliance with the permit requirements related to the discharge of potential pollutants from the site. Notably, complying with the Numeric Action Levels (NALs) and Total Maximum Daily Limits (TMDLs), as applicable, can be challenging for composting operators.

Composting activities under SIC 2875 are subject to the following additional analytical parameters surrounding numerous potential pollutants: Total Iron (Fe), Nitrate and Nitrite, Nitrogen (N+N), Total Lead (Pb), Total Zinc (Zn), and Total Phosphorus (P). As composting activities handle organic materials, it is common for them to have higher concentrations of N+N than other nonorganic activities. Also, the use of heavy equipment may contribute to increased Fe concentrations. The limits for these additional analytical parameters, and the standard analytical parameters are listed in **Table 16.**

Table 16: Analytical Parameters and Limitations

Parameter	Numeric Action Limit (mg/L unless otherwise stated)
pH	Less than 6.0, greater than 9.0 pH units
Total Suspended Solids (TSS)	100
Oil & Grease (O&G)	15
Fe	1.0
N+N	0.68
Pb	0.262
Zn	0.26
P	2.0

As evident in the table, the NALs are extremely low for several of these parameters which makes it difficult for a composting activity to comply, especially on an unpaved working pad. Noncompliance with the IGP leaves the operator open to potential civil lawsuits under the CWA that can be brought against the operator by any member of the public. Historically, individuals or environmental organizations partner with law firms that target facilities that report noncompliance with the NAL requirements but include potential other areas of noncompliance related to a facility's potential pollutant assessment, site map, and monitoring implementation plan. Typically, these threats of litigation are settled out of court, but can amount to a significant financial burden for a small- or medium-sized operator.

Construction General Permit (CGP)

As discussed in **Section IV: Air and Water Permitting**, the CGP is required when an activity disturbs more than one (1) acre of land. Composting activities require significant acreage to manage the material receiving, pre-processing (e.g., grinding), composting, and post-processing (e.g., screening) activities and likely will require coverage under the CGP. While this permit is not as intensive as the Compost General Order, it does require the operator to retain assistance from a Qualified Stormwater Developer (QSD) to develop and help oversee the implementation of the site-specific SWPPP.

CGP Challenges

The main hurdle in meeting the criteria of CGP is retaining the expertise of a QSD for the development and implementation of the construction SWPPP. This may be an added cost to the construction of the facility that the operator did not anticipate.

Local Construction Permits

After the project obtains the necessary approvals from the regulatory agencies described above (e.g., land use/CEQA, LEA permits and Notifications, local air district, RWQCB), an operator typically needs to obtain additional local permits for construction. For a composting activity, these are typically a grading permit and/or a building permit. While each individual jurisdiction may have a slightly different process and permit fees, the purpose of this analysis is to highlight the potential impacts these permits have on the development of small- and medium-sized composting activities.

Grading Permits

Grading permits are typically required to be prepared and stamped by a licensed professional, such as a professional engineer. Before creating an accurate, engineered grading plan, a topographic survey of the property will first need to be completed. The cost of the survey depends on the property size; however, these surveys are not typically cost prohibitive compared to other project design aspects. The survey is conducted to quantify the amount of cut (i.e., soil removal) and fill (i.e., soil addition) required for the project's working pad. It is important to note that the grading plan includes drainage considerations such as swales, berms, and detention ponds so the accuracy of the survey is important to support the drainage calculations.

No significant hurdles are anticipated in obtaining the grading permit, although time to perform the survey, design the grading and drainage plan, and complete the permitting process should be accounted for in the project schedule. The potential hurdles associated with this permit (e.g., drainage and working pad surfaces) are discussed under the Compost General Order.

Building Permits

Similar to the grading and drainage plan, building construction documents are required to be prepared and stamped by a licensed professional. The topographic survey prepared for the grading plan can help plan for a building design, but for any structures, including detention ponds, a geotechnical study will need to be conducted to determine the soil characteristics and design requirements. A geotechnical report is often more costly than a topographic survey but is also not seen as typically cost prohibitive for the development of a composting facility compared to other project design aspects.

No significant hurdles are anticipated for the building permit process. Design requirements for the building may be a condition of the project through another permit, such as their land use and CEQA approval.

Gap Analysis for Food Material Composting Activities

While Section III summarized various land use and CEQA requirements, and Section IV identified the air quality and water quality permitting requirements for composting activities, it is important to perform a gap analysis on the varying regulations for small- and medium-sized composting activities. There are three major differences in compost activity permitting across these varying agencies, which can be summarized in the following categories: 1) feedstock type, 2) on-site capacity, and 3) annual tonnage throughput. The lack of consistency across the permitting agencies for composting activities increases the complexity and difficulty for operators to understand and comply with the applicable regulations. Additionally, an important data gap for composting activities is the lack of available, accurate data on emissions produced from mixtures of green material and food scraps. This fourth area of consideration is applicable to both the land use permitting process and obtaining air quality permits.

Feedstock Type

The only composting activity that can handle source-separated, nonvegetative food scraps are activities which obtain a full SWFP. EA Notification Tier research composting operations may be able to handle nonvegetative food scraps, but these approvals are limited in both on-site capacity and duration (i.e., two-year active approval). There are examples of full-scale SWFP composting activities that started their operations under this EA Notification Tier approval, but after the two-year timeline expires the operation either must cease operations, eliminate food scraps as a feedstock, or modify its permit to a full SWFP. For a small-sized composting activity to operate with only a two-year active permit with limited feedstock capacities is a significant financial barrier. An operation most likely would be able to secure stable, long-term financing for a green material-only composting operation that has a higher feedstock capacity and no approval expiration date, than a limited two-year active approval.

Contrary to the CalRecycle/LEA permit and approval process, the Compost General Order allows “residentially co-collected or self- hauled food and green materials” for Tier 1 facilities. If a composting operation wants to accept source-separated, nonvegetative food scraps it must comply with all Tier 2 facility requirements, which are significantly more intensive. Most notably, a Tier 2 composting facility is required to contain all run-off from a 25-year 24-hour storm event (e.g., detention pond) which is a significant financial obstacle and requires an allocation of the property for non-composting activities.

These are significant hurdles for small- and medium-sized composting activities to contribute to organic waste diversion mandated under SB 1383.

On-Site Capacity

The Compost General Order, as discussed in more detail in Section IV, has specific thresholds for on-site capacity. A Tier 1 facility must store less than 25,000 cubic yards of material (this includes receiving, pre- and post-processing, active and curing compost, and final product storage) on site at any given time. A Tier 2 facility has greater than 25,000 cubic yards of material. Under these limits, a full SWFP may either qualify as a Tier 1 or Tier 2 facility under the Compost General Order. While both Registration and EA Notification Tiers fall under the Tier 1 on-site capacity thresholds, depending on their feedstock they may be required to comply with Tier 2 requirements. The variations in on-site capacity, in addition to the allowable feedstocks, may result in confusion for a EA Notification Tier composting activity that may be under the impression they qualify for less stringent requirements from CalRecycle/LEA. An example of this is a research composting operation that accepts source-separated, nonvegetative food waste.

It is important to note that a composting activity that gives away or sells no more than 5,000 cubic yards of compost product per year is exempt from the Compost General Order. Depending on site-specific criteria, the operation may be subject to other water quality permits (e.g., IGP or individual WDR). While the research composting operation has a limit of 5,000 cubic yards under the CalRecycle/LEA approval process, this is for 5,000 cubic yards on site at any given time. An operator may get confused that they are exempt from the Compost General Order because these quantities may look the same initially but are two different metrics.

Annual Tonnage Throughput

As noted in Section IV, the local air districts do not regulate a composting activity's on-site capacity but rather annual throughput. The annual throughput is what the air districts use to estimate the activity's PTE. As described from the results of our survey to the local air districts, there was confusion as to how to apply the definition of small- and medium-sized composting activities included in this report to the air permitting process. While one air district converted the on-site cubic yard capacity to estimate annual tonnage throughput, most air districts responded with their emissions thresholds which are based on the PTE. Understanding the relationship between on-site cubic yard capacity and annual tonnage throughput is a complex process, as it relies on a multitude of factors such as composting retention time, material and product storage time, and the bulk density of the material. As identified in the CalRecycle FacIT Conversion Table 1[39], the bulk density of organic materials can vary from roughly 0.181542857 tons per cubic yard of green waste (or roughly 363 pounds per cubic yard) to 0.5615 tons per cubic yard of food waste (or roughly 1,123 pounds per cubic yard). Using these boundaries above, the on-site capacity for a 12,500 cubic yards EA Notification Tier composting activity can range from roughly 2,300 tons of material to over 7,000 tons of material. The responsibility of understanding the appropriate bulk

[39] https://www2.calrecycle.ca.gov/Docs/107834

density and composting activity annual throughput falls on the responsibility of the compost operator.

This can further add to the complexity of obtaining approvals for a small- and medium-sized composting activity, as they can fall under the less stringent regulatory requirements from both CalRecycle/LEA and the Compost General Order but be required to comply with potentially stringent air permitting requirements such as BACT, ERCs, and an HRA.

Best Available Control Technology Requirements

While the requirement to use of BACT is specific to each local air district, a BACT requirement also can be set statewide. An example of a BACT specific to the air district, SJVAPCD, is rule 2201 (New Source Review) with compost-specific rules.

“BACT is the most stringent emission limitation or control technique of the following:

- Achieved in practice for such class or category of source;
- Contained in any State Implementation Plan approved by the EPA for such class or category of source;
- Contained in an applicable federal New Source Performance Standard; or
- Any other emission limitation of control technique, including process and equipment changes of basic or control equipment, found by the Air Pollution Control Officer to be cost effective and technologically feasible for such class or category of sources or for a specific source.”

This is nearly identical to SCAQMD’s definition of BACT in Regulation XIII (New Source Review) Rule 1302.

There is not publicly established BACT for composting operations, as the previously published BACT guidelines produced by SJVAPCD have been rescinded to be updated. However, it is common knowledge in the industry that the composting BACT requirement was set by an ASP composting facility in SCAQMD which reported to achieve 80% reduction in VOCs. The ammonia reduction has been seen to fall between 50% and 60% depending on the specific project.

Some composting facilities have reported higher VOC and ammonia emission reduction, however, the above is commonly used as the BACT standard. Unfortunately, without this being published data, there is the potential for this to be left to the discretion of the local air district which may require lower or higher reduction in criteria pollutants. For the purposes of this project, an ASP composting system is typically seen as meeting BACT requirements, however, the specific BACT requirements are not currently set in stone and are subject to interpretation. This leaves a potential hurdle for composting activities to meet BACT if it is unclear that the specific emission reduction required is in the composting activity's air district.

Emissions Data

The most recent emissions factor for composting activities was updated by the SJVAPCD March 2023 [40] (2023 SJVAPCD Compost Emission Factors). It is important to note that not all air districts utilize these emission factors (or even similar emission factors). However, for the purpose of this study the HDR Team will use the SJVAPCD emission factors as an example to highlight the emissions data gap.

As noted in Table 1 of the 2023 SJVAPCD Compost Emission Factors report, the emission factors for "organic material" are combined into one factor that includes green waste, 15% food scraps, and grape pomace. However, later on in the report SJVAPCD states the following:

"The District (SJVAPCD) has not been able to identify an emission factor for uncontrolled food waste composting. Source tests from controlled composting operations have yielded emission factors ranging from 3.4 pounds of VOC per ton of food waste composted (micropore cover) to 37.1 pounds of VOC per ton of food waste composted (Ag Bag)."

Similar to the range of bulk densities that can be used to convert a composting activity's cubic yard throughput to tons, the information highlighted here poses a significant range of potential emissions from food scraps composting. This typically does not come into play during the permitting process, as local air districts will apply the established "organic material" composting emission factors to composting operations, however, it is not common for composting operations to be required to conduct emissions source testing to verify the accuracy of the applied emission factors. In the event the original permitting emission factor is lower than the achieved-in-practice emission rate generated during the source test, then the operation's air permit is updated to include this higher PTE. This may result in the requirement of ERCs and/or an HRA, both of which could pose a significant hurdle both financially and operationally to the composting operation.

Summary of Permitting Recommendations

A new commercial (or municipal) composting facility is a significant piece of infrastructure and requires the coordination of a number of regulatory agencies early in the planning process to result in a successful facility. The following is a breakdown of each permit discussed in this memo, and some recommendations from the HDR Team to streamline the permitting process for small- and medium-sized composting activities.

A summary of the responsible government entity per permit, a description of the compliance requirement, and recommendations are provided in **Appendix D.**

[40] http://sjvapcd.dst.ca.us/media/hdsoobtp/criteria-compost-emission-factors-report-final-voc-nh3-3-21-23.pdf

Land Use / CEQA

Of all permits discussed in this memo, the local land approval and CEQA process typically has the longest lead time. It is imperative for the proponent to engage with the local jurisdiction/lead agency to have a pre-application meeting process, or equivalent meeting with the jurisdiction's planning department to verify the appropriate permitting pathway, such as a Conditional Use Permit, and anticipated CEQA needs, such as special studies.

It is important to understand the potential environmental impacts from the project, and to design the project in a way to mitigate as many of these potential impacts as possible during the project design. While CEQA is a separate approval than the other permits outlined in this memo, the project components must be consistent throughout all permitting efforts. For example, if other regulatory entities such as the RWQCB requires a detention pond, then a detention pond must be included in the land use application submittal and corresponding CEQA document. Similarly, if the air district requires compliance with BACT, then the appropriate composting technology needs to be assessed during the CEQA review.

While some small- and medium-sized composting activities may not be subject to CEQA, it is still important for the local jurisdiction and the project proponent to understand the permitting requirements of all regulatory agencies prior to applying for permits so that the project is consistent. This reduces the potential for iterative permit revisions or modifications as the project is further developed.

<u>Land Use Approval</u>

The following are recommendations for proponents to engage with local jurisdictions/lead agencies to assist the proponent with the land use approval process:

- Review property zoning designation and correspondence with the municipal code to assess permitting pathway;
- Download and review application forms to understand local permitting requested information;
- Facilitate a pre-application meeting with the planning department;
- Engage elected officials and key stakeholders to garner project support.

<u>CEQA</u>

The following are recommendations for proponents to engage with local jurisdictions/lead agencies to hopefully streamline the permitting process:

- Identify potential environmental impacts to design project components to mitigate to a lesser than significant impact;
- Identify key special studies that are likely required. For composting projects, these typically include air quality, traffic, hydrology/water quality, and cultural resources;
- Engage elected officials and key stakeholders to garner project support.

CalRecycle / LEA Permits and Notifications

In general, the BMPs for CalRecycle/LEA permits and notifications are similar across the permitting and approval tiers. Namely, the proponent should be prepared to:

- Perform a siting suitability analysis to determine the composting activity's compatibility with the surrounding land uses;
- Prepare and implement an Odor Impact Minimization Plan;
- Prepare and implement a vector control plan, and mitigation against another potential public nuisance;
- Maintain appropriate recordkeeping to verify the composting activity's on-site cubic yard capacity and annual tonnage throughput.

EA Notification Tier

For EA Notification Tier approvals, it is vital for a composting activity to maintain accurate records on their material receiving and processing to maintain their Registration or EA Notification Tier approval status. If a composting activity reports on-site cubic yard capacity that exceeds the approval threshold, then they will need to either modify their operations to reduce the on-site capacity or obtain a full SWFP.

Solid Waste Facility Permits

Similar to EA Notification Tier approvals, composting operations must maintain accurate records. Although a full SWFP can have higher on-site capacity and more allowable feedstocks, the composting activities must comply with the site-specific Report of Composting Site Information (RCSI). The RCSI not only outlines the composting activities and feedstocks, but also lists compost additives and/or amendments used at the site. Often, the use of compost additives and/or amendment requires specific material information and notification to the RWQCB.

Water Quality Permits

Compost General Order

The Compost General Order outlines specific design specifications depending on the compost facility tier. In addition to meeting these requirements, the following are BMPs to help obtain coverage and compliance with the Compost General Order:

- Meet with the RWQCB to understand specific region requirements outside the Compost General Order (e.g., storm event requirements);
- Perform a geotechnical investigation to understand the groundwater and soil characteristics;
- Work with a licensed professional to design the drainage conveyances and containment structures.

Stormwater Permits

A unique site-specific SWPPP is required for both the Industrial General Permit (IGP) and Construction General Permit (CGP). As stated in their names, CGP is for the construction portion of the composting facility and is required for the facility up until all areas of work have been stabilized, or operations begin in soil generating composting areas. The IGP is required for the ongoing operation of the composting facility to remain in compliance once operations begin and stormwater or waste waters could be generated and discharged. In addition to meeting the requirements of the SWPPP, the following are BMPs to help streamline the permitting process and stormwater permits compliance:

- Inclusion of applicable minimum and advanced stormwater BMPs to minimize the potential impact to stormwater quality discharged from the site (these can include measures to treat rainwater during construction, or treatment of stormwater and wastewater once operations begin);
- Inclusion of applicable Compost General Order requirements as related to Construction Quality Assurance and drainage containment and conveyance systems, such as dealing with wastewaters generated by composting activities;
- Engage a local firm to prepare and implement the site-specific SWPPP. A local company may also conduct stormwater sampling during construction (required by the CGP) or sampling of treated waters (required by the IGP).

Air Quality Permits

The air quality permitting process, as discussed in this report and Section IV, is a complex process contingent on operator provided information as well as local air district established rules and emission factors. Aside from understanding the permitting requirements, we have identified the following BMPs to assist operators with permit acquisition and compliance.

Stationary Sources

Stationary sources are regulated by the local air districts, which each have unique requirements and thresholds, such as for BACT, ERCs, and an HRA. The following recommendations may help an operator navigate this process:

- Estimate the project's PTE prior to applying for an air quality permit;
- Evaluate the potential ERCs required based on the PTE;
- Assume the composting activity meets BACT requirements if utilizing an ASP composting system, however, additional emissions reductions may be available depending on specific facility conditions.

Mobile Sources

Obtaining coverage for mobile sources from CARB through its PERP program is a fairly straightforward process. It is important to note that typically grinders and screens

located at composting operations are typically considered stationary sources and regulated by the local air district. The definition of “portable” is listed in Section 2452(dd) of the PERP regulation and in summary must not reside at the same location (e.g., facility) longer than 12 consecutive months. The HDR Team’s recommendations for an operator with mobile equipment that complies with the PERP requirements are to:

- Work with the equipment vendor to obtain equipment specifications;
- Verify that the vendor-provided information (such as equipment ID) matches the on-site equipment.

Local Construction Permits

Both of the local construction permits are fairly straightforward in their requirements and permitting processes, however, it is important to consider these requirements from both the local jurisdictions and the RWQCB during the design of the facility layout.

Grading Permit

The recommended permitting BMPs for the grading permit process include:

- Perform a topographic survey;
- Prepare preliminary grading and drainage design early on in the permitting process (e.g., land use approval process) to understand the requirements and site implications;
- Use of a licensed professional (e.g., Professional Engineer) to prepare these plans.

Building Permit

The recommended permitting BMPs for the building permit process include:

- Prepare preliminary building design early on in the permitting process (e.g., land use approval process) to understand the requirements and site implications;
- Use of a licensed professional (e.g., Professional Engineer) to prepare these plans.

VI Economic Analysis

Financial Analysis Introduction

The cost of siting and developing a composting operation is a key element of setting up a comprehensive business plan for both small and medium composting activities. When developing a composting activity, the activity developer/operator will need to consider both capital costs (one-time expenses to set up the activity) and operational costs (on going expenses to run the activity). Establishing a realistic financial model for a new enterprise starts with a firm understanding of the anticipated, or contractually committed, delivery of feedstock materials and the revenue stream that will be generated. Those costs are not analyzed here but are key to building a budget that will be capable of funding the capital costs that are described below.

As discussed in Section III, siting considerations play a great role in the costs that are likely to be incurred in the development of any site. Each site will have unique characteristics that will lead to decisions about where capital costs may be reduced, or perhaps increased, in order to have the basic elements for successful operations and/or the appropriate environmental controls in place to mitigate potential impacts from the operations. Similarly, as outlined in Section IV, the permitting requirements may have a significant influence on project costs.

To complete this research, the HDR Team conducted outreach to local planning agencies to obtain cost information related to the land use and CEQA process, as well as compost operation or facility operators and equipment vendors to gain insight into the capital and operational costs specific to small- and medium-sized composting activities as defined in this study.

Planning Agencies Outreach

During Section III, the HDR Team performed a desktop study of the land use requirements and CEQA processes at various cities and counties across California. This work also included a municipal code analysis for compost-specific language. From this task, we outreached to jurisdictions which included and excluded compost-specific language to obtain more specific information as it relates to their specific permitting pathways, with a particular focus on cost information for land use and CEQA approvals.

The survey distributed to planning agencies included questions on compost-specific activities in each jurisdiction's zoning code and General Plan, number of small or medium composting sites in their jurisdiction, level of permitting required for composting facilities, and fees associated with permitting. A copy of the survey to planning agencies is included in **Appendix E**.

The HDR Team received only a few responses, with one jurisdiction recommending making a formal request for a professional consultation with fees of $165 per hour for jurisdiction conducted research. The following is a summary of the responses received.

Survey Results – City of Redding

The city of Redding replied to the survey in an email dated March 28, 2024.

Jurisdiction

The city of Redding reported that the planning area does not have compost-specific activities specified in its zoning code or General Plan.

Permitting for Small and Medium Composting Activities

The city of Redding reported that it has one medium composting operation in the planning area. The facility uses ASP, in-vessel technology. Planning agency staff reported that the facility required the same permit as a solid waste transfer/recycling facility and an EIR for CEQA clearance.

Costs and Timelines

At the time that the CEQA review was completed (1993), the review fee was $875. Current environmental permitting fees are 20% of the application fee. As shown on the City's current fee schedule, the total environmental permitting fees range between $6,121.50 to $20,899.20. The timeline for approval is estimated to take approximately six months or more.

Survey Results – City of Sacramento

The city of Sacramento replied to the survey request with two emails, dated March 27, 2024, and April 11, 2024.

Jurisdiction

The city of Sacramento reported that compost-specific activities are specified in both the zoning code and the city of Sacramento's Climate Action and Adaptation Plan.

Within the city of Sacramento's zoning code, the use is known as "Recycling facility – minor, major, green waste." A recycling facility is defined as, "a facility for the acceptance of recyclable materials from the general public, other recycling facilities, local government agencies, and other business enterprises. The facility is used for the collection, short-term storage, processing, and transfer of recycled materials having a residual solid waste of 10% or less of non-putrescent material requiring transport to a landfill. A recycling facility may use portable or permanent equipment to chip, crush, grind, or process recyclable waste products."

Permitting for Small and Medium Composting Activities

City of Sacramento staff reported that there are five locations processing green waste within the city's jurisdiction. However, the Planning Division does not track the cubic yards of material processed at green waste facilities and was therefore unable to provide information on the number of small or medium composting facilities or the types of technologies that are used.

The city updates its General Plan every five years and has a certified Master EIR, which evaluates the cumulative effects on the environment of the adoption of the General Plan. Facility applications would be reviewed to determine consistency with the General Plan and zoning regulations. The city of Sacramento Planning Division would consider whether the proposed operation would have site-specific effects that have not been evaluated in the Master EIR, including effects due to surrounding uses (e.g., noise, transportation traffic).

The city of Sacramento Planning Division considers recycling and composting integral to and consistent with the city's sustainability, conservation, and climate change, and anticipates that composting operations would qualify for an exemption from a CEQA review, or a finding, supported by memo documentation, as an activity consistent with the General Plan (e.g., CEQA Guidelines section 15183). Exemptions are processed internally with no charge beyond an initial fee for review.

Costs and Timelines

The current cost of an application for a new Conditional Use Permit (CUP) is approximately $12,000. City of Sacramento staff reported that the CEQA fee is set based on the level of determination, and that additional application fees may apply depending on the scope of the project.

The city states that recycling and composting are activities that are consistent with, and integral to, the city's various policies and the type of project focused on in this study may qualify for an exemption from CEQA in most cases. Alternatively, the project could also be supported by other documentation such as an activity that is consistent with the General Plan (CEQA Guidelines Section 15183). To process an exemption is not seen as a costly or time intensive process, with an estimated fee of $10,000 with the exemption granted in approximately eight weeks.

Survey Results – Butte County

Butte County replied to the survey request with an email dated April 11, 2024.

Jurisdiction

Butte County reported that the planning area has compost-specific activities specified in its zoning code and its General Plan.

Butte County staff stated that, "Butte County does not categorize composting facilities by size and defines them all under the same land use as composting facilities. 'Agricultural processing' includes composting activities related to agricultural zoning and onsite uses. Composting in other applications is considered a commercial use and subject to a conditional use permit."

Permitting for Small and Medium Composting Activities

Butte County reported that there are three small or medium composting operations in its jurisdiction. Of those, one uses ASP, and one uses a composting technology that may be equivalent to ASP and is located at the Butte County Sanitary Landfill.

The composting facilities range from permitted by-right to a requirement for a Conditional Use Permit, depending on zoning required for each site.

Costs and Timelines

The cost of application fees and CEQA review for small composting activities depends on which type of permit is required. It can range from no cost to $14,353.53. The timeline for approval typically ranges from three to six months.

The cost of application fees and CEQA review required for medium composting included a CEQA cost of $2,916.75, which is included in the CUP cost of $14,353.53. The estimated timeline for approval for a medium composting facility was reported to be six to eight months.

Compost Operator and Vendor Outreach

Several small- and medium-sized composting activities as defined in this Study were identified in Section III during the land use and CEQA research and analysis. These facilities were outreached to with a facility-specific survey to gain insight into the capital and operational costs, as well as barriers and opportunities identified by the facility. The HDR Team received limited responses from the composting activities, and thus also included compost system vendors who work with small- and medium-sized composting activities to gain additional industry insight. To keep the anonymity of the few operations and vendors that did respond, the following is a summary of the information obtained. A copy of the survey is included in Appendix F.

Survey Results – Operators and Vendors

The HDR Team was able to gain insight into some of the large capital expenses for small- and medium-sized composting operations through discussions with the compost vendors. The vendors were fairly straightforward and transparent, offering various configurations that could meet the needs of these sized composting activities. The daily or weekly cubic yard or tonnage input of feedstock materials is the largest driver for sizing the appropriate ASP composting system.

Siting and Design Financial Considerations

Land Acquisition

The cost of purchasing land or leasing space for a composting operation may be one of the more significant costs in the budget, or may bring no additional expense at all, depending upon what options are available for locating it. For small and medium composting operations, only those with the most robust revenue models will be able to afford to purchase land exclusive to siting. Co-locating composting operations at a smaller scale will almost always be a more viable option.

Purchase/Lease

Sales and leasing options vary widely in price across California. When considering whether to lease or purchase a site for a composting facility, several factors come into play. Below are the considerations:

(1) Financial Considerations

- Leasing: Leasing a site typically requires less upfront capital compared to purchasing. It allows the developer to spread out the costs over time through monthly lease payments.
- Purchase: Purchasing a site involves a larger initial investment but can offer long-term cost savings, as the developer won't have ongoing lease payments. Additionally, owning the property may provide potential for appreciation, depending on market conditions.

(2) Flexibility

- Leasing: Leasing offers more flexibility in terms of scaling operations or relocating if needed. If the composting facility needs change over time, the developer can adjust without being tied down to a specific property.
- Purchase: Owning the property gives the developer full control over the site. You can make modifications or expansions without needing approval from a landlord. However, this lack of flexibility can also be a drawback if changes are needed, or if the location becomes less favorable.

(3) Long-Term Viability:

- Leasing: Depending on the lease terms, there might be uncertainty about the long-term availability of the site. Landlords could choose not to renew the lease or may increase the rent significantly.
- Purchase: Buying the property provides stability and ensures that the site will be available for the long term, assuming no unforeseen circumstances like eminent domain or zoning changes.

(4) Control and Customization:

- Leasing: The developer has limited control over the property, as major modifications may require landlord approval. Customization options may be restricted.
- Purchase: Ownership gives the developer full control over the property, allowing you to customize it to suit your specific needs and optimize the layout for composting operations.

(5) Tax Implications:

- Leasing: Lease payments are typically deductible as a business expense. However, you won't benefit from property appreciation.
- Purchase: Property ownership offers potential tax benefits such as mortgage interest deductions and depreciation. Additionally, any increase in the property's value over time could result in capital gains taxes if the developer decides to sell in the future.

(6) Risk Management:

- Leasing: Leasing can mitigate some financial risks associated with property ownership, such as fluctuations in property values or unexpected maintenance costs.
- Purchase: While property ownership comes with potential financial rewards, it also exposes the developer to risks such as property depreciation, market fluctuations, and unforeseen liabilities.

(7) Legal and Regulatory Considerations

- Leasing: Lease agreements may include provisions related to environmental regulations, zoning restrictions, and other legal considerations. It's essential to review these terms carefully to ensure compliance.
- Purchase: As the property owner, the developer is responsible for ensuring compliance with all relevant laws and regulations. Conducting thorough due diligence before purchasing can help identify any potential legal issues.

Ultimately, the decision between leasing and purchasing a composting facility site depends on your specific circumstances, including your financial situation, long-term goals, flexibility needs, and risk tolerance. It's essential to weigh these factors carefully and possibly consult with legal, financial, and real estate professionals to make an informed decision.

Co-location Options

In nearly all cases, there are distinct financial advantages to co-locating small- and medium-sized composting operations. Beyond limiting purchase or lease costs, there are often permitting cost advantages (to be discussed further below) to the co-location option.

EXISTING LANDFILL OR OTHER SOLID WASTE FACILITY

Siting small- and medium-sized composting operations at an existing solid waste facility or landfill will typically provide significant cost reductions in both permitting and site development. The ability to minimize permitting costs lies mainly in being able to take advantage of existing entitlements for land use (usually compatible with other solid waste activities, like composting) and environmental review (where many of the

potential impacts from the similar operations may already have been considered, especially for the volume of organic materials and traffic coming to the existing site). Additionally, the use of existing infrastructure is often a way to reduce site development costs to a substantial level.

ON-FARM

Agricultural composting operations have reduced regulatory burdens, particularly for facilities which are able use all the compost produced on site. Additionally, having a ready, local market/use for the compost reduces overall operational costs and potential transportation costs, both environmental and financial.

COMMUNITY GARDENS AND MUNICIPAL PARKS

Siting a composting operation at a community garden or in a municipal park can offer several financial advantages, both for the garden itself and the broader community. Here are some key financial benefits:

(1) Reduced Waste Disposal Costs: Community gardens often generate organic waste in the form of plant trimmings, food scraps, and other garden debris. By composting this waste on-site, the garden can significantly reduce or even eliminate the need to pay for waste disposal services. This can lead to substantial cost savings over time, especially for larger community gardens with significant organic waste volumes.

(2) Savings on Soil Amendments: Compost produced on-site provides a rich source of organic matter, nutrients, and beneficial microorganisms that can improve soil fertility and structure. By using compost as a soil amendment, community gardens can reduce their reliance on store-bought fertilizers and other soil additives, resulting in cost savings on external inputs.

(3) Increased Garden Productivity: The use of compost in community garden beds can lead to increased yields and healthier plant growth. Healthy soil enriched with compost retains moisture better, provides essential nutrients to plants, and supports beneficial soil organisms. As a result, community gardens may see higher crop yields and reduced plant disease, ultimately leading to more abundant harvests and greater overall productivity.

(4) Cost Sharing and Resource Efficiency: Siting a composting operation at a community garden allows for shared resources and collaborative efforts among gardeners. Community members can contribute organic waste to the composting process, reducing the burden on any single individual or organization. Shared labor, materials, and equipment further enhance resource efficiency and help distribute costs across multiple stakeholders.

(5) Grant Funding and Support: Community gardens with integrated composting operations may be eligible for grant funding, subsidies, or other financial support from government agencies, nonprofit organizations, or private donors. These funds can be used to offset the costs of composting infrastructure, education and outreach

programs, or other garden-related expenses, providing additional financial benefits to the garden and its stakeholders.

(6) Revenue Generation Opportunities: Some community gardens may explore revenue-generating opportunities associated with their composting operations. For example, they could sell excess compost to garden members or the broader community, offer composting workshops or classes for a fee, or participate in local farmers' markets or community events where compost and other garden products are sold.

(7) Property Value Enhancement: A well-maintained community garden with an integrated composting operation can enhance the aesthetic appeal and desirability of the surrounding neighborhood. This, in turn, may positively impact property values for nearby homeowners and businesses, providing indirect financial benefits to the community as a whole.

By leveraging these financial advantages, community gardens can not only promote environmental sustainability and food security but also enhance their long-term financial viability and contribute to the economic well-being of the communities they serve.

SCHOOLS

Siting a composting operation at a school or university can offer numerous financial advantages, both for the institution itself and the broader community. Here are some key financial benefits:

(1) Waste Management Cost Reduction: Schools and universities often generate significant amounts of organic waste from cafeteria food scraps, landscaping debris, and other sources. By composting this organic waste on-site, educational institutions can reduce or eliminate the need for costly waste disposal services. This can lead to substantial savings on waste management expenses over time.

(2) Soil Improvement and Landscaping Savings: Compost produced on-site can be used to enrich soil in campus gardens, lawns, and landscaping features. By using compost as a natural soil amendment, schools and universities can reduce the need for chemical fertilizers and irrigation, leading to savings on landscaping and maintenance costs. Additionally, compost can improve soil structure and water retention, reducing erosion and runoff, and minimizing the need for costly soil remediation measures.

(3) Educational Opportunities and Outreach: A composting operation at a school or university can serve as an educational resource for students, faculty, and the broader community. Students can learn about environmental sustainability, waste reduction, and organic agriculture through hands-on composting activities and educational programs. Engaging the community in these activities can enhance the institution's reputation and attract prospective students, donors, and partnerships.

(4) Research and Innovation: Educational institutions can use composting operations as research platforms to study composting techniques, waste management strategies,

and soil health outcomes. Faculty and students can collaborate on research projects, experiments, and demonstrations related to composting, leading to innovations in waste management practices and environmental science education. Grant funding and partnerships with industry stakeholders can support research efforts and provide additional financial resources for the institution.

(5) Community Engagement and Partnerships: Composting activities at schools and universities can foster partnerships with local government agencies, businesses, nonprofit organizations, and community groups. Collaborative composting initiatives can leverage resources, expertise, and funding opportunities to support shared sustainability goals and address community needs. Engaging stakeholders in composting programs can build relationships, enhance public awareness, and strengthen community ties.

(6) Green Certification and Recognition: Implementing composting initiatives can contribute to schools and universities' efforts to achieve green certifications, such as LEED (Leadership in Energy and Environmental Design) certification or recognition as a Green School or Eco-Campus. These certifications can enhance the institution's reputation, attract environmentally conscious students and faculty, and provide access to funding, grants, and awards for sustainability initiatives.

(7) Operational Efficiency and Resource Conservation: Composting operations promote resource conservation and operational efficiency by closing the loop on organic waste management. By diverting organic waste from landfills and converting it into a valuable soil amendment, schools and universities can reduce their environmental footprint and demonstrate a commitment to sustainability. These efforts can result in cost savings, regulatory compliance, and enhanced institutional resilience in the face of resource scarcity and climate change.

By leveraging these financial advantages, schools and universities can transform their campuses into hubs of sustainability, innovation, and community engagement. Composting operations can support educational goals, reduce operational costs, and demonstrate leadership in environmental stewardship, benefiting both the institution and the broader community.

Abandoned Urban Infrastructure and Brownfield Sites

Siting small or medium composting activities in inner-city abandoned infrastructure and brownfield sites can offer several financial benefits:

(1) Lower Land Costs: Inner-city abandoned infrastructure and brownfield sites often have lower land costs compared to prime real estate locations. This can significantly reduce the initial investment required to establish a composting operation.

(2) Access to Waste Streams: Inner-city areas typically generate significant amounts of organic waste from households, restaurants, and businesses. By locating composting operations in these areas, operators can access ample waste streams for composting, reducing transportation costs and increasing efficiency.

(3) Potential Grants and Incentives: Governments and organizations often offer grants and incentives for the redevelopment of brownfield sites and the implementation of sustainable waste management practices. Composting operations located in these areas may be eligible for financial support, tax breaks, or subsidies, which can help offset startup and operational costs.

(4) Job Creation and Economic Development: Establishing composting operations in inner-city areas can create employment opportunities for local residents, contributing to economic development and revitalization efforts. Additionally, these operations can stimulate related industries such as landscaping, agriculture, and retail.

(5) Value-added Products: Composting operations can generate revenue not only from the sale of compost but also from value-added products such as organic fertilizers, soil amendments, and mulches. By processing organic waste locally, operators can produce high-quality compost products tailored to the needs of urban agriculture and landscaping markets.

(6) Community Engagement and Education: Composting operations located in inner-city areas can serve as educational hubs, engaging local communities in sustainable waste management practices and environmental stewardship. This can enhance public support for the operation, attract volunteers, and potentially generate revenue through educational programs and workshops.

(7) Mitigation of Environmental Costs: By diverting organic waste from landfills and converting it into compost, these operations can help mitigate environmental costs associated with landfilling, such as greenhouse gas emissions, leachate contamination, and land degradation. While these benefits may not directly translate into financial gains for the composting operation, they can contribute to cost savings for municipalities and society as a whole.

Overall, siting composting operations in inner-city abandoned infrastructure and brownfield sites can offer a range of financial benefits, including lower land costs, access to waste streams, potential grants and incentives, job creation, value-added products, community engagement, and mitigation of environmental costs. These benefits can make composting operations in urban areas financially viable and socially impactful ventures.

Land Acquisition Cost Implications

The cost of land acquisition is subject a number of complex factors and available options, as outlined extensively in the above. Average annual agricultural land costs for California are available through the USDA National Agricultural Statistics Service[41], through an annual survey. Industrial land costs, for largely undeveloped properties which look suitable for compost facility siting, were derived from a search of available

[41] https://www.nass.usda.gov/Statistics_by_State/California/Publications/Economic_Releases/index.php

lands on April 15, 2024, for both lease and sale. [42]. Land available for purchase ranged from $13,000/acre outside of Lancaster and Palmdale to over $2 million/acre in Colton and Los Angeles. Similarly, land leases ranged from $41,817/acre ($0.96/ square foot/year) to over $150,064/acre in Apple Valley ($6.89/sf/year).

Site Evaluation, Engineering and Operations Design Costs

In designing and engineering small and medium composting operations, several economic considerations are paramount. By integrating these economic considerations into the design and engineering of small and medium composting operations, operators can optimize efficiency, minimize costs, and enhance the financial viability and sustainability of their ventures. The following are top considerations that should be thoroughly evaluated during the site pre-development efforts.

(1) Scalability: Designing the facility to be scalable allows for flexibility in accommodating fluctuations in waste inputs and market demand for compost products. This ensures that the operation can adjust capacity as needed without incurring excessive costs for expansion or contraction.

(2) Process Efficiency: Efficiency in composting processes is essential for minimizing operational costs and maximizing throughput. Optimal process design considers factors such as composting method (e.g., windrow, static pile, vermicomposting), aeration and moisture control, mixing and turning equipment, and temperature management. Efficient processes reduce labor, energy, and material inputs, improving overall economic performance.

(3) Technology Selection: Choosing appropriate composting technology depends on factors such as scale, available space, waste composition, and desired product quality. Small-scale operations may employ simpler, low-cost technologies such as open windrows or static piles, while medium-scale facilities might benefit from more advanced systems like aerated static piles or in-vessel composting. Selecting cost-effective technologies that match the specific needs and constraints of the operation is crucial for maximizing returns on investment.

(4) Material Handling and Equipment: Efficient material handling and equipment utilization contribute to cost savings and productivity gains in composting operations. Designing the layout to minimize material movement, streamline workflow, and optimize equipment utilization can reduce labor requirements and operational downtime. Additionally, investing in durable, reliable equipment that meets the operational needs of the facility can minimize maintenance costs and prolong equipment lifespan.

(5) Resource Utilization: Maximizing the utilization of available resources, including organic waste feedstocks, bulking agents, and composting inputs (e.g., water, energy), is essential for economic efficiency. Implementing strategies to source

[42] Vacant land search, LoopNet, retrieved April 15, 2024

inexpensive or free feedstocks, such as food waste from local businesses or yard trimmings from municipal collection programs, can reduce material procurement costs. Similarly, optimizing resource use through efficient composting processes, water recycling systems, and renewable energy technologies can lower operational expenses and improve profitability.

(6) Quality Control and Product Marketing Ensuring high-quality compost products is critical for market acceptance and premium pricing. Designing quality control measures to monitor key parameters such as temperature, moisture content, pH, and maturity of the compost ensures consistency and compliance with product standards. Investing in product testing, certification, and marketing efforts can differentiate the compost operation in the marketplace and command higher prices, enhancing economic returns.

(7) Regulatory Compliance and Risk Management: Compliance with environmental regulations and risk management practices is essential for avoiding costly fines, penalties, or legal liabilities. Designing the facility to meet regulatory requirements for air emissions, odor control, leachate management, and nutrient runoff minimizes the risk of regulatory noncompliance and associated costs. Implementing robust risk management practices, such as contingency planning for equipment failures or market disruptions, helps mitigate financial risks and ensures operational resilience.

Geotechnical and Civil Engineering

Geotechnical and civil engineering costs for developing a small or medium composting operations depend heavily on the existing site conditions and the specific requirements of the project. Overall, geotechnical and civil engineering costs for developing a small or medium composting operation vary depending on the existing site conditions, project scope, regulatory requirements, and site-specific challenges. Engaging qualified geotechnical engineers early in the project planning process may help identify potential geotechnical risks, optimize site development strategies, and minimize unforeseen costs during construction and operation. Here are some key considerations:

(1) Site Investigation: Geotechnical engineers typically conduct site investigations to assess soil conditions, groundwater levels, and geological features. The scope of the investigation may include soil sampling, laboratory testing, and geophysical surveys to evaluate soil composition, strength, permeability, and bearing capacity. The complexity and extent of the site investigation influence the associated costs.

(2) Site Preparation and Grading: Depending on the existing topography and soil conditions, site preparation and grading may be necessary to create a level, stable foundation for the composting facility. This could involve earthmoving, excavation, compaction, and grading to accommodate infrastructure such as composting pads, access roads, drainage systems, and retaining structures. The cost of site preparation depends on factors such as site size, terrain, soil properties, and grading requirements.

(3) Foundation Design and Construction: Civil engineers design foundations to support the structural loads of buildings, equipment, and composting processes. The foundation design considerations include soil bearing capacity, settlement analysis, seismic conditions, and groundwater effects. Depending on site-specific factors, foundation types such as shallow footings, deep piles, or mat foundations may be recommended. The cost of foundation design and construction depends on the complexity of the design, soil conditions, foundation type, and construction methods.

(4) Ground Improvement: In some cases, ground improvement techniques may be required to enhance soil stability, strength, or drainage properties. Common ground improvement methods include soil stabilization, compaction, soil reinforcement, and ground densification. These techniques may be necessary to mitigate risks such as soil settlement, liquefaction, or slope instability. The cost of ground improvement depends on the extent of soil treatment required and the selected improvement methods.

(5) Environmental Considerations: Geotechnical and civil engineering costs may also include assessments of environmental factors such as contamination risks, groundwater protection measures, and land use compatibility. Geotechnical engineers work closely with environmental consultants to address potential environmental impacts of the composting operation and implement mitigation measures as needed. Costs associated with environmental assessments and remediation efforts depend on the site's contamination levels, regulatory requirements, and remediation technologies.

(6) Regulatory Compliance: Compliance with regulatory requirements for engineering and site development adds to the overall project costs. Design engineers ensure that the project meets applicable building codes, zoning regulations, environmental permits, and land use restrictions. The cost of regulatory compliance includes permit fees, environmental assessments, engineering design reviews, and inspections by regulatory agencies.

Mechanical and Electrical Engineering

When developing a small or medium windrow composting operation, both mechanical and electrical engineering considerations typically do not play significant roles. But, in the case where utilizing aerated static pile technology facility design necessitates their participation, there are some financial considerations for each of the following aspects. In summary, integrating both mechanical and electrical engineering considerations into the financial planning process is essential for the successful development and operation of a small or medium composting operation. By carefully evaluating equipment costs, energy efficiency measures, regulatory compliance, and financing options, the developer can optimize the financial performance and sustainability of the composting operation.

(1) Mechanical Engineering

- Equipment Costs: Mechanical engineering may involve the design and procurement of equipment such as shredders, mixers, turners, and screening systems. The cost of these machines can vary significantly based on factors such as size, capacity, and technology. It's essential to assess the capital investment required for purchasing or leasing equipment.
- In the case of many aerated static pile composting systems, the technology provider will deliver the mechanical engineering for the design of blowers, ducting and other aeration equipment.
- Maintenance Expenses: Along with initial costs, ongoing maintenance expenses should be factored in. Regular maintenance ensures the optimal functioning and longevity of equipment, reducing the risk of breakdowns and costly repairs. Budgeting for maintenance can help prevent unexpected financial burdens.
- Automation and Control Systems: Implementing automation and control systems can enhance efficiency and reduce labor costs. However, the initial investment in such systems needs to be justified by potential savings in labor and increased productivity. Consider the cost-benefit analysis of automation solutions tailored to your composting operation's scale and requirements.
- Energy Efficiency: Mechanical processes consume energy, and optimizing energy efficiency can lead to cost savings in the long run. This may involve selecting energy-efficient equipment, implementing waste heat recovery systems, or integrating renewable energy sources such as solar or biomass to power the operation.

(2) Electrical Engineering

- Power Supply Infrastructure: Electrical engineering entails designing the power supply infrastructure to support the operation's electrical needs. This includes determining the required voltage, installing transformers, wiring, and distribution panels. Assessing the upfront costs of establishing the electrical infrastructure is essential.
- Energy Consumption Analysis: Conducting an energy consumption analysis helps identify opportunities for reducing electricity usage and associated costs. This may involve optimizing equipment operation schedules, implementing energy-efficient lighting and HVAC systems, and investing in energy management software to monitor and control energy consumption.
- Backup Power Systems: To mitigate the risk of power outages disrupting operations, considering backup power systems such as generators or battery backup solutions is crucial. While these systems involve additional costs, they can prevent revenue losses due to downtime during power interruptions.

- Regulatory Compliance: Electrical engineering also involves ensuring compliance with regulatory standards and codes related to electrical installations and safety. Failing to meet regulatory requirements can result in fines and penalties, so budgeting for compliance measures is essential.

(3) Overall Financial Considerations

- Return on Investment (ROI): Evaluate the financial feasibility of the composting operation by calculating the expected ROI. Consider factors such as initial capital investment, operational expenses, revenue projections from compost sales, and potential savings from efficiency improvements.
- Financing Options: Explore financing options such as loans, grants, or incentives available for sustainable and environmentally friendly projects like composting operations. Utilizing financing options can help alleviate the upfront financial burden and improve cash flow management.
- Lifecycle Cost Analysis: Conduct a lifecycle cost analysis to assess the total cost of ownership over the lifespan of the composting operation. This includes not only upfront capital expenses but also operating costs, maintenance expenses, and potential revenue streams. Making informed decisions based on lifecycle cost analysis can lead to more cost-effective solutions.

Fire Protection Engineering

The use of a fire protection engineer would be atypical in most of California when developing a small or medium composting operation. But, in certain high fire hazard areas, particularly in many parts of the state where seasonal wind events can lead to disaster, fire protection engineering may play a crucial role in ensuring the safety of the facility, personnel, and surrounding environment. Integrating fire protection engineering considerations into the financial planning process for small or medium composting operations is essential for mitigating the risk of fire hazards and ensuring regulatory compliance, personnel safety, and asset protection. By investing in fire detection, suppression, emergency response, structural protection, regulatory compliance, and insurance coverage, composting operators can minimize the financial impact of fire incidents and safeguard their operations against potential losses.

Here are some financial considerations for integrating fire protection engineering into composting operations:

(1) Fire Detection and Alarm Systems:

- Installation of fire detection and alarm systems is essential to quickly identify and alert personnel about potential fire incidents.
- Consider the initial costs of purchasing and installing fire detection devices such as smoke detectors, heat detectors, flame detectors, and fire alarm control panels.

- Factor in ongoing maintenance costs for testing, inspection, and servicing of these systems to ensure reliability and compliance with regulatory standards.

(1) Fire Suppression Systems:

- Implementing fire suppression systems such as sprinklers, foam systems, or water mist systems can help suppress fires in their early stages, minimizing damage and preventing spread.
- Evaluate the upfront costs of designing, installing, and commissioning fire suppression systems tailored to the specific requirements and hazards of the composting operation.
- Budget for regular maintenance and testing of fire suppression equipment to ensure functionality and compliance with industry standards.

(2) Emergency Response Planning:

- Develop comprehensive emergency response plans outlining procedures for fire prevention, detection, containment, and evacuation.
- Allocate resources for training personnel on fire safety protocols, emergency evacuation procedures, and proper use of fire extinguishers and other firefighting equipment.
- Consider the costs associated with conducting regular fire drills and exercises to assess the effectiveness of emergency response plans and enhance personnel preparedness.

(3) Structural Fire Protection:

- Enhance the structural fire protection measures of buildings and storage areas through fire-resistant construction materials, compartmentation, and fire barriers.
- Assess the initial costs of implementing structural fire protection measures during the design and construction phases of the composting facility.
- Factor in ongoing maintenance expenses for inspecting and repairing fire protection features to ensure compliance with building codes and standards.

(4) Regulatory Compliance:

- Understand and comply with local, state, and national regulations governing fire protection and safety in industrial facilities, including composting operations.
- Budget for permit application fees, inspections, and compliance assessments conducted by regulatory authorities.
- Allocate resources for periodic updates and modifications to fire protection systems and procedures to align with evolving regulatory requirements.

(5) Insurance Costs:

- Work with insurance providers to assess the risk profile of the composting operation and determine appropriate coverage for property damage, business interruption, and liability related to fire incidents.
- Consider the impact of fire protection measures, such as the installation of fire detection and suppression systems, on insurance premiums and deductibles.
- Evaluate the potential cost savings associated with implementing robust fire protection measures that may lead to lower insurance rates and reduced financial exposure in the event of a fire loss.

Site Evaluation, Engineering and Design Cost Implications

The cost of site evaluation, engineering and design work is typically very site-specific, highly dependent on the size and location of the operations and subject to a number of complex factors and available options, as outlined extensively throughout several sections of this report. A simple site plan and design may be as low as roughly $5,000. For a medium-sized operation in a highly sensitive area or in a remote, undeveloped area with high fire risk or other environmental factors (i.e. requiring full pavement design, water quality improvements, and fire protection engineering) to consider typically starting costs are in the $500,000 range.

Permitting Cost Implications

Similar to site evaluation, engineering and design work, permitting costs are very site-specific, highly dependent on the size and location of the operations and subject to a number of complex factors and available options, as outlined extensively throughout several sections of this report. A simple permitting effort for a small-sized operation, co-located on an existing developed site, may be as low as zero, for a medium operation requiring only an EA Notification (without land use, air or water permitting requirements could be as low as roughly $5,000. For a medium-sized operation in a highly sensitive area or in a remote, undeveloped area with substantial environmental risk factors (i.e. requiring substantial land use approval work, environmental review, water quality and air quality compliance, etc. to consider could range above $500,000.

Land Use Conformance and Environmental Review

As further discussed in Section III, it is important to have a cohesive strategy to navigating the land use approval and environmental review process for any development project; it may also be important when developing a small or medium composting operation. Here are some financial considerations regarding potential costs and the use of professional services:

(1) Site Selection and Zoning Analysis:

- Land use consultants help identify suitable locations for composting operations based on factors such as zoning regulations, land availability, and proximity to feedstock sources.
- Budget for the cost of site selection studies, including site visits, zoning analyses, and feasibility assessments to determine the best location for the composting facility while minimizing regulatory hurdles.

(2) Regulatory Permitting and Compliance:

- These firms assist in obtaining the necessary permits and approvals from local, state, and federal regulatory agencies for land use, environmental compliance, and operational requirements.
- Allocate funds for consultant fees, permit application costs, regulatory compliance assessments, and any required mitigation measures to ensure adherence to regulations throughout the project lifecycle.

(3) Land Use Planning and Entitlements:

- Operators will need to navigate the land use planning process, including obtaining land use entitlements, rezoning applications, and conditional use permits necessary for establishing composting operations.
- Budget for the cost of land use planning services, including application fees, public hearings, and administrative expenses associated with securing land use approvals from regulatory authorities.

(4) Environmental Review and Impact Assessment:

- Depending on the project's scale and potential environmental impacts, environmental consultants may be needed to conduct environmental reviews, impact assessments, or studies to evaluate the project's effects on natural resources, habitats, and sensitive receptors.
- Allocate funds for environmental assessments, data collection, analysis, and reporting required to address any environmental concerns and ensure compliance with environmental regulations.

(5) Stakeholder Engagement and Public Outreach:

- Effective communication with stakeholders, including local communities, government agencies, and neighboring property owners, is crucial for gaining support and addressing concerns related to the composting operation.
- Budget for public outreach efforts, stakeholder engagement activities, community meetings, and communication materials to foster transparency, build trust, and minimize opposition to the project.

(6) Project Management and Coordination:

- Land use consultants provide project management and coordination services to streamline the development process, facilitate interagency coordination, and ensure timely completion of permit applications and regulatory approvals.
- Allocate funds for project management fees, coordination expenses, and administrative costs associated with overseeing the development process and managing regulatory compliance requirements.

(7) Risk Management and Contingency Planning:

- Land use consultants may help identify and mitigate potential risks associated with the composting operation, such as regulatory uncertainties, legal challenges, and community opposition.
- Budget for risk management strategies, contingency funds, and legal support services to address unexpected challenges, mitigate financial risks, and ensure project success.

In summary, integrating the services of a land use consulting firm into the development of small or medium composting operations is essential for navigating regulatory requirements, securing land use approvals, and mitigating risks. By budgeting for site selection, regulatory permitting, environmental review, stakeholder engagement, project management, and risk management services, composting developers can ensure compliance, minimize delays, and maximize the financial viability of their projects.

Water Board

Water quality impacts are an important consideration when developing small or medium composting operations, as improper management of water resources can lead to environmental pollution, regulatory noncompliance, and financial liabilities. Below are some financial implications related to water quality impacts:

(1) Regulatory Compliance Costs:

- Composting operations must comply with regulations governing water quality protection, which may include permits for stormwater discharges, wastewater management, and groundwater protection.
- Budget for permit application fees, compliance monitoring, and reporting requirements imposed by regulatory agencies to ensure adherence to water quality standards and regulations.

(2) Infrastructure Investment:

- Developing and maintaining infrastructure to manage water quality impacts can incur significant upfront and ongoing costs.

- Invest in infrastructure such as sedimentation basins, erosion control measures, runoff diversion systems, and wastewater treatment facilities to mitigate the risk of water pollution and protect water quality.

(3) Wastewater Treatment and Disposal Costs:

- Composting operations generate wastewater from activities such as washing equipment, cleaning surfaces, and managing leachate from compost piles.
- Allocate funds for wastewater treatment systems, such as settling tanks, filtration systems, and biological treatment processes, to treat wastewater before discharge or reuse.
- Consider the cost of wastewater disposal, including fees for discharge permits, hauling wastewater to treatment facilities, or implementing on-site.

(4) Monitoring and Testing Expenses:

- Regular monitoring and testing of water quality parameters, including pH, turbidity, nutrient levels, and microbial contaminants, are essential for ensuring compliance with regulatory standards and detecting potential impacts on water resources.
- Budget for the cost of water quality monitoring equipment, laboratory analyses, and sampling protocols to assess the effectiveness of pollution control measures and identify any corrective actions needed.

(5) Liability and Legal Costs:

- Water quality impacts from composting operations can lead to legal liabilities, enforcement actions, and lawsuits from affected parties, regulatory agencies, or environmental advocacy groups.
- Allocate funds for legal fees, fines, penalties, and settlements associated with addressing water quality violations, defending against legal claims, and resolving disputes with stakeholders or regulatory authorities.

(6) Insurance Premiums and Coverage:

- Obtain insurance coverage for potential water quality liabilities, pollution incidents, and regulatory enforcement actions through comprehensive general liability insurance, environmental liability insurance, or pollution legal liability insurance.
- Budget for insurance premiums, deductibles, and coverage limits to protect against financial losses resulting from water quality impacts and associated legal claims.

(7) Reputation and Brand Image:

- Water quality impacts can damage the reputation and brand image of composting operations, leading to loss of customers, negative publicity, and decreased market value.
- Invest in proactive measures to prevent water pollution, demonstrate environmental stewardship, and communicate sustainability initiatives to stakeholders, investors, and the public to safeguard the reputation and financial value of the business.

Addressing water quality impacts is essential for the responsible development and operation of small or medium composting operations. By budgeting for regulatory compliance, infrastructure investment, wastewater treatment, monitoring expenses, legal liabilities, insurance coverage, and reputation management efforts, composting operators can minimize the financial risks associated with water pollution and protect the long-term sustainability of their operations.

COMPOST GENERAL ORDER

Most small and medium composting operations will be subject to the requirements of the General Waste Discharge Requirements (WDRs for Commercial Composting Operations (Compost General Order, although there are some conditional waivers for facilities which are located on agricultural sites, or primarily serve agricultural markets. If operators are considering receiving food materials from commercial sources, they should be aware that there are likely to be cost impacts for installation of water quality protection measures and required reporting and monitoring which would be significant.

The WDRs outline regulatory standards and guidelines for managing organic waste in a manner that minimizes environmental impacts as discussed further in Section IV.

While these Compost General Order requirements provide a regulatory framework to promote responsible management of organic waste through composting while protecting water quality, air quality, and public health, they may also have a significant cost impact on small- and medium-sized composting operations development.

Should small or medium composting operations be sited in agricultural locations, or sell predominately to agriculture, the conditional waiver may be an option and limit the cost impacts to the development of the site.

STORMWATER

Many small or medium composting operations may, or may not, be subject to specific stormwater regulatory compliance measures if they are co-located with other operations which may be, or if they are below the thresholds for compliance. Further discussion of the Industrial General Permit (IGP) and Construction General Permit (CGP) permitting process, requirements, challenges, and opportunities are included in Sections IV and V. For those operations that are, the below summary will provide an outline of the potential costs related to mitigating stormwater quality impacts.

(1) Stormwater Pollution Prevention Plan (SWPPP): Facilities must develop and implement a Stormwater Pollution Prevention Plan (SWPPP) tailored to their operations. The SWPPP identifies potential sources of stormwater pollution, describes best management practices (BMPs) to minimize pollution, and outlines procedures for monitoring and corrective action.
(2) Site Evaluation and Control Measures: Composting operations must conduct a site evaluation to identify potential sources of pollutants, such as organic residues, nutrients, and sediment. Control measures, such as erosion and sediment control measures, containment berms, and vegetative buffers, must be implemented to prevent pollutants from being carried off-site by stormwater runoff.
(3) Employee Training: Facility personnel must receive training on stormwater pollution prevention measures outlined in the SWPPP. Training programs typically cover topics such as spill prevention and response, proper waste management, and maintenance of stormwater controls.
(4) Monitoring and Sampling: Facilities are required to implement a monitoring program to assess the effectiveness of BMPs and ensure compliance with permit requirements. This may include visual inspections, sampling of stormwater discharges, and analysis of pollutant levels.
(5) Reporting and Recordkeeping: Operators must submit annual reports to the SWRCB summarizing monitoring data, BMP implementation, and any corrective actions taken. Additionally, facilities are required to maintain records of inspections, training activities, and stormwater management practices for a specified period.
(6) Compliance Assurance and Enforcement: The SWRCB conducts inspections and audits to ensure compliance with the IGP. Noncompliance may result in enforcement actions, such as penalties, corrective measures, or revocation of permit coverage.

Air Permitting

Where composting operations may come under the authority of local air districts, the following are some key aspects typically considered in the air permitting process that may impact project cost. For more information on the specific potential air permitting requirements, please refer to Sections IV and V.

(1) Emission Sources: The permitting process typically involves identifying potential emission sources within the composting facility. These may include emissions from organic materials receiving, storage, processing, composting and transportation activities associated with the operation.
(2) Odor Control Measures: Despite their limited authority over composting operations, air districts are typically engaged with odor complaints and work with the LEA to assure operators are not a nuisance. Odor is a significant concern for composting operations, especially in populated areas. Air districts and LEAs may require the implementation of odor control measures such as covering compost piles, using biofilters, or incorporating odor-neutralizing agents.
(3) Monitoring and Reporting: Permitting often involves establishing monitoring requirements to track emissions and ensure compliance with air quality standards.

Operators may be required to install emission monitoring equipment and submit regular reports to the air district.

(4) Operating Conditions: Permit conditions may specify operating parameters such as maximum pile heights, composting temperatures, and composting durations to control emissions and optimize the composting process.

(5) Best Management Practices (BMPs): Operators may be required to implement BMPs (discussed in more detail in the next chapter of this report) to minimize emissions and environmental impacts. These practices may include covering incoming organic material, controlling moisture levels, and properly managing runoff.

(6) Public Notification and Complaint Response: Some air districts require composting facilities to develop and implement plans for public notification of activities and procedures for responding to complaints related to odor or other environmental concerns.

(7) Compliance Assurance: Air districts conduct inspections to ensure that composting facilities are operating in compliance with permit conditions and regulatory requirements. Noncompliance may result in enforcement actions such as fines or permit revocation.

(8) Community Engagement: Engaging with local communities and stakeholders throughout the permitting process can help address concerns, build trust, and facilitate smoother operations.

Navigating the permitting process for composting operations in California can be complex, but by understanding and addressing these considerations, operators can demonstrate their commitment to environmental stewardship and regulatory compliance. Working closely with the local air district and other relevant regulatory agencies is essential for achieving successful permitting outcomes.

Solid Waste Facility Permitting

Small and medium composting operations have been defined for this study as those being up to 5,000 cubic yards in total on-site volume of all organic materials (small) and those being up to 12,500 cubic yards in total on-site volume (medium). The solid waste facility permitting options for these facilities under current CalRecycle permitting tiers (14 CCR §17854.1 do not, however, differentiate a separate permitting pathway and both sizes are subject to the same requirements. Further discussion on the CalRecycle and/or Local Enforcement Agency (LEA), permitting and approval processes are included in Section V.

Nondisposal Facility Element

Composting operations, like other solid waste diversion facilities, are required to be identified in the solid waste planning documents, required under Title 14, for the jurisdiction in which they are to be located. In order to conform to these planning requirements, a facility needs to be included in the jurisdiction's Nondisposal Facility Element (NDFE. The regulatory process for achieving conformance with the NDFE inclusion is relatively simple, straightforward, and should have relatively minor cost implications for an operator, which must provide a summary description of facility

operations and a location map, upon which a jurisdiction would use that information to amend their current NDFE with the information provided and send a notification letter to CalRecycle of that process.

Capital Cost Composting Estimates

Capital startup costs for small or medium composting operations can vary widely depending on the multitude of factors discussed in detail above, and in previous sections of this report. In estimating the capital costs for a small composting operation, it is possible that they are much lower in most regulatory frameworks than for a medium operation, given the much lower potential threat to generate significant environmental or community health impacts, but it may or may not be measurable without having much specificity on the location and site characteristics. However, once food materials are introduced for either size, the solid waste facility permitting requirements ratchet up significantly due to increased environmental review and other mitigation measures. Combining those additional cost considerations along with the water quality protection measures specified for Tier 2 facilities (who accept food materials from commercial sources) in the Compost General Order (for those small operations which do not meet the conditions identified for waiver as an agricultural operation) has the potential to make for an insurmountable cost burden, once all necessary site improvements are designed and constructed.

Table 17 includes a high-level planning estimate for typical capital expenses associated with the siting and developing of small- and medium-sized composting activities as defined in this study. There are unlimited site-specific and project-specific variables that could significant impact the capital costs required for these operations. The HDR Team's goal was to provide a low and high range of costs for a mid-level project with the following key assumptions. The below assumes the following throughputs for a small and medium composting activity: 1) an annual throughput of 10,000 tons per year (TPY), representing a 5,000 cubic yards on-site capacity and the completion of four to five composting cycles per year, and 2) an annual throughput of 25,000 TPY, representing a 12,500 cubic yards on-site capacity also completing four to five composting cycles per year.

- Located in a low-density urban or rural area (e.g., not along coastal urban areas or high-density urban areas);
- Site has moderate-to-poor soils;
- Five-acre parcel with four acres of lime-treated operations working pad;
- Operation processes allow feedstocks under the Compost General Order Tier 1 requirements;
- Operation requires full grading and building permits;
- Operation requires compliance with the Construction General Permit and Industrial General Permit;
- Reputable contractor and construction compliance with use of prevailing wages for construction labor;

- Assumes a Compost General Order Tier 1 detention pond (i.e., includes a clay liner but not an HDPE liner with lysimeter);
- Use of a pipe-on-grade positive aeration composting system with compost cap;
- Construction and installation of a truck scale and modular trailer for office/scale house;
- Use of water truck or equivalent to comply with fire requirements.

For the higher range costs, the following could also apply:

- Larger on-site and/or throughput capacity; and
- Operation required to obtain an air permit and purchase ERCs for permit compliance.

Table 17: Typical Capital Expenses for Siting and Developing Composting Operations

Typical Start Up Capital Costs	**Low Range (10,000 TPY)**	**High Range (25,000 TPY)**
Land Acquisition		
Purchase	$3,650	$2,050,000
Lease	$13 per acre	$150,064 per acre
Engineering Costs		
Engineering Design	$5,000	$500,000 and up
Permitting	$50,000	$500,000 and up
Construction Costs		
Site Preparation	$200,000	$1,500,000
Utility Installation	$50,000	$500,000
Structural Improvements	$50,000	$250,000
Equipment		
Compost Aeration System	$50,000	$720,000
Grinder	$80,000	$500,000 and up
Loader	$75,000	$150,000
Moisture Addition / Water Truck	$20,000	$90,000
Screen	$75,000	$250,000
Temperature Probes	$500	$500
Mixers[a]	$40,000	$200,000
Sub-total[b]	**$699,163**	***$7,360,564 and up***
Contingency		

Typical Start Up Capital Costs	Low Range (10,000 TPY)	High Range (25,000 TPY)
Conceptual Planning Contingency	$209,765	$1,938,246 and up
Total	**$908,928**	**$9,298,810 and up**

Notes:
[a] Mixers are not necessary equipment at green waste only composting operations.
[b] Assumes a four-acre working pad and five-acre parcel.

Sources: Rynk, Robert, et al, editors: The Composting Handbook: A How-to and why Manual for Farm, Municipal, Institutional and Commercial Composters. Elsevier, 2021.

Phone Interviews with Composting Technology Providers, Edgar & Associates, April 8-12, 2024

Compost Operating Cost Estimates

Operating costs for small or medium composting operations also vary widely depending on the multitude of factors:

- Labor costs
- Land acquisition debt service.
- Equipment amortization
- Fuel and lubricants.
- Site and equipment maintenance
- Utilities costs (electricity, water, sewer, etc.)
- Stormwater and leachate management (annual maintenance, testing, etc.)
- Equipment parts
- Equipment replacement
- Materials handling and trucking
- Disposal of non-compostable materials
- Soil blending ingredients.
- Lab testing for Title 14 compliance (pathogen reduction, metals and physical contamination, etc.)
- Certifications (CDFA OIM license and registration, Organic Materials Review Institute, USCC Seal of Testing Assurance, etc.)

In estimating the operating costs for a small or medium composting operation, there should typically be efficiencies that can be realized as the size and number of onsite personnel increases, but the cost of additional land or upgrading equipment tend to diminish or overshadow them. Additionally, other factors can impact operating costs, like weather and the amount of contamination in feedstock. Site operations in dry climates tend to be more efficient as stormwater and leachate management, onsite

movement of equipment and materials and other challenges with excess rainfall become more likely.

Table 18 includes a high-level estimate for typical expenses associated with operating small- and medium-sized composting activities, as defined in this Study. Site-specific and project-specific variables also impact the operating costs required for these operations. The HDR team's goal was to provide a range of costs for both a small- (assuming roughly 10,000 tons per year) and a medium-sized operation (assuming roughly 25,000 tons per year).

Table 18. Estimated Operating and Maintenance (O&M) Expenses for Composting Operations

	Small Activities (10,000 TPY)		**Medium Activities (25,000 TPY)**	
O&M	**Range (per ton of incoming feedstock)**	**Annual Cost**	**Range (per ton of incoming feedstock)**	**Annual Cost**
Pre- and Post-Processing Activities	$10-$15 per ton	~$100,000-$150,000	$10-$15 per ton	~$250,000-$375,000
Operations	$13-$20 per ton	~$130,000-$200,000	$20-$30 per ton	~$500,000-$750,000
Maintenance	$1-$2 per ton	~$10,000 to $20,000	$1-$2 per ton	~$25,000-$50,000
Total O&M Costs	**$24-$37 per ton**	**~$240,000-$370,000**	**$31-$47 per ton**	**~$775,000-$1,175,000**

Source: Phone interviews with operators of small/medium composting operations located in both Northern and Southern California, Edgar & Associates, April 22, 2024

VII Best Management Practices for Operating Small and Medium Composting Activities

Introduction

The purpose of this technical memo is three-fold:

- To focus on the operations for the receipt, processing, and marketing occurring at small- and medium-sized composting activities including the investigation of the use and efficiency of equipment, labor, and transportation to meet CalRecycle Compostable Material Handling Minimum Operating Standards (14 CCR, Division 7, Chapter 3.1, Articles 5 through 9);
    - Also included is an in-depth summary of BMPs for specific key compost processing parameters.
- To evaluate the permitting challenges and solutions for particular case study examples not included in Section V; and
- To develop and identify good neighbor policies and BMPs for how composting activities can benefit their communities.

Best Management Practices for Compost Processing Parameters

Composting is a biological process; therefore, the biological principles and the processes driving them are the same regardless of the scale of the operation. Optimizing the biological principles that govern the decomposition process, specifically water (e.g., moisture content), oxygen, carbon to nitrogen ratio, porosity, and temperature are key to rapidly achieving stability, avoiding odors and efficiently managing the process.

Moisture Content

In most parts of California, managing moisture in a compost operation is the single greatest challenge and probably the most important limiting factor. The composting process uses a lot of moisture, and the environment (in most parts of the state) is mostly hot and dry which evaporates a significant amount of moisture from a pile. Further, turning a windrow, or forcing air into a pile, can also cause a loss of moisture in a pile. Since all the microbes live in the moisture film around the feedstock particles, when a compost pile does not have adequate moisture, the microorganisms will not thrive and thus slow down or halt the decomposition process. The closer to optimum moisture, the more quickly more material will approach stability. The ideal moisture content for composting is between 50% and 60% for starting materials and the moisture of in-process compost should be at or above 50% until the end of the process.

There is not currently a mechanical tool that can reliably measure moisture in a composting environment. However, there are several ways to measure moisture in a

pile. These are further described in the following section.

How to Measure Moisture in a Compost Pile

There are several easy ways to measure moisture in a compost pile. These include the squeeze test, the microwave method, using a dehydrator, and using a drying oven. The benefit of most of these tests is that they can be done quickly and on-site. Compost laboratories also perform moisture tests, but the tests may take days or weeks before providing usable results. All of these methods are equally valid and accurate enough for a field verification of moisture.[43].

THE SQUEEZE TEST

Perhaps the easiest and quickest way to estimate moisture in a compost pile is by using the squeeze test. Take a sample of compost in your hand from roughly 18 inches to 24 inches into the pile. Make sure there are no sharp objects in the sample. When performing this test, one may want to wear thin nitrile gloves to protect your hands and because moisture will show up better on the gloves than your skin. Squeeze tightly. The US Composting Council[44] has published detailed interpretations of the Squeeze Test but suffice it to say that if you squeeze the sample in your hand and when you unclench your hand it retains its shape (like a snowball) it is close enough to 50% moisture. An operator's ability to accurately estimate moisture from a squeeze test will improve if one calibrates it to one of the methods below (or conducts laboratory tests).

THE MICROWAVE METHOD

The microwave method requires taking a sample from the subject pile. Take 100 grams of the sample and put on a paper plate. Using a standard low-power microwave (do this outside for ventilation purposes) to evaporate the moisture in small (one- to two-minute bursts) and continue to weigh the sample until it stops losing weight (i.e., the moisture has been evaporated). By subtracting the dry weight of the sample from the wet weight (make sure to also subtract the weight of the paper plate) and then dividing by the wet weight (and multiplying by 100) the result is the moisture percentage.

THE DEHYDRATOR METHOD

The dehydrator method is similar to the microwave method. While this method takes longer, it does not require as much attention as the microwave method. The method is similar as well: take a 100 gram sample, place in a commercial food dehydrator and dehydrate according to manufacturer's instructions. It may take overnight or even 24 hours, but when the sample is dry, weigh the dry sample. By subtracting the dry weight

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[43] Peters, John, On Farm Testing of Corn Silage, University of Wisconsin, Madison, https://fyi.extension.wisc.edu/forage/on-farm-moisture-testing-of-corn-silage/

44 US Composting Council, "Measuring Moisture by Look and Feel", Compost Operator Training Course, undated.

of the sample from the wet weight and then dividing by the wet weight (and multiplying by 100) the result is the moisture percentage.

DRYING OVEN

Some facilities may have access to a drying oven, either at a university, nursery, or other source. Drying ovens usually use lower temperatures and longer residence times which can be beneficial in soil testing, but the method is the same, add a 100-gram sample, dry according to the oven specifications, then subtract the dry weight of the sample from the wet weight and then divide by the wet weight (and multiply by 100) the resultant is the moisture percentage.

Oxygen/Aeration

Composting is an aerobic (with oxygen) process. Air is delivered via aeration. Adequate aeration whether via pile porosity or through mechanical aeration, such as turning a pile or forced aeration, is critical to maintaining predominantly aerobic conditions. Oxygen (or carbon dioxide (CO_2) can be measured in the field with hand-held instruments, but achieving a good bulk density is the only reliable way to assure good air flow into a pile. CO_2 is an analog of oxygen. If one has the CO_2 measurement, one can subtract that number from 21% oxygen and get the oxygen percentage. This is true whether that air comes in through natural processes or from an aeration system.

Several manufacturers offer handheld tools that can measure oxygen or CO_2. But it is common practice for composters, especially operators of smaller sites, to rely on measurements of bulk density to achieve positive airflow in their piles.

Porosity and Free Air Space

In the past 10 years or so, composters have increasingly started to appreciate the role pile porosity has in the success of the composting process. Porosity refers to the air space in and around the feedstock particles. This is sometimes referred to as “air-filled” porosity, to distinguish it from the space occupied by moisture. Composters interested in measuring porosity (and increasing their air flow) can measure a pile’s bulk density using a container of a known volume. Similar to understanding a composting system’s aeration, bulk density is a reasonable surrogate for free air space and is very easy to measure in the field.

<u>Measuring Bulk Density</u>

Composters can use a standard 5-gallon bucket to measure bulk density in a pile.

1. Weigh the empty bucket to establish a tare weight.
2. If the exact volume of the bucket is not known, fill with a known volume of water and mark the 5-gallon line.
3. Mark the outside of bucket into thirds between the bottom and the five-gallon mark.
4. Fill the bucket with in-process compost (start from the middle of a pile if possible) up to the one-third mark.

5. Drop the bucket approximately 10 times from a height of 6 inches to approximate the compacted density.
6. Fill the bucket up the two-thirds mark and repeat the dropping.
7. Fill the bucket to the 5-gallon mark and repeat the dropping process.
8. After dropping the bucket, top-up the compost in the bucket to make up for the now compacted material. There is no need to repeat the compaction step.
9. Weigh the now full bucket with a digital luggage or fishing scale (or a bench scale if available).
10. Subtract the tare weight from step one from the total weight.
11. Multiply the total weight (the full bucket, minus the empty bucket) and multiply by 40.
12. The resulting weight will approximate the bulk density of the pile as expressed in pounds per cubic yards.
13. Although there are variations, a good bulk density to shoot for is 1,000 pounds per cubic yard or less.

Carbon to Nitrogen Ratio (C:N or C/N)

The carbon to nitrogen ratio (C:N or C/N) is a fundamental measure of the balance of two fundamental elements of compost feedstocks. Any feedstock can be characterized as to its ratio of carbon and nitrogen. In fact, the industry tends to bifurcate feedstocks into either a 'high carbon' or 'high nitrogen' category (though 'high nitrogen' isn't truly accurate and might be better referred to as 'low carbon'). Regardless, balancing feedstocks to achieve an acceptable carbon to nitrogen ratio is a critical part of balancing feedstock characteristics. Unfortunately, there are only two ways to establish an accurate C:N ratio. The first is to have feedstocks tested by a lab and have the lab measure Total Carbon and Total Nitrogen. Most labs also will provide the carbon-to-nitrogen ratio, which is always expressed as ## carbon to 1 nitrogen. The other way is to use published data and make an educated guess based on the proposed feedstocks. Unfortunately, published data are specific to the materials tested and may or may not be similar to a specific operation's feedstocks.

Most literature recommends a starting C:N ratio of 30 to 1 or higher. Lower C:N ratios have been shown to cause nitrogen to volatilize and be lost to the atmosphere (most commonly as ammonia). Ammonia is an odorous gas but is unlikely to be an odor problem at most compost sites as it dissipates quite readily in the atmosphere (i.e., it doesn't travel very far before dissipating). It is important to note that composters also measure C:N ratio at the end of the process (typically through lab analysis). The C:N ratio at the end of the composting process should be lower as some carbon is consumed in the composting process and given off as carbon dioxide. Some users of compost may want a lower C:N ratio, as too high a C:N ratio may tie up nitrogen in the soil. This will depend on the end user, but some literature suggests a final C:N ratio of 20:1, and some studies recommend even lower. Certain markets may also seek an even lower C:N ratio in their compost product, such as some agricultural users.

Temperature

Temperature is the single most reliable and easily measured parameter to determine the health of a compost pile. The temperature of a pile should increase beyond ambient temperature rapidly and within a few days of being created. Temperatures should remain steady and above 140° F for much of the process. Temperatures will drop if a pile is "turned" (whether with a specialized piece of equipment or a front-end loader) but will likely rebound within a day or two. Extreme weather events — like major storms or very strong winds — *may also affect compost temperatures, but only temporarily. Compost is a very effective insulator, and piles will retain heat for a long time. Pile size and shape will also impact the pile's ability to maintain heat.

If a pile is generating too much heat or is unable to dissipate the heat, it is a good sign that other pile parameters may be out of the ideal range. For example, a pile that is too wet and dense may generate heat, but not dissipate it effectively. Too much heat can and does result in conditions that can lead to spontaneous combustion (i.e., cause a fire). Spontaneous combustion is the most common cause of fires at composting facilities. There are many conditions that can lead to spontaneous combustion, but a pile that is generating more heat than it can dissipate is one of the common mechanisms. If temperatures exceed 180°F, actions should be taken to reduce the temperature.

It is important to note that the only way to reliably reduce the temperature of a composting mass is to lower the height of the pile. Turning the pile and/or watering the pile may temporarily reduce the heat of the pile, but the heat will rapidly return and may be even more robust than before watering and turning.

Compost Process-Specific Troubleshooting

There are several compost process parameters to attend to for efficient composting. If one parameter is out of specification the entire process can slow down, underperform, or cause other nuisance conditions. Table 19 lists several common process-specific conditions which may affect compost operations and possible solutions.

Table 19: Compost Process Troubleshooting

Parameter	Issue	Possible Cause	Possible Solution
Moisture	Not enough starting moisture	Feedstocks arrive dry	Add moisture to feedstocks during or immediately after grinding and turning

Parameter	Issue	Possible Cause	Possible Solution
Moisture	Moisture loss during process	Dry operating conditions, too much turning	Consider turning less frequently, if possible, increase watering
Oxygen/aeration	Pile not getting enough oxygen	Pile density	Measure bulk density, add bulkier materials to recipe
Oxygen/aeration	Pile not getting enough oxygen	Insufficient fan schedule	Increase fan 'on' time, check bulk density
Temperature	Piles not heating up	Incorrect C:N ratio	Check C:N ratio, adjust recipe
Temperature	Piles not heating up	Inadequate moisture	Check moisture, mix, and add as necessary.
Temperature	Piles not heating up	Inadequate porosity	Check pile bulk density, adjust as necessary.
Temperature	Excessive temperature (above 180°(F)	Inadequate porosity	Check pile bulk density, adjust as necessary.
Temperature	Excessive temperature (above 180° F)	Excessive pile height	Reduce pile height
C:N Ratio	Pile generating free ammonia	Too low a C:N ratio	Add a carbon source, re-mix pile
C:N Ratio	Pile not heating up	Too high initial C:N ratio	Add a nitrogen source, re-mix pile
Porosity/Bulk density	Pile not heating up, or heating up, but not respiring	Pile is too dense	Check pile bulk density, add some bigger chips and re-mix the pile.

Parameter	Issue	Possible Cause	Possible Solution
Pathogens	Failed one or more pathogens	Inattentive sampling or handling	Review pathogen sampling videos, take new sample, resubmit.

Operational Challenges and Methods

The most common challenges at small and medium compost activities include odor, truck traffic, pathogen reduction, recordkeeping, and managing throughput.

Odor

Odor is the number one reason, though often combined with other factors, that composting facilities (at any scale) close. Most compost operations in California have a written Odor Impact Minimization Plan, and numerous examples can be accessed through the Solid Waste Information System (SWIS) database. CalRecycle has also published the Comprehensive Compost Odor Response Project (C-CORP) which is a major report on compost odors, causes and mitigations. The C-CORP report contains an Odor Mitigation Matrix which offers numerous practical solutions to compost operation odors.

Truck Traffic

Managing truck traffic can be challenging at a growing facility. However, effort should be made to minimize impacts from feedstock delivery trucks. This might include scheduling feedstock deliveries for noncommute hours and re-routing trucks away from sensitive receptors (e.g., residential homes, hospitals, and schools) or underdeveloped roads.

Pathogen Reduction

All compost operations and facilities should regularly document pathogen reduction as per Title 14 regulations (one sample analyzed per every 5,000 cubic yards produced). See the table below for the PFRP. Complying with the pathogen reduction standard is a two-step process. First, there is a time and temperature relationship, depending on the composting methodology, which must be documented. Second, the efficacy of the time and temperature process must be verified by laboratory testing. Table 20 summarizes the pathogen reduction processes by composting methodology.

Table 20: Pathogen Reduction Process by Compost Methodology

Compost Method	Pathogen Reduction Process
Windrow	Active compost shall be maintained under aerobic conditions at a temperature of 55 degrees Celsius (131 degrees Fahrenheit) or higher for a pathogen reduction period of 15 days or longer. During the period when the compost is maintained at 55 degrees Celsius or higher, there shall be a minimum of five (5) turnings of the windrow.
Aerated Static Pile (ASP)	Active compost shall be covered with 6 to 12 inches of insulating material, and the active compost shall be maintained at a temperature of 55 degrees Celsius (131 degrees Fahrenheit) or higher for a pathogen reduction period of 3 days.

Achieving environmental compliance with the pathogen reduction standards, shown in Table 21, is occasionally a challenge for some facilities and must be accurately recorded and maintained to verify compliance.

Table 21: Pathogen Reduction Standards

Analyte	Standard
Salmonella	< 3 Most Probable Number (MPN) per 4 grams
Fecal Coliform	< 1,000 MPN/g

The philosophy of sampling is to make sure that any sample taken is both random and representative of the pile being sampled. The Composting Research and Education Foundation (CREF) has two videos on proper sampling which are available on YouTube:

Part 1: https://www.youtube.com/watch?v=0C-m5zNCGQg

Part 2: https://www.youtube.com/watch?v=NYrfZSMFPxQ

These videos should be studied prior to taking a sample for pathogen analysis. Particular attention should be paid to keeping sampling tools and containers sterile so as not to affect the results. A composter should also work with their analytical lab to understand lab handling procedures and recommended sampling container and shipping requirements. Shipping a sample on a Tuesday, for example, is more like to be tested more expeditiously than one sent over the weekend.

Failing a Pathogen Test

It is not uncommon for a composter to fail a pathogen test over the life of the facility, but before redesigning an entire operation, it would be good to analyze the following:

1. How was the sample gathered? Were proper sampling methods followed? Were tools sterilized before taking the sample?
2. How was the sample handled? Was the sample handled properly? Was it immediately put on blue ice? Was it shipped in a way to minimize handling time?
3. Is it possible the lab made a mistake? Was a prior lab used, or was a new lab tried? Did the lab use compost-specific methods?

If a sample fails the pathogen test, it would be good to review the sampling procedure and re-take the sample. If the sample passes, one might conclude that the first sample was the result of bad sampling or handling procedures. If the sample fails a second time, it may indeed be because of a flaw in the composting process, issues with recontamination, or another cause.

Recordkeeping: Managing a composting operation requires a significant amount of recordkeeping. Some of these are regulatory requirements and some are helpful for managing the operation, still more are helpful for selling the compost product. Typical recordkeeping includes:

Production. This should include tons in and tons out. A composting operation may have a tons per day limitation, and typically has an on-site limitation as well. For the purposes of this study, the composting activities are limited to up to 5,000 cubic yards or 12,500 cubic yards of all materials on-site at any one time. So, the volume of total materials on-site is also important to track for regulatory compliance. Likewise, tons or cubic yards leaving the facility also need to be tracked.

Process. Typically, operations will track temperatures, turns, (at a minimum for documenting pathogen reduction) as well as moisture.

Regulatory. These can include records of pathogen reduction, heavy metals and physical contaminants, which must be sampled and analyzed every 5,000 cubic yards. Operating a EA Notification Tier composting operation has a number of regulatory recordkeeping requirements even though it is not technically a “permit”. These operations are still subject to regular inspections and meeting state minimum standards.

Finished Products. Most users of compost may want laboratory analysis on one or more aspects of the finished compost, beyond the three regulatory standards listed above. These might include stability and maturity, micronutrients, organics matter, pH, electrical conductivity, and other characteristics of the compost.

SB 1383. SB 1383 added additional recordkeeping requirements including participating in the Recycling and Disposal Reporting System (RDRS) system, mostly to track tons in and tons recycled, as well as tracking organics disposed of in the waste stream.

Site Capacity

One of the major challenges with a EA Notification Tier operation is balancing feedstock, processed material, in process compost, finished products and other material on-site so as not to exceed the 12,500 cubic yards limit. Similarly, for a research composting operation to not exceed the 5,000 cubic yards limit.

Site Management

Managing the compost operation involves more than just managing the composting process. Other activities include general site management, equipment maintenance, material receiving and traffic control, compost sales and marketing, and managing regulatory compliance. Effective site management plays an important role in operating an efficient composting operation.

General Site Management. General Best Management Practices for site management include designing the site with counterclockwise travel, minimize material handling, system delays, backtracking, bottlenecks, inefficiency, maintain flexibility, physically separate feedstocks, finished products, prioritize ease of housekeeping and maintenance, and control access and security. The biggest inefficiency in composting operations is too many touches (i.e., any material handling. Every time the material is "touched," it costs money and lowers the efficiency of the operation.

Material Receiving and Traffic Control. Most sites need some way to receive and track (and charge for) incoming loads of feedstock. The pay shack should be set far enough off of the main road so as to avoid stacking traffic up on the public road.

Compost Sales & Marketing. Fundamentally, if feedstock is brought onto the site and made into compost, that compost has to move off the site somewhat concurrently to conserve processing space and to continue to comply with the volume requirements of a EA Notification Tier operation. A detailed discussion on marketing compost is beyond the scope of this Study, but one general recommendation is that the bigger the project, the sooner market development has to occur. In California, the state that leads the nation in agricultural production, over 65% of compost sales are into agriculture. California also has robust horticultural markets, markets with Caltrans, and emerging carbon sequestration markets. Composters need to educate themselves as to what markets they can access to assure a smooth off-take of finished product.

Managing Regulatory Compliance. The various obligations of running an EA Notification Tier composting facility have been discussed elsewhere in this report. Most of it deals with good recordkeeping. Maintaining a good relationship with your LEA (and other regulators) is also critical.

Permitting Challenges and Solutions

The following are hypothetical case studies to highlight examples of the permitting challenges and opportunities for small- and medium-sized composting activities.

Permitting Case Study Example #1

A company wanted to start a privately owned composting facility on land in the unincorporated portion of a mostly suburban county. After acquiring the land and submitting the Notification application, the operator was notified that the project would need a Conditional Use Permit (CUP) and need to complete the California Environmental Quality Act (CEQA) process. These unanticipated permitting costs added unexpected costs to the start-up of the facility. Later the Army Corps of Engineers (Corps) alleged that a drainage course that had been unearthed in a previous (unrelated) excavation of the site was considered a "Water of the United States" and required a special CWA Section 404 permit from the Corps. After a lot of negotiation and a 404 determination, it turned out the natural, previously underground spring was indeed not a "water of the United States" and the operator continued with its CUP and CEQA permitting process. However, the multiple unseen regulatory requirements slowed the planned facility development and incurred significant unexpected costs.

Best Management Practice: Understanding which regulatory programs that apply to a project fall on the responsibility of the operator.

Permitting Case Study Example #2

An existing Material Recovery Facility that already receives recyclables, municipal solid waste, and clean green waste has available acreage to add a small composting activity to its facility boundary. The operator consults with the local planning department on the land use and CEQA permitting requirements and is informed an Environmental Impact Report (EIR) Addendum is required to add composting. The EIR Addendum is approved by the planning director. The facility already has a full SWFP, the appropriate air quality permits for on-site composting activity equipment, and is enrolled in the Industrial General Permit (IGP). The facility is required to update its Transfer Processing Report (TPR) to include a Report of Composting Site Information (RCSI). The local air district does not permit composting activities. The IGP is updated to include the composting activity, and the facility qualifies as a Tier 1 facility under the Compost General Order and is not required to install an on-site detention pond.

Best Management Practice: An existing waste processing facility may have an easier permitting pathway to include a small composting activity than a greenfield, or new, small composting activity would, depending on the permitting requirements. In either case, operators should reach out to their LEA early in the planning process to discuss proposed operational changes.

Community Benefits and Policies

A component of the CEQA process includes a public comment period, where the public is notified of the project and provided an opportunity to provide written comments or participate in the public hearing to approve or deny a project. However, depending on the project location and land use requirements, there may be no required public comment period. And not all EA Notification Tier operations go through CEQA. Similarly, during the CalRecycle full SWFP process, a public information meeting is

held to provide information about the project in a public setting. However, EA Notification Tier approvals do not require a public information meeting. Therefore, for small- and medium-sized composting activities, the level of public involvement and education may be determined primarily by the operator.

There are several BMPs for composting activities to be a good neighbor, whether directly or indirectly engaging with the public. The following are some examples:

- Optimizing the compost process parameters (see above) to effectively manage a facility to minimize potential odors;
- Re-routing vehicles that use the facility away from residential homes and other sensitive receptors during peak commute hours;
- Improving the site security and perimeter aesthetics to compliment the surrounding architecture or culture;
- Adjust operations based on specific meteorological conditions to minimize impacts (noise, odor, dust);
- Plant visual and auditory buffers (trees, berms);
- Provide free compost and/or delivery to immediate neighbors and community groups;
- Host annual open house (during International Compost Awareness Week, start of May);
- Participate in environmental educational fairs, festivals, etc.; and
- Be an asset to the community.

In addition to the BMPs outlined above, composting activities located in or near communities designated as “disadvantaged” by the California EPA have the opportunity to improve local air quality and economic conditions. Composting diverts organic material from landfills, which also may be located in disadvantaged communities, where it would otherwise contribute to fugitive landfill emissions of greenhouse gases and other air pollutants of concern. In some cases, the relative locations of the composting activity and the landfills result in fewer vehicle miles traveled (lower overall emissions) or fewer vehicles traveling through disadvantaged communities. Compost activities can also hire and train staff from the local community, improving income and career opportunities for residents. Keeping compost in the local area may also contribute to increasing carbon sequestration, reducing stormwater runoff, and may benefit local landscaping beautification projects.

Compost facilities can adopt a Community Benefits Agreement with a local organization to formalize community benefits offered by a facility such as job creation, job training, community garden support (through compost product donations), and assisting in community education events or campaigns.

Additional Resources

A number of groups in the U.S. can help a composter manage operational BMPs. The following is not an inclusive list, but a list of some key organizations and agencies that work with California composters.

CalRecycle. The CalRecycle website contains a wealth of information from the nuts and bolts of permitting to the current hot topics in composting. Maybe start with the "Organics Page" https://calrecycle.ca.gov/organics/

US Composting Council (USCC). The USCC is a nonprofit association of composters, researchers, vendors, consultants, academics, and others all dedicated to growing and expanding the compost industry. The USCC has countless resources, offers an annual conference with an equipment demonstration and tracks hot topics and regulatory developments across the U.S. https://www.compostingcouncil.org/default.aspx

The Association of Compost Producers (ACP). ACP is the California Chapter of the U.S. Composting Council and holds regular meetings and workshops for composters. https://www.healthysoil.org/

Composting Research and Education Foundation (CREF). CREF is the research and education foundation of the US Composting Council. CREF manages the week-long Compost Operator Training Courses offered annually in CA. CREF also manages compost research and provides outreach materials on topics of interest to the composting industry. https://compostfoundation.org/

VIII Key Findings

The permitting process for and development of small- and medium-sized composting activities can be a complex and costly process depending on site location, permitting requirements, and operational requirements including site improvements and required equipment.

Results Summary

As noted throughout this report, there is a wide range of variables that can impact the successful permitting and development of small- and medium-sized composting activities across the state of California. These include, but are not limited to, design (e.g., feedstock type and capacity), operational, and regulatory components (e.g., required permits and approvals). The following is a brief summary of the results of this Study.

Key Findings

Small and/or medium-sized composting activities may be exempt from many of the permits typically required, or fall under a lower tier for approvals and requirements depending on their site location, site capacity and annual throughput, and feedstock type.

Alternatively, small- and/or medium-sized composting activities may require additional permitting and be subject to the same stringent requirements as large-scale composting activities depending on their site location, site capacity and annual throughput, and feedstock type.

The capital costs for permitting and development of a small and/or medium-sized composting activity may range from roughly $1 million to over $8 million and up. Annual operating costs may range from $24 to $47 per ton of material received and is largely dependent on-site capacity.

Opportunities exist to develop tools to identify and inform to a prospective operator on site suitability criteria and permitting requirements.

Recommendations for Successful Compost Facility Development

While this report includes a variety of BMPs to help compost operators navigate these development components, the following are the key takeaways that any prospective compost operator should take into consideration before starting this process.

1. Business Plan

   Develop a business plan consisting of likely feedstock sources, operational requirements, product markets, financing needs, and other key components of a composting operation.

2. Site Suitability
   Identify candidate sites and confirm permitting pathway and related permitting requirements in addition to evaluate site characteristics prior to committing financial resources to site acquisition.
3. Land Use Conformity
   Check with local jurisdiction for site use consistency with the surrounding land uses and communities.
4. Feedstock
   Assess hauling distances from and access to feedstock sources and compost product markets are economical.
5. Local Air District Requirements
   Identify the applicability of New Source Review, Best Available Control Technology, and Emission Reduction Credits.
6. Water Quality Design Considerations
   Design facility site improvements to comply with groundwater, wastewater, and stormwater run-off requirements.
7. CalRecycle / Local Enforcement Agency (LEA) Approvals
   Coordinate operational requirements and approvals with your LEA.
8. Local Construction Permits
   Investigate the appropriate approvals for construction.
9. Capital Investment
   Secure financing for land, equipment, and construction capital expenses.
   Select and procure equipment.
10. Staff Training
    Identify staff responsibilities and training needs.
    Consider operator training.
11. Compost Product Markets
    Identify suitable product markets and obtain third-party certifications.

In addition to these recommendations for prospective operators, the HDR Team has the following recommendations for regulatory agencies which have jurisdiction over composting activities:

- Jurisdictions include compost-specific language in the municipal code to include the permitting pathway by size (small, medium, or large) and type (i.e., feedstock) to help clarify the land use permitting approval process. This can be supported by the development of a model ordinance.
- Regulatory agencies develop permitting checklists to clarify the permitting process and requirements applicable to composting activities.

Tool Opportunities

In addition to the above items, this report also identified opportunities for the development of a statewide tool to assist with navigating the permitting process for these activities.

<u>GIS Tool Opportunities</u>

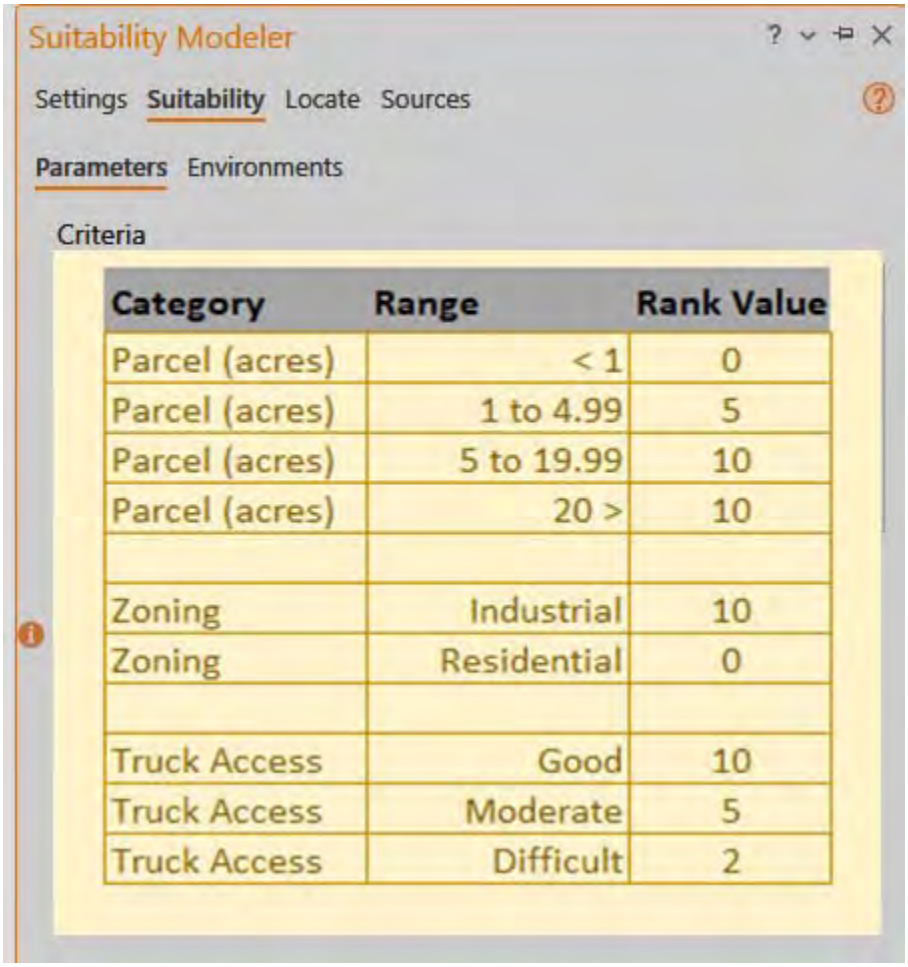
The HDR Team explored three potential GIS approaches: 1 developing customized applications for each county, 2 utilizing a single GIS site suitability tool with standardized statewide data resources, and 3 utilizing a GIS system as a tool to analyze, retrieve, and collection information from CalRecycle users on a map. The main hurdles associated with the first two approaches are the development of customized applications by county or parcel-level can result in high costs. While the data exists to create these GIS tools, developing a custom, comprehensive mapping tool that is available to the general public (i.e., unlimited users and covers the entire state of California can be significantly expensive as it relates to data research, technology, and ongoing recordkeeping and updating.

The third approach is a combination of using existing jurisdictional information (e.g., Air Districts, Regional Water Boards, County Boundaries and general regional information as it relates to the environment (e.g., flood plains, water bodies, ground water depth, terrain type and accessibility (e.g., road network, population. This approach would not be as comprehensive as the parcel level data but could showcase statewide permitting information and key site criteria that could be used to assist with compost facility permitting and development. While this approach may be less costly than the other two approaches, it would still require substantial funding.

The following are images to demonstrate a few of the limitless possibilities using GIS.

Figure 11: GIS Site Suitability Modeler Example

This concept image displays how a Site Suitability Model could look in a GIS system using a subset of the Suitability Categories. This table illustrates data layers, ranges, and example rank values that would be used to support a Site Suitability Tool.



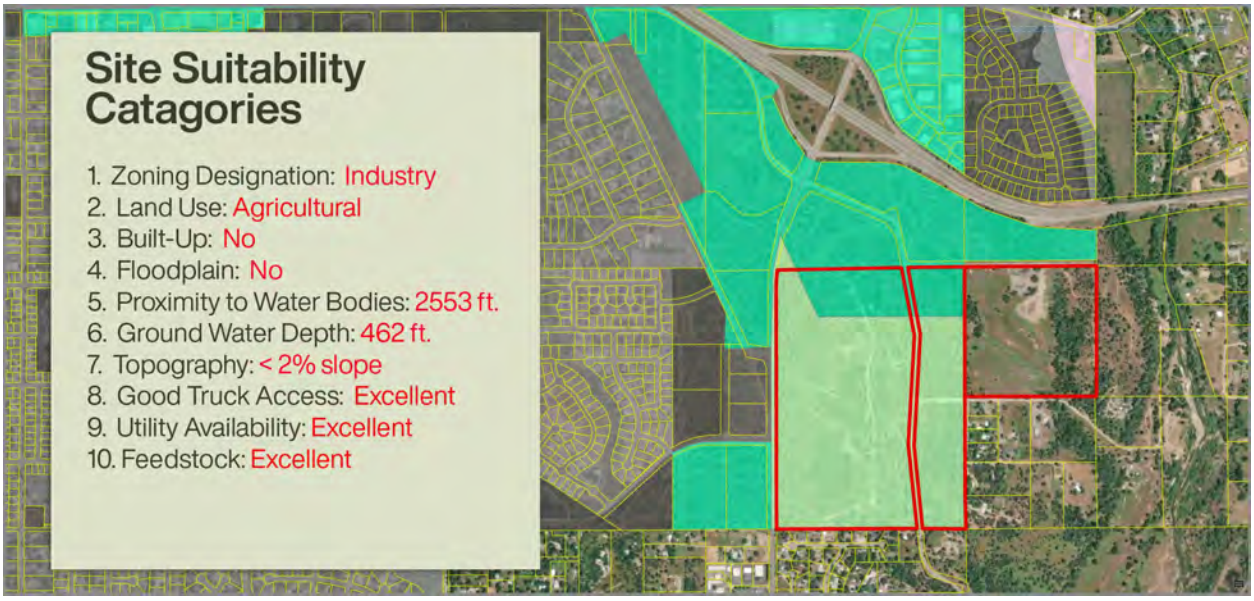
Category	Range	Rank Value
Parcel (acres)	< 1	0
Parcel (acres)	1 to 4.99	5
Parcel (acres)	5 to 19.99	10
Parcel (acres)	20 >	10
Zoning	Industrial	10
Zoning	Residential	0
Truck Access	Good	10
Truck Access	Moderate	5
Truck Access	Difficult	2

Figure 12: GIS Ranking Values Example

This concept image shows data layers (parcels, zoning, and roads) that would assist the users in evaluating the site's potential. The GIS system could guide the users on how to rank the values for a proposed site.

Figure 13: GIS Site Suitability Categories Example

This concept images shows a larger view of candidate's site in the surrounding community. Using GIS, users can quickly populate Site Suitability Categories.

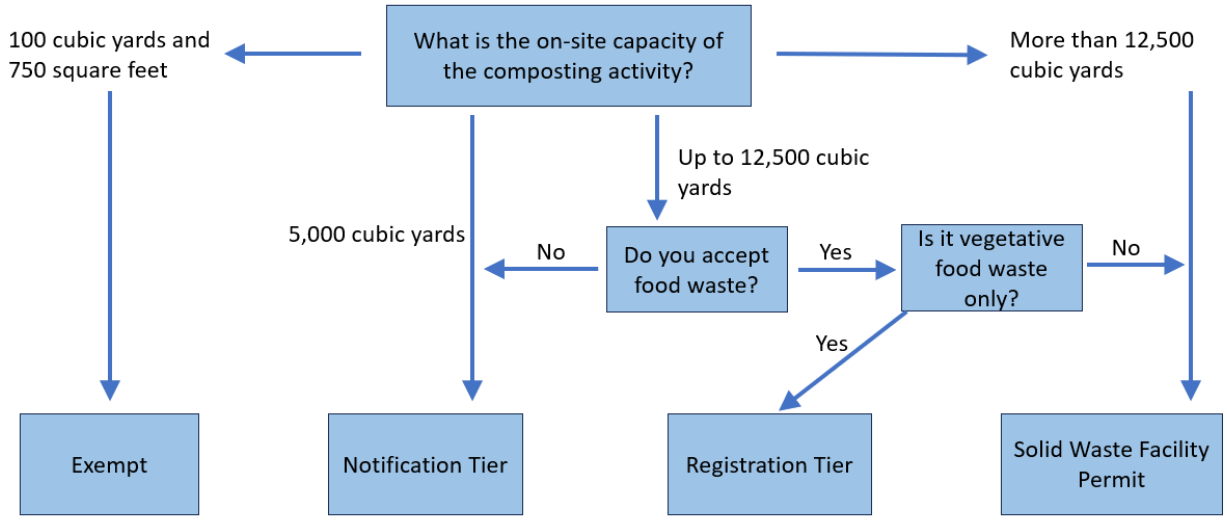


Permitting Matrices Tool Opportunities

Two traditional forms of data delivery include the use of a permitting matrix via flowchart or excel.

One option is for the development of a permitting matrix showing the flowchart of the various permitting layers for composting activities. The following is an example highlighting the permitting flowchart as it relates to CalRecycle's current composting regulatory tiers. This flowchart can be combined with other regulatory requirements to develop a master permitting flowchart. Since most RWQCB and CalRecycle regulations are consistent throughout the state, the flowchart can be on a county, city, or air district basis.

Figure 14: CalRecycle Composting Approval and Permit Tier Flowchart



Another option for providing a useful permitting and development tool for small- and medium-composting activities is the use of excel similar to the table contained in **Appendix D**. This permitting matrix can be a great tool to introduce a prospective operator to the permitting process with BMPs for each step they may encounter along the way.

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Appendix A
Municipal Code Analysis

A. Municipal Code Analysis

Objective

HDR Engineering Inc., (HDR) was retained by CalRecycle for DRR23044 Small and Medium Composting Project Permitting. As part of Section III, the HDR Team reviewed several jurisdictions to evaluate the presence or absence of compost-specific regulations in their local municipal code. These jurisdictions were selected to be representative of the state based on:

- Population density
- Geographic size and location
- Prevalence of existing organics processing facilities
- Applicable air district
- Applicable regional water quality control board (RWQCB)

From these criteria, the HDR Team, with approval from CalRecycle, researched the following jurisdictions:

Counties:

1. Butte
2. Sonoma
3. Sacramento
4. Santa Clara
5. Monterey
6. Fresno
7. Ventura
8. Los Angeles
9. San Bernadino
10. Riverside
11. Mono
12. San Diego

Cities:

1. Alameda
2. Bishop
3. Fresno
4. Los Angeles
5. Ontario
6. Redding
7. Riverside
8. Sacramento
9. San Diego
10. San Jose
11. Santa Barbara

12. Ukiah

The following sections detail the results of the municipal code analysis for the above jurisdictions. Please see **Section III** for the comprehensive synopsis of this municipal code analysis and for the associated recommended best management practices.

Counties

Butte County[45]

Zoning Definition:

1. Composting Facility — a commercial/industrial facility where organic matter is transformed into soil or fertilizer by biological decomposition. Composting activities accessory to an on-site agricultural or residential use are excluded from this definition.

Zoning Requirements:

- **"Composting Facility"**
  - Permitted Use, subject to Zoning Clearance
    - HI – Heavy Industrial
  - Minor Use Permit:
    - AG – Agriculture
    - AS – Agriculture Services
    - RW – Neal Road Recycling, Energy, and Waste Facility Overlay Zone
  - Conditional Use Permit:
    - GI – General Industrial
  - Use not allowed:
    - TM – Timber Mountain
    - TPZ – Timber Production
    - RC – Resource Conservation
    - All Residential Zones
    - All Commercial and Mixed-Use Zones
    - All Special Purpose Zones

Sonoma County[46]

Zoning Definitions:

2. Commercial Composting — commercial facility that produces compost from the onsite and/or offsite organic material fraction of the waste stream in compliance with California Code of Regulations, Title 14, Division 7.

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[45] https://online.encodeplus.com/regs/buttecounty-ca/doc-viewer.aspx?ajax=0&tocid=002.002.005#secid-39

[46] https://library.municode.com/ca/sonoma_county/codes/code_of_ordinances?nodeId=CH26SOCOZORE

Zoning Requirements:

- **"Commercial composting"**
  - Conditional Use Permit
    - LEA – Land Extensive Agriculture
    - DA – Diverse Agriculture
    - RRD – Resources and Rural Development
  - Prohibited Use
    - LIA – Land Intensive Agriculture
    - TP – Timberland Production District
    - All Residential Zones
    - All Commercial Zones
    - All Industrial Zones
- **"Non-commercial composting"**
  - Permitted Use
    - LIA – Land Intensive Agriculture
    - LEA – Land Extensive Agriculture
    - DA – Diverse Agriculture
    - RRD – Resources and Rural Development
    - AR – Agriculture and residential
  - Prohibited Use
    - TP – Timberland Production District
    - RR – Rural Residential
    - R1 – Low Density Residential
    - R2 – Medium Density Residential
    - R3 – High Density Residential
    - All Commercial Zones
    - All Industrial Zones

Sacramento County[47]

Zoning Definitions:

3. Commercial Composting Facilities are not explicitly called out in the municipal code for Sacramento County.
4. Solid Waste Facility — facility that is a solid waste transfer or processing station, a disposal facility or other waste conversion facility, and also includes any solid waste operation that may be carried out pursuant to an Enforcement Agency Notification, including a construction debris chip and grind facility that does not involve green waste.

[47] https://planning.saccounty.gov/LandUseRegulationDocuments/Documents/Zoning-Code/Zoning_Code_Full_1.13.23.pdf.pdf

5. Green waste Facility — Facility that accepts garden, wood, and other organic waste to reprocess into compost, wood chips, or other products, including the use of power-driven processing equipment.
6. Another form of composting mentioned in this code is small-scale composting that supports community and market gardens. The Sacramento County code states that these systems shall be maintained to be free of pests and odors, located away from public street frontages, and may not be located within 20 feet of interior property lines.

Zoning Requirements:

- **"Solid Waste Facility"**
  - Conditional Use Permit by the Board of Supervisors
    - M-2 – Heavy Industrial
  - Not Permitted
    - All Agricultural Zones
    - All Agricultural Residential Zones
    - All Residential Zones
    - All Recreation Zones
    - All Mixed Use Zones
    - All Commercial Zones
- **"Green waste Facility"**
  - Conditional use Permit by the Planning Commission
    - AG – Agricultural
    - UR – Urban Reserve
    - IR – Interim Agricultural Reserve
    - M-1 – Light Industrial
    - M-2 – Heavy Industrial
  - Not Permitted
    - All Agricultural Residential
    - All Residential Zones
    - All Recreation Zones
    - All Mixed Use Zones
    - All Commercial Zones
- **"Community and Market Garden"**
  - Note that the regulations for market gardens vary based on the acreage of the garden.
  - Permitted Primary Use (Community Gardens Only)
    - All Agricultural/Agricultural Residential
    - All Residential Zones
    - All Recreation Zones
    - All Mixed Use Zones
    - All Commercial Zones
    - All Industrial Zones
  - Minor Use Permit (Market Gardens Only)

        - AR-1/AR-2
        - All Residential Zones
        - All Recreation Zones
        - All Mixed Use Zones
        - All Commercial Zones
        - All Industrial Zones

Santa Clara County[48]

Zoning Definitions:

7. Composting and Wood Recycling — composting, reduction, and recycling of vegetation, wood, and other non-hazardous organic wastes, including food wastes. This classification does not include composting or other treatment of sludge materials from sewage treatment plants.

Zoning Requirements:

- **"Composting and Wood Recycling"**
    - Architecture and Site Approval (ASA)
        - OS/F - Open Space and Field Research
    - Use Permit/ASA
        - A – Exclusive Agriculture
        - AR – Agricultural Ranchlands
        - HS – Hillside
        - RR – Rural Residential
        - MH – Heavy Industrial
        - A1 – General Use
    - Not Permitted
        - CN – Neighborhood Commercial
        - CG – General Commercial
        - OA – Administrative-Professional Office
        - ML – Light Indistrial
        - RS – Roadside Services

Monterey County[49]

Zoning Definitions:

8. Composting Facilities are not explicitly called out in the municipal code for Monterey County and would likely fall under Solid Waste and Liquid Waste Disposal Sites; however, these sites are not explicitly defined in the County's code.

Zoning Requirements:

- **"Solid Waste and Liquid Waste Disposal Sites"**

[48] https://stgenpln.blob.core.windows.net/document/ZonOrd.pdf#0-TOC

[49] https://library.municode.com/ca/monterey_county/codes/code_of_ordinances?nodeId=TIT21ZO

    - Use Permit Required
        - PQP – Public and Quasi-Public
- Use Not Permitted
    - All other zoning districts.

Fresno County[50]

Zoning Definitions:

9. Solid Waste Facility — any location or facility used for the disposal of solid, semisolid, and liquid wastes including but not limited to garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, discarded home and industrial appliances, manure, vegetable or animal solid and semisolid wastes and other discarded solid and semisolid wastes, and including solid waste processing facilities as a secondary activity in conjunction with a disposal operation.

Zoning Requirements:

- **"Solid Waste Facility"**
    - Conditional Use Permit
        - M-3 – Heavy Industrial
    - Uses Expressly Prohibited
        - M-1 – Light Industrial
        - M-2 – General Industrial
        - R-C – Resource Conservation
        - TPZ – Timberland Preserve Zone
        - All Residential Zones
        - All Commercial Zones

Ventura County[51]

Zoning Definitions:

10. Composting Operations — type of organics processing operation that processes organic materials to a stabilized state through controlled biological decomposition or vermicomposting. This may include the chipping, shredding, or screening of material on-site prior to its being composted.
11. The Ventura County Municipal Code also breaks down composting operations into several categories including biosolids composting, commercial organics processing (small-, medium-, and large-scale), and on-site composting (small-, medium-, and large-scale).

Zoning Requirements:

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[50] https://www.fresnocountyca.gov/Departments/Public-Works-and-Planning/divisions-of-public-works-and-planning/development-services-division/zoning-ordinance

[51]https://library.municode.com/ca/ventura_county/codes/code_of_ordinances?nodeId=DIV8PLDE_CH1ZO_ART5USSTZO

- **“Biosolids Composting Operations”**
  - Conditional Use Permit
    - OS – Open Space
    - M2 – Limited Industrial
    - M3 – General Industrial
  - Not Allowed
    - All other agricultural, residential, special purpose, commercial, and industrial zones
- **“Commercial Organic Processing Operations”**
  - Small-Scale (up to 200 cubic yards on-site)
    - Conditional Use Permit
      - AE – Agricultural Exclusive
      - RE – Rural Exclusive
      - M2 – Limited Industrial
      - M3 – General Industrial
        - Zoning Clearance Unless Specifically Exempted
          - OS – Open Space
          - RA – Rural Agricultural
          - TP – Timberland Preserve
        - Not Allowed
          - All other agricultural, residential, special purpose, commercial, and industrial zones
  - Medium-Scale (200 cubic yards to 1,000 cubic yards on-site)
    - Conditional Use Permit
      - OS – Open Space
      - AE – Agricultural Exclusive
      - RA – Rural Agricultural
      - TP – Timberland Preserve
      - M2 – Limited Industrial
      - M3 – General Industrial
    - Not Allowed
      - All other agricultural, residential, special purpose, commercial, and industrial zones
  - Large-Scale (over 1,000 cubic yards on-site)
    - Conditional Use Permit
      - OS – Open Space
      - AE – Agricultural Exclusive
      - RA – Rural Agricultural
      - TP – Timberland Preserve
      - M2 – Limited Industrial
      - M3 – General Industrial
    - Not Allowed
      - All other agricultural, residential, special purpose, commercial, and industrial zones

- **“On-Site Composting Operations”** (not related to normal farming activities)
  - Small-Scale (up to 10 cubic yards on-site)
    - Exempt
      - All agricultural, residential, special purpose, commercial, and industrial zones excluding Temporary Rental Unit
    - Not Allowed
      - TRU – Temporary Rental Unit Regulation
  - Medium-Scale (10 cubic yards to 200 cubic yards on-site)
    - Zoning Clearance Unless Specifically Exempted
      - OS – Open Space
      - AE – Agricultural Exclusive
      - RA – Rural Agricultural
      - RE – Rural Exclusive
      - RO – Single-Family Estate
      - TP – Timberland Preserve
      - M1 – Industrial Park
      - M2 – Limited Industrial
      - M3 – General Industrial
    - Conditional Use Permit
      - RPD – Residential Planned Development
      - CO – Commercial Office
      - C1 – Neighborhood Commercial
      - CPD – Commercial Planned Development
    - Not Allowed
      - All other agricultural, residential, special purpose, commercial, and industrial zones
  - Large-Scale (over 200 cubic yards on-site)
    - Conditional Use Permit
      - OS – Open Space
      - AE – Agricultural Exclusive
      - RA – Rural Agricultural
      - RE – Rural Exclusive
      - RPD – Residential Planned Development
      - M1 – Industrial Park
      - M2 – Limited Industrial
      - M3 – General Industrial
    - Not Allowed
      - All other agricultural, residential, special purpose, commercial, and industrial zones

Los Angeles County[52]

Zoning Definitions:

12. Composting Facilities are specifically called out in the municipal code for Los Angeles County. In this code, “Composting” is defined as, “the product resulting from controlled biological decomposition of organic wastes that are source separated from the solid waste stream.” Similarly, “Composting center, station, or facility” is defined as, “a facility whose principal function is to receive and to process green waste through composting. More specifically, composting is broken down into “Composting, green waste only,” “Composting, mixed waste, or food waste,” “Composting, vermiculture,” and “In-vessel composting.” Additionally, composting is considered for both principal and accessory uses for each land type. For simplicity, only principal uses were considered in this review.

Zoning Requirements:

- **“Green waste, mixed waste, food waste, and in-vessel”**
  - Conditional Use Permit (Green waste, Mixed waste, Food waste, and In-vessel)
    - A-2 – Heavy Agricultural
    - M-1 – Light Manufacturing
    - M-1.5 – Restricted Heavy Manufacturing
    - M-2 – Heavy Manufacturing
    - M-2.5 – Aircraft, Heavy Industrial
- **“Vermiculture”**
  - Ministerial Site Plan Review
    - A-2 – Heavy Agricultural
    - M-1 – Light Manufacturing
    - M-1.5 – Restricted Heavy Manufacturing
    - M-2 – Heavy Manufacturing
    - M-2.5 – Aircraft, Heavy Industrial
- Not Permitted
  - A-1 – Light Agricultural
  - O-S – Open Space
  - R-R – Resort and Recreation
  - W – Watershed
  - All Residential Zones
  - All Commercial Zones
  - All Rural Zones

52 https://library.municode.com/ca/los_angeles_county/codes/code_of_ordinances?nodeId=TIT22PLZO_DIV3ZO_CH22.22INZO_22.22.020INZODE

San Bernardino County[53]

Zoning Definitions:

13. Composting facility — facility where organic matter that is derived primarily from off-site is to be processed by composting and/or is processed for commercial purposes. Activities of a composting facility may include management, collection, transportation, staging, composting, curing, storage, marketing, or use of compost.
14. Solid Waste Disposal Site — site used for the final disposal of solid waste, which may also include facilities for separating and differentiating waste products, and/or recycling the waste products.

Zoning Requirements:

- **"Solid Waste Disposal Site"**
  - Conditional Use Permit
    - IC – Community Industrial
    - IR – Regional Industrial
    - IN – Institutional
    - RL – Rural Living
    - RS – Single Residential
    - RM – Multiple Residential
  - Use Not Allowed
    - FW – Floodway
    - OS – Open Space
    - SD-RES – Special Development-Residential
    - SD-COM – Special Development-Commercial
    - SD-IND – Special Development-Industrial
    - All Commercial Zones
- **"Composting facility"**
  - Conditional Use Permit
    - RC – Resource Conservation
    - AG – Agriculture
    - RL – Rural Living
    - Use Not Allowed
    - FW – Floodway
    - OS – Open Space
    - RS – Single Residential
    - RM – Multiple Residential
    - SD-RES – Special Development-Residential
    - SD-COM – Special Development-Commercial
    - SD-IND – Special Development-Industrial
    - All Commercial Zones

[53] https://www.sbcounty.gov/uploads/lus/DevelopmentCode/DCANotice20140821.pdf

Riverside County[54]

Zoning Definitions:

15. Composting Facilities are specifically called out in the municipal code for Riverside County, but not explicitly defined. In this code, organic waste composting is combined with sewage sludge composting. All mentions of composting in this code are classified as "Sewage Sludge/Organic Waste Composting Facilities."

Zoning Requirements:

The land use regulations for commercial and non-commercial composting operations are summarized as follows.

- **"Sewage Sludge/Organic Waste Composting Facilities"**
  - Conditional Use Permit
    - M-R (Mineral resource Zone)
    - M-R-A (Mineral resources and Related Manufacturing Zone)
    - A-2 (Heavy Agricultural Zone)
- Not Permitted
  - All other residential, commercial, manufacturing, agricultural, industrial, and miscellaneous zones.

Mono County[55]

Zoning Definitions:

- Non-commercial composting - a composting operation that does not create a nuisance problem and has less than 100 cubic yards of material on site at any given time.
- Commercial composting - any operation that has over 100 cubic years at a given time.

Zoning Requirements:

- **"Non-commercial composting"**
  - Permitted Uses:
    - AG – Agriculture (Non-commercial)
    - PF – Public and Quali-Public Facilities (Non-commercial)
    - RM – Resource Management (Non-commercial)
- **"Commercial composting"**
  - Use Permit:
    - AG – Agriculture (Commercial)
    - PF – Public and Quali-Public Facilities (Commercial)

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[54] Chapter 17.113 - M-R MINERAL RESOURCES ZONE* | Code of Ordinances | Riverside County, CA | Municode Library

[55] https://www.monocounty.ca.gov/sites/default/files/fileattachments/planning_division/page/9617/2023_land_use_element_final_.pdf

- RM – Resource Management (Commercial)

San Diego County[56]

Zoning Definitions:

16. Organic Materials Processing — operations that include but are not limited to static piles, windrow, in-vessel, vermicomposting, and mushroom farming.
17. Community Garden Composting — This type of composting is small in scale (20 cubic yards maximum) and is meant to facilitate composting on the neighborhood level. Community composting is not commercial and can occur within residential and agricultural settings.
18. Commercial Composting Operations — refers to the organic material processing as a primary use for commercial scale operations to divert organic materials from landfills (Must not exceed 100 cubic yards).
19. Large Commercial Organic Materials Processing — refers to the organic material processing as a primary use for commercial scale operations to divert organic materials from landfills (greater than 100 cubic yards).

Zoning Requirements:

- **"Organic Materials Processing"**
  - Agricultural Operations where feedstock was derived onsite.
    - Use permitting in any zones where agricultural operations are permitted.
  - Agricultural Operations where feedstock was derived offsite.
    - Permitted subject to the provisions of Section 6977 of San Diego Municipal Code
      - A70 – Limited Agriculture
      - A72 – General Agriculture
      - C37 – Heavy Commercial
      - C38 – Service Commercial
      - C40 – Rural Commercial
      - S88 – Specific Plan Area
      - S90 – Holding Area
      - All Industrial Zones
- **"Community Garden Composting"** (Must not exceed 20 cubic yards)
  - No Permit Required
  - Any site where active agricultural operation is present.
  - All Residential Zones
- **"Commercial Composting Operations"**
  - Permitted Primary Use (Must not exceed 100 cubic yards)

[56] https://www.sandiegocounty.gov/content/sdc/pds/zoning.html

        - A70 – Limited Agriculture
        - A72 – General Agriculture
        - C37 – Heavy Commercial
        - C38 – Service Commercial
        - C40 – Rural Commercial
        - All Industrial Zones
        - S80 – Open Space
        - S82 – Extractive
        - S86 – Parking
        - S88 – Specific Plan Area
        - S90 – Holding Area
        - S92 – General Rural
        - S94 – Transportation & Utility Corridor
- **"Large Commercial Organic Materials Processing"**
    - Major Use Permit
        - M58 – High Impact Industrial
        - A72 – General Agriculture
        - S92 – General Rural

Cities

City of Ukiah[57]

General Definitions:

20. Community composting — means any activity that composts green material, agricultural material, food material, and vegetative food material, alone or in combination, and the total amount of feedstock and compost on site at any one time does not exceed one hundred (100) cubic yards and seven hundred fifty (750) square feet, as specified in 14 CCR Section 17855(a)(4); or as otherwise defined by 14 CCR Section 18982(a)(8).

Zoning Definitions:

21. Composting — A controlled microbial degradation of organic waste yielding a humus-like product of potential value as a soil conditioner.

22. Recycling Facility — A facility where recyclable material is collected, processed, packaged, stored, and shipped/trucked off the site.

23. Solid Waste Facility — Any structure, other appurtenances, and improvements on the land, and all contiguous land, used for the treatment, transfer, storage, disposal, or recycling of solid waste.

24. Utility Service (Major) — Generating plants, electrical switching facilities and primary substations, refuse collection or disposal facilities, water and wastewater treatment

[57] https://www.codepublishing.com/CA/Ukiah/#!/html/Ukiah05/Ukiah0504-0100.html

plants, and similar facilities of public agencies or public utility firms having potentially significant impact on surrounding uses.

Zoning Requirements:

- **"Refuse disposal/recycling areas and refuse transfer stations and similar uses."**
  - Permitted use:
    - PF (Public Facilities)
- **"Production of agricultural commodities for commercial purposes"**
  - Permitted use:
    - A-E (Agricultural Exclusive)
- **"Recycling Facility"**
  - Permitted use:
    - C-2 (Heavy Commercial)

City of Sacramento[58]

Zoning Definitions:

25. Recycling facility — minor, major, green waste - means a facility for the acceptance of recyclable materials from the general public, other recycling facilities, local government agencies, and other business enterprises. The facility is used for the collection, short-term storage, processing, and transfer of recycled materials having a residual solid waste of 10% or less of non-putrescent material requiring transport to a landfill. A recycling facility may use portable or permanent equipment to chip, crush, grind, or process recyclable waste products. The categories of recycling facilities used by this title are:

    - Minor recycling facility - a recycling facility that is not a major recycling facility and is not a convenience recycling facility. A minor facility cannot accept green waste.
    - Major recycling facility - a facility with an operation involving 50 tons or more of material per day; or that includes on-site stockpiled material of 5,000 tons or more; or that includes more than 50 truck trips per day; or with a site area that exceeds three acres. A major facility cannot accept green waste.
    - Green waste facility - a facility that accepts garden, wood, and other organic waste to reprocess into compost, wood chips, or other products. "Chip and ship" or "chip and grind" facilities are included in this type of facility. Such a facility must meet the criteria and standards listed in chapter 17.228. Facilities which receive green waste (garden, wood, or other organic waste) for shipment to another facility for reprocessing or composting are included in this type of facility. Such a facility may use power-driven processing equipment.

[58] https://library.qcode.us/lib/sacramento_ca/pub/city_code/search_results

Zoning Requirements:

- **"Green Waste Facility"**
  - Conditional Use Permit:
    - Requires zoning administrator conditional use permit:
      - C-4 (Heavy Commercial)
      - M-1 (Light Industrial)
      - M-2 (Heavy Industrial)
      - M-1(S) (Light Industrial)
      - M-2(S) (Heavy Industrial)
      - M-T (Industrial and Transit-area Zone)
    - Requires planning and design commission conditional use permit:
      - A (Agriculture)

City of Alameda[59]

General Definitions:

26. Community composting — any activity that composts green material, agricultural material, food material, and vegetative food material, alone or in combination, and the total amount of feedstock and compost on-site at any one (1) time does not exceed one hundred (100) cubic yards and 750 square feet, as specified in 14 CCR Section 17855(a)(4); or, as otherwise defined by 14 CCR Section 18982(a)(8).

27. Composting or compost (or any variation thereof) — includes a controlled biological decomposition of organic materials yielding a safe and nuisance free compost product.

28. "Facilities, operations, and activities that recover organic waste" are referred to as "Compost facilities, in-vessel digestion facilities, and publicly owned treatment works."

29. 21-4 - REQUIREMENTS FOR FACILITY OPERATORS AND COMMUNITY COMPOSTING OPERATIONS.

    - Owners of facilities, operations, and activities that recover organic waste, including, but not limited to, compost facilities, in-vessel digestion facilities, and publicly-owned treatment works shall, upon request from the WMA, provide within sixty (60) days information regarding available and potential new or expanded capacity at their facilities, operations, and activities, including information about throughput and permitted capacity necessary for planning purposes.

Zoning Requirements:

[59] https://library.municode.com/ca/alameda/codes/code_of_ordinances?nodeId=CHXXISOWARE

30. **“Sale of agricultural products produced on the premises, provided that no permanent commercial structure for such purpose shall be permitted.”**

    - Permitted Use**:**
        - A - Agricultural Combining District

City of San Jose[60]

General Definitions:

31. High Diversion Organic Waste Processing Facility — a facility that is in compliance with the reporting requirements of 14 CCR Section 18815.5(d) and meets or exceeds an annual average Mixed Waste organic content Recovery rate of fifty percent (50%) between January 1, 2022 and December 31, 2024, and seventy-five percent (75%) after January 1, 2025, as calculated pursuant to 14 CCR Section 18815.5(e) for Organic Material received from the "Mixed Waste Organic Collection Stream" as defined in 14 CCR Section 17402(a)(11.5); or, as otherwise defined in 14 CCR Section 18982(a)(33).
32. Solid waste disposal facility — a facility or site where final disposal of solid waste occurs, and such facility or location meets all of the following requirements.
    - A. The facility or site is designated as a disposal site in the Integrated Waste Management Plan for Santa Clara County; and
    - B. The facility or site is operating pursuant to a solid waste facility permit issued pursuant to Chapter 3 of Part 4 of Division 30 of the California Public Resources Code; and
    - C. The facility or site is in conformance with all applicable state, federal and local laws and regulations including without limitation the applicable provisions of the San José Zoning Code contained in San José Municipal Code, Title 20, and all permits issued pursuant to said Title 20.

Zoning Definitions:

33. Commercial composting facility — a facility where waste organic matter, including leaves, brush, and other organic waste, decomposes in a controlled environment and is processed for reuse.
    - No specific zoning districts and uses tied to this.
34. Processing facility — a facility that involves methods such as sorting, compacting, flattening, baling, shredding, grinding, or crushing of recyclable material. Processing can also include the processing of collected recyclable materials into aggregate, building materials and other products. Processing may also involve composting and

60 https://library.municode.com/ca/san_jose/codes/code_of_ordinances?nodeId=TIT20ZO_CH20.80SPUSRE_PT13REFA_20.80.1100PERE

the decomposing of organic matter, including leaves, brush, wood waste and other organic waste in a controlled environment for reuse.

Zoning Requirements:

- **"Processing facility"**
  - Conditional Use Permit:
    - IP (Industrial Park)
  - Special Use Permit:
    - LI (Light Industrial)
    - HI (Heavy Industrial)

Other Siting Information:

- Part 13 RECYCLING FACILITIES[17]
  - Composting facilities.
    - Setbacks of all outdoor uses including, but not limited to, compost heaps and structures, shall be those provided for in the zoning district in which the composting facility is located, but shall not be less than 25 feet;
    - A landscape strip of at least fifteen feet in width shall be provided along all property lines;
    - Noise levels of composting facility operations shall not exceed 55 dBA as measured at the property line of residentially zoned or occupied property, or otherwise shall not exceed 70 dBA as measured at all other adjacent property lines of the site;
    - Sign criteria shall be those provided for in the zoning district in which the composting facility is located;
    - Sufficient water shall be available on site to put out any fire which may occur;
    - The stockpiling of composted material, and the composting and processing of such material, shall be accomplished in a manner which will protect the health and safety of all composting facility employees;
    - Composting facilities where mixed waste is composted shall be enclosed by a solid wood or masonry fence. Sufficient slope shall be provided to allow the drainage of all water; and
    - All composting facilities shall be maintained in a manner that repels and keeps away flies, vermin, birds and rodents (i.e., free of pests) and shall not constitute a nuisance in terms of odor or dust.

City of Fresno[61]

General Definitions:

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61 https://library.municode.com/ca/fresno/codes/code_of_ordinances?nodeId=MUCOFR_CH15CIDECOINRE_PTIIIREAPSOALDI_ART27STSPUSAC_S15-2720COGAURFA

35. Solid Waste Facility — shall be defined as found in California Public Resources Code section 40194, as amended: “Includes a solid waste transfer or processing station, a composting facility, a gasification facility, a transformation facility, an EMSW conversion facility, and a disposal facility.”

36. Certified Recycling Facility — a recycling, composting, materials recovery or re-use facility that is fully licensed, certified and eligible under federal, state and local laws and regulations. The Director shall maintain a listing of Certified Recycling Facilities.

Zoning Definitions:

37. Recycling Facility — A facility for receiving, temporarily storing, transferring and/or processing materials for recycling, reuse, or final disposal. This use classification does not include facilities that deal with animal matter, nor does it include waste transfer facilities that operate as materials recovery, recycling, and solid waste transfer operations, which are classified as utilities.

38. Community Garden — Use of land for and limited to the cultivation and tillage of soil for the production, growing, and harvesting of any agricultural, floricultural, or horticultural commodity.

39. Utilities, Major — Generating plants; electric substations; solid waste collection, including transfer stations and materials recovery facilities; solid waste treatment and disposal; water or wastewater treatment plants; and similar facilities of public agencies or public utilities.

Zoning Requirements:

- **“Recycling Facility”**
  - Conditional Use Permit:
    - Employment District (E):
      - IL (Light industrial)
      - IH (Heavy industrial)
      - PSP (Public and Semi- Public Districts)
      - PI (Public and Institutional)
- **“Utilities, Major”**
  - Permitted use:
    - Employment District (E):
      - IL (Light industrial)
      - IH (Heavy industrial)
      - PSP (Public and Semi- Public Districts)
      - PI (Public and Institutional)
  - Conditional Use Permit:
    - B (Buffer District)
    - E (Employment District)
      - RBP (Regional Business Park)
      - PSP (Public and Semi- Public Districts)
      - OS (Open Space)

- Downtown Districts
  - DTN (Downtown Neighborhood) – Activity Class B and C
  - DTG (Downtown General) – Activity Class B and C
  - DTC (Downtown Core) – Activity Class B and C

Other Information:

- Recycling Processing Facility:
  - Minimum Lot Size. Three acres.
  - Location. Facilities shall not about a residential district or use and shall have direct access to a Major Street that is properly designated to accommodate the type of traffic that will be generated by the facility.
  - Screening. The facility shall be screened from public rights-of-way, by a Screening Wall, per 15-2008-C, or within an enclosed structure. Frontage landscaping (a minimum of 10 feet) is required.
  - Pavement. The area used for recycling, parking, and/or storage shall be paved per Public Works Standards for parking lots.
  - Outdoor Storage. Exterior storage of material shall be in sturdy containers or enclosures that are secured and maintained in good condition. Storage shall not be visible above the height of the required Screen Wall.
    - Exterior storage of materials, other than baled material, shall be in sturdy containers or enclosures which are covered, secured, and maintained in good condition.
    - Outdoor storage shall comply with the Fire Code for pile size, fire apparatus access, and fire hydrant protection.
  - Identification. Facilities shall be clearly marked with the name and phone number of the facility operator and hours of operation.
  - Processing. Processing facilities are limited to baling, briquetting, crushing, compacting, grinding, shredding, and sorting of source-separated recyclable and reusable materials.
  - Noise. Shall comply with all applicable Noise standards.
  - Fluids. A processing facility may accept used motor oil and/or used oil filters for recycling from the generator in accordance with Government Code 25250.11 of the California Health and Safety Code. All storage of used motor oil and/or used oil filters must be within a containment apparatus capable of containing all stored oil in the event of a spill or leak. No containment apparatus shall exceed a capacity greater than 55 gallons. All used motor oil and/or used oil filter storage containers shall be located on an approved surface.
  - Batteries. A processing facility may accept used lead-acid batteries in accordance with Government Code 25215.1 of the California Health and Safety Code Section 25215.1. All batteries must be stored inside an enclosed building.

    - Hours of Operation. If the facility is within 500 feet of a Residential District, or an existing home, it may not operate between the hours of 7 p.m. and 7 a.m.
    - Personnel. The facility shall be administered by on-site personnel during the hours the facility is open,
    - Maintenance. If CRV materials are accepted, compliance with the Site Maintenance and Operational Requirements of Subsection 15-2750-B.19 is required.
- Ordinance regarding public health and safety at solid waste facilities (whole ordinance is about their facility permit)[62]:
    - Increased zoning/permitting requirements and enforcement for solid waste facilities due to fire risk.
    - This whole ordinance is another level of permitting unique to this city.
- Composting
    - Composting is allowed as a minor accessory use to the site.
    - Composting must be done within a sealable container and may only consist of materials generated on-site.
    - The container must be setback at least three feet from property lines.
    - Composting must not lead to runoff of contaminated water nor expose adjacent properties to adverse noise, odors, pests, etc.

City of Los Angeles[63]

General Definitions:

40. Windrow composting — The process in which compostable material is placed in elongated piles or windrows which are mechanically turned or aerated to encourage decomposition and to reduce odors.

Zoning Definitions:

41. Composting Facility — Any facility which processes source-separated organic materials to a stabilized state through controlled biological decomposition where the resultant material is beneficial to plant growth or soil structure when used as a soil amendment. Materials may initially be chipped, shredded, and/or screened on site prior to being composted. Composting may be conducted in an in-vessel system or in the open, such as windrow composting or aerated static pile composting. This definition shall not include any composting of green waste and/or wood waste conducted for noncommercial, nonprofit purpose.

42. Chipping and Grinding Facility — Any facility which temporarily stores and/or processes source-separated green waste and/or wood waste by means of chipping,

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[62] https://library.municode.com/ca/fresno/codes/code_of_ordinances?nodeId=MUCOFR_CH10REREPUNUREPRCOUS_ART4SOWAREFAOR

[63] https://codelibrary.amlegal.com/codes/los_angeles/latest/lamc/0-0-0-109065

grinding, mixing and/or screening to produce a material of varying particle size. The material produced by the above-described processes may be used as ground cover, biofuel, wood chips, animal bedding, worm food or other similar uses. This definition shall not include any chipping and/or grinding of green waste and/or wood waste conducted for noncommercial, nonprofit purpose.

Zoning Requirements:

- **"Composting and mulching facilities"**
  - Permitted Use:
    - M2 (Light industrial zone)
      - Includes chipping and grinding facilities when enclosed in a building.
- Other permits needed:
  - Compostable Materials Handling Facility Permit
  - Tiers:
    - Class 1 - Enforcement Agency Notification
    - Class 2 - Registration Permit
    - Class 3 - Full Solid Waste Facility Permit.

Other Information:

- Community and Market Gardens:
  - Composting. Composting is limited to the materials generated on-site and must be used on-site. Composting shall be located outside of required setbacks and shall be screened pursuant to Section 30.15.120, Screening.
  - Setbacks. Buildings, structures, and composting associated with community and market gardens shall comply with the residential setbacks when located in a residential zone and nonresidential setbacks when located in a nonresidential zone.

City of Bishop[64]

- No definitions

Zoning Requirements:

- **"Processing of natural resource products"**
  - No definition available
  - Permitted use:
    - M-1 (General Industrial)

64 https://library.municode.com/ca/bishop/codes/code_of_ordinances?nodeId=COOR_TIT17ZO_CH17.86MIWADE_17.86.060PEPR

City of Riverside[65]

General Definitions:

43. Organics recycling — the process of collecting, sorting and treating designated organic recyclable materials and/or designated green materials that would have otherwise become solid waste and returning them to a safe, nuisance-free compost product by treating the materials to a controlled biological decomposition.

Zoning Definitions:

44. Recycling facility — those facilities or operations that receive, process, and transfer to market recyclable materials or organic recyclable materials that have been source separated from the solid waste stream.

Zoning Requirements:

- **"Recycling Center — Solid Waste Transfer Stations and Material Recovery Facilities (MRF)"**
  - Conditional Use:
    - I (General Industrial)

City of San Diego[66]

Zoning Definitions:

45. Green materials composting facilities — centers that produce a humus-like material under a process of managed biological decomposition from green materials, leaves, tree trimmings, untreated wood, shrubbery cuttings, or other plant matter that has been source-separated from the municipal solid waste stream.

46. Mixed organics composting facilities — centers that produce a humus-like material under a process of managed biological decomposition from green materials, leaves, tree trimmings, untreated wood, shrubbery cuttings, kelp, other plant material, manure, or urea that has been source-separated from the municipal solid waste stream.

Zoning Requirements:

- All separately regulated commercial services uses.
- **"Green Materials Composting Facility"**
  - Limited Use permit:
    - AG (Agricultural General)
      - Neighborhood Use Permit:

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65 https://library.municode.com/ca/riverside/codes/code_of_ordinances?nodeId=PTIICOOR_TIT6HESA_CH6.06BUMUSOWAREORRE

66 https://docs.sandiego.gov/municode/MuniCodeChapter13/Ch13Art01Division03.pdf

        - AR (Agricultural Residential)
        - IL1 (Industrial Light)
        - IL3 (Industrial Light)
        - IH1 (Industrial Heavy)
        - IH2 (Industrial Heavy)
        - IBT (International Business and Trade)
- **"Mixed Organic Composting Facility"**
    - Conditional Use Permit:
        - AR (Agricultural Residential)
        - AG (Agricultural General)
        - IL1 (Industrial Light)
        - IL3 (Industrial Light)
        - IBT (International Business and Trade)
            - Neighborhood Use Permit:
                - IH1 (Industrial Heavy)
                - IH2 (Industrial Heavy)

City of Santa Barbara[67]

Zoning Definitions:

47. Recycling Collection Facility — A center for the acceptance, by donation, redemption, or purchase, of recyclable materials from the public where limited processing and storing of such items is conducted on-site.

48. Public Works and Utilities — Generating plants, electric substations, solid waste collection, including transfer stations and materials recovery facilities, solid waste treatment and disposal, water or wastewater treatment plants, corporation yards, equipment service centers, and similar facilities that primarily provide maintenance and repair services, storage facilities for vehicles and equipment, and similar facilities of public agencies or public utilities. This classification includes onsite or offsite ancillary offices associated with a principal use located in the same zone district.

Zoning Requirements:

- **"Recycling Collection Facility"**
    - Administrative Use Permit:
        - M-C (Manufacturing Commercial)
        - M-I (Manufacturing Industrial)
- **"Public Works and Utilities"**
    - Conditional Use Permit:
        - M-C (Manufacturing Commercial)
        - M-I (Manufacturing Industrial)

[67] https://library.qcode.us/lib/santa_barbara_ca/pub/municipal_code/item/title_30-division_iii-chapter_30_185?view=all#title_30-division_iii-chapter_30_185-30_185_340

- CO-MI (Coastal Manufacturing Industrial)

City of Ontario[68]

Zoning Definitions:

49. Community Gardens — include small-scale crop production and farming by individuals on multiple plots, or food and/or ornamental crop production on larger plots, which is maintained and grown by volunteers or community groups as a form of recreation, education, and/or community charity.
50. Urban Farms — smaller-scale private farming operations in which plants and their products are grown and sold (on-site and/or off-site) for profit.
51. Waste treatment and disposal — Other nonhazardous waste treatment and disposal (limited to composting facilities and anaerobic digestion; excludes fertilizer and manufacturing)

Zoning Requirements:

- **"Waste treatment and disposal"**
  - Conditional Use Permit:
    - IH (Heavy Industrial)
    - AG (Agriculture)
- **"Community Gardens"**
  - Administrative Use Permit for all zoning districts.

Other Information:

- The on-site composting of site-generated refuse is prohibited for Commercial Crop Production and Farming.
  - Commercial Crop Production and Farming is a use in which plants and their products are grown for sale, intended for widespread distribution to wholesalers or retail outlets. Commercial Crop Production and Farming includes oilseed and grain farming; vegetable and melon farming; fruit and tree nut farming; greenhouse, nursery and floriculture production; and other crop farming.
- Community Gardens — Community Gardens include small-scale crop production and farming by individuals on multiple plots, or food and/or ornamental crop production on larger plots, which is maintained and grown by volunteers or community groups as a form of recreation, education, and/or community charity. (Note: To ensure the sustainability of a Community Garden, up to 49% of the Community Garden may consist of an Urban Farm established in compliance with Subsection F (Urban Farm) of this Section).

[68] https://www.ontarioca.gov/sites/default/files/Ontario-Files/Planning/Documents/chapter_5.0_-_zoning_and_land_use_20180501.pdf

- Composting. The composting of site-generated refuse is an excellent method for providing sustainable fertilization of Community Gardens. Materials from off-site sources shall be limited to green waste (no manure from off-site sources shall be used for composting purposes). Facilities that choose to engage in composting shall provide a Composting Plan with their Administrative Use Permit application (required pursuant to Subparagraph E.2.a (General Provisions) of this Section), and shall comply with each of the following standards:
  - (1) A compost pile and composting facilities shall be located at least 20 FT from any interior property line and shall not be located within any front or street side yard setback area.
  - (2) A compost pile shall be located at least 50 feet from any habitable structure.
  - (3) A compost pile and composting facilities shall be screened and/ or hidden from public view and shall not exceed 5 feet in height.
  - (4) Composting activities shall be conducted in a manner that does not create a nuisance (generation of noise, odors, insects, etc.) nor impact the public health, safety or welfare of the area surrounding the Community Garden, and/or Community Garden participants.
  - (5) The scale of the composting activity shall be consistent with the fertilizer requirements for the Community Garden the composting activity is intended to serve.

- Urban Farms — Urban Farms are smaller-scale private farming operations in which plants and their products are grown and sold (on-site and/or off-site) for profit. Urban Farms include, but are not limited to, strawberry fields, flower and vegetable raising orchards, and vineyards. Additionally, Urban Farms may include items grown or produced as an ancillary activity to established land uses, such as, but not limited to, food service uses, including restaurants and special food services. Items not grown or produced on-site shall not be sold on-site, except in conjunction with an allowed retail store. (Note: An Urban Farm may be established and operated ancillary to a Community Garden pursuant to Subsection E (Community Gardens) of this Section).
  - Composting. The composting of site-generated refuse is an excellent method for providing sustainable fertilization of Urban Farms. Facilities that choose to engage in composting shall provide a Composting Plan with their Administrative Use Permit application (required pursuant to Subparagraph F.2.a (General Provisions) of this Section) and shall comply with the composting standards set forth in the “Community Gardens” requirements (see Subparagraphs E.2.c(1) through (5) of this Section).
- Waste Treatment and Disposal — Composting and Anaerobic Digestion Facilities. The following standards shall govern the establishment and operation of composting and anaerobic digestion facilities:

- Any new Dairy for which a Conditional Use Permit is required, shall not be located within 100 FT, as measured in a straight line from any point along the outer boundaries of the property or lease space containing the use, to any residentially zoned property or sensitive land use, including hospitals and other healthcare facilities; senior citizen care facilities; preschools; daycare facilities; public or private elementary, middle (junior high) or high schools; public parks; recreation centers; sports parks; or any similar facility where minors (persons under 18 years of age) regularly congregate.
- A Manure Only Composting Facility shall not be located within 0.25-mile, as measured in a straight line from any point along the outer boundaries of the property or lease space containing the use, to any residentially zoned property or sensitive land use, including hospitals and other healthcare facilities; senior citizen care facilities; preschools; daycare facilities; public or private elementary, middle (junior high) or high schools; public parks; recreation centers; sports parks; or any similar facility where minors (persons under 18 years of age) regularly congregate. A Green Waste or combination Green Waste and Manure Composting Facility shall not be located within 0.50 mile, as measured in a straight line from any point along the outer boundaries Division 5.03 — Standards for Certain Land Uses, Activities and Facilities Ontario Development Code Page 5.03-121 (Rev. 20170606) of the property or lease space containing the use, to any residentially zoned property or sensitive land use, including hospitals and other healthcare facilities; senior citizen care facilities; preschools; daycare facilities; public or private elementary, middle (junior high) or high schools; public parks; recreation centers; sports parks; or any similar facility where minors (persons under 18 years of age) regularly congregate.
- A 100-foot setback shall be maintained between a project's perimeter property line and any material being composted or anaerobic digester on the project site.
- A Conditional Use Permit application for a Composting or Anaerobic Digestion Facility shall be submitted with a traffic study, which analyzes the impacts of project generated truck traffic on traffic from residential development in the area and the surrounding roadway system and recommends measures to mitigate identified impacts to a level of nonsignificance and appropriate routes to freeways.
- The following shall be considered for inclusion as conditions of approval, as appropriate, for any Composting or Anaerobic Digestion Facility requiring Conditional Use Permit approval:
  - Maintain good air flow through the compost material;
  - Turn compost based on temperature, not a schedule;
  - Restrict material movement to times when the potential for winds are low and general population is least (i.e., when people are indoors or away from their homes, and not on weekends);

- Minimize disturbance of dusty areas by equipment;
- Minimize dust by adding moisture to material when moving or turning, and regularly water dirt roadways, dry material and unused areas;
- Berms (defined as earthen mounds constructed along the perimeter of a composting site to minimize sight into the property and reduce debris from blowing off-site) shall be maximum 15 feet in height, and in no case higher than the allowed material rows;
- Berms shall be set back minimum 10 feet behind a street property line and minimum 5 feet from all other property lines, or one-half the height of the berm, whichever is greater;
- Berms shall be comprised primarily of soil and shall have a slope not to exceed a 2:1 ratio (horizontal to vertical (h:v). Berms can be as steep as 1.5:1, if properly evaluated, with appropriate calculations, by the city engineer; and
- The surface of the outside portions of the slopes (facing a public street) should have properly installed and maintained landscaping or hydro seeding with jute matting to prevent erosion or sloughing.

City of Redding[69]

General Definitions:

52. Organic waste — solid waste including but not limited to food, green material, landscape and pruning waste, organic textiles and carpets, lumber, nonhazardous wood, paper products, printing and writing paper, manure, biosolids, digestate, and sludges.

Zoning Definitions:

53. Utilities, Major — Generating plants, electric substations, solid waste collection, including transfer stations and materials recovery (recycling processing) facilities, solid waste treatment and disposal, water or wastewater treatment plants and similar facilities of public agencies or public utilities.

Zoning Requirements:

- **"Utilities, Major"**
  - Permitted use (P):
    - GI (General Industry)
    - HI (Heavy Industry)
  - Use Permit (U):
    - PF (Public Facilities)
    - HC (Heavy Commercial)
    - RC (Regional Commercial)

[69] https://library.municode.com/ca/redding/codes/code_of_ordinances?nodeId=TIT9HESA_CH9.28SOWARE

- GC (General Commercial)
- GO (General Office)
- RL (Rural Lands)

Other Information:

54. How to apply for a use permit[70]

[70] https://library.municode.com/ca/redding/codes/code_of_ordinances?nodeId=TIT18ZO_DIVIIAD_CH18.14USPE_18.14.040AP

Appendix B
Air District Survey

B. Air District Survey for Small and Medium Composting Activities

Date: Tuesday, March 12, 2024

Project: CalRecycle (contract DRR23044): Small and Medium Composting Project Permitting

Introduction:

On behalf of CalRecycle contract DRR23044 Small and Medium Composting Project Permitting, we are soliciting your feedback on a short survey to better understand the permitting requirements for **small and medium** composting activities.
For the purposes of this study, we are defining small and medium composting activities as follows:

- Small composting activities have up to 5,000 cubic yards of material on-site at any given time
- Medium composting activities have up to 12,500 cubic yards of material on-site at any given time
- Both small and/or medium composting activities meet the following specifications:
    - Feedstocks include one or more of the following: agricultural material, green material, food material, and vegetative food material.
    - Operate in compliance with Environmental Health Standards as described in 14 CCR, Division 7, Chapter 3.1, Article 7, including:
        - Maximum metal concentrations and pathogen reduction pursuant to Title 14 Section 17868.3 and Section 17868.2
        - Physical contamination limits pursuant to Title 14 Section 17868.3.1
    - Utilize a covered aerated static pile (ASP) or equivalent system.
        - For the purpose of defining what is an equivalent system to ASP, it would be a composting system/technology that provides the same or similar level of efficacy with regard to:
            - Compliance with the composting operating standards (i.e. odors, noise, vectors, etc.) pursuant to (14 CCR Section 17867).
            - Protection from potential harm to public health and safety, and the environment.
            - Time and resources.

Survey:

1. Do you have any **small and/or medium** composting activities/facilities in your air district?
    - Yes or No: _____

- Total number of operations: _____
  - Number of small composting activities: _____
  - Number of medium composting activities:_____
- What number use covered aerated static pile (CASP) systems: _____
- What number use a composting technology that may be equivalent to CASP? _____
  - Are these:
    - In-vessel? _____
    - Within a fully-enclosed building? _____
    - Other: _____

2. What is the process to get a small composting activity approved in your air district?
   - Assume the composting activity uses a covered aerated static pile (CASP) system or equivalent system, which meets Best Available Control Technology requirements.
     - If they only accept green material

       _____
       _____
       _____
       _____
       _____

     - If they only accept agricultural material

       _____
       _____
       _____
       _____
       _____

     - If they accept green and food material

       _____
       _____
       _____
       _____
       _____

       - Would CEQA compliance most likely be required? Yes or No:

         _____
         - Would it be required to be performed by the lead agency or by the Air District?
       - Would a Health Risk Assessment most likely be required (by air district)?
3. What is the process to get a medium composting activity approved in your air district?
   - Is the process for a medium composting activity the same as a small composting facility? (Yes or No, if Yes, skip to Question #4):

     _____

- Assume the composting activity uses a covered aerated static pile (CASP) system or equivalent system, which meets Best Available Control Technology requirements.
  - If they only accept green material

    _____
    _____
    _____
    _____
    _____

  - If they only accept agricultural material

    _____
    _____
    _____
    _____
    _____

  - If they accept green and food material

    _____
    _____
    _____
    _____
    _____

    - Would CEQA compliance most likely be required? Yes or No:

      _____
      - Would it be required to be performed by the lead agency or by the air district?

        _____
    - Would a Health Risk Assessment most likely be required (by air district)?

4. What composting activities are exempt from your air district rules?_____
   _____
   _____
   _____
   _____
5. What is the trigger threshold to require emission reduction credits for a project in your district?

   _____
   _____
   _____
6. What are your permit application fees (initial and annual)?

   _____
   _____
   _____
7. Do you have any comments as it relates to the permitting opportunities and challenges for small and medium composting facilities?

Appendix C

Regional Water Quality Control Board Survey

C. Water Board Survey for Small and Medium Composting Activities

Date: Tuesday, March 12, 2024

Project: CalRecycle (Contract DRR23044): Small and Medium Composting Project Permitting

Introduction:

On behalf of CalRecycle (contract DRR23044) Small and Medium Composting Project Permitting, we are soliciting your feedback on a short survey to better understand the permitting requirements for **small and medium** composting activities.
For the purposes of this study, we are defining small and medium composting activities as follows:

- Small composting activities have up to 5,000 cubic yards of material on-site at any given time
- Medium composting activities have up to 12,500 cubic yards of material on-site at any given time
- Both small and/or medium composting activities:
  - Feedstocks include one or more of the following: agricultural material, green material, food material, and vegetative food material.
  - Operate in compliance with Environmental Health Standards as described in 14 CCR, Division 7, Chapter 3.1, Article 7, including:
    - Maximum metal concentrations and pathogen reduction pursuant to Title 14 Section 17868.3 and Section 17868.2
    - Physical contamination limits pursuant to Title 14 Section 17868.3.1
      - Utilize a covered aerated static pile (CASP) or equivalent system.
        - For the purpose of defining what is an equivalent system to CASP, it would be a composting system/technology that provides the same or similar level of efficacy with regard to:
          - Compliance with the composting operating standards (i.e. odors, noise, vectors, etc.) pursuant to (14 CCR Section 17867).
          - Protection from potential harm to public health and safety, and the environment.
          - Time and resources.

Survey:

1. Do you have any **small and/or medium** composting activities/facilities in your region?
   - Yes or No: _____
   - Total number of operations: _____

- Number of small composting activities: _____
- Number of medium composting activities:_____
  - What number use covered aerated static pile (CASP) systems: _____
  - What number use a composting technology that may be equivalent to CASP? _____
    - Are these:
      - In-vessel? _____
      - Within a fully-enclosed building? _____
      - Other: _____

2. Are they a Tier 1 or Tier 2 facility under the Compost General Order?
   - Do you have a list of or number of facilities that are exempt from the Compost General Order?
3. Compost General Order
   - What is the process to get a small composting activity approved in your water board region?
     - Assume the composting activity uses a covered aerated static pile (CASP) system or equivalent.
     - If they only accept green material

       _____
       _____
       _____
       _____
       _____

     - If they only accept agricultural material

       _____
       _____
       _____
       _____
       _____

     - If they accept green and food material

       _____
       _____
       _____
       _____
       _____

     - Would CEQA compliance most likely be required? Yes or No: _____
       - Would it be required to be performed by the lead agency or by the Water Board? _____
   - What is the process to get a medium composting activity approved in your water board region?
     - Is the process for a medium composting activity the same as a small composting facility? (Yes or No, if Yes, skip to Question #4): _____

- Assume the composting activity uses a covered aerated static pile (CASP) system or equivalent.
  - If they only accept green material

    _____
    _____
    _____
    _____
    _____

  - If they only accept agricultural material

    _____
    _____
    _____
    _____
    _____

  - If they accept green and food material

    _____
    _____
    _____
    _____
    _____

  - Would CEQA compliance most likely be required? Yes or No: _____
    - Would it be required to be performed by the lead agency or by the Water Board?

      _____

4. Construction General Permit
   - What is the process to get a small and/or medium composting activity approved for this permit?

     _____
     _____
     _____
     _____
     _____

   - What activities are exempt from this permit?

     _____
     _____
     _____
     _____
     _____

5. Industrial General Permit
   - What is the process to get a small and/or medium composting activity approved for this permit? _____
     _____
     _____

_____
_____

- What activities are exempt from this permit?

_____
_____
_____
_____
_____

6. What are your permit application fees (initial and annual)?

_____
_____
_____
_____
_____

7. Do you have any comments as it relates to the permitting opportunities and challenges for small and medium composting facilities?

_____
_____
_____
_____
_____
_____
_____

Appendix D
Summary of Permitting Recommendations

D. Summary of Permitting

Summary of Composting Activity Permitting Agencies and Recommendations

Approval	Regulatory Agency	Description	Recommendations
Land Use and CEQA			
Land Use Approval	Local Land Use Authority	CUP, Zoning Administrator, or other similar approval.	• Review property zoning designation and correspondence with the municipal code to assess permitting pathway; • Download and review application forms to understand local permitting requested information; • Facilitate a pre-application meeting with the planning department; • Engage elected officials and key stakeholders to garner project support.
California Environmental Quality Act (CEQA)	Local Land Use Authority	Review of potential environmental impacts and identification of project mitigation measures, as applicable.	• Perform a siting suitability analysis to determine the composting activity's compatibility with the surrounding land uses; • Identify potential environmental impacts to design project components to mitigate to a lesser than significant impact; • Identify key special studies that are likely required. For composting projects, these typically include: air quality, traffic, hydrology/water quality, and cultural resources;

			• Engage elected officials and key stakeholders to garner project support.
Local Enforcement Agency Permits and Notifications			
Excluded Tier	Local Enforcement Agency		• Reach out to the Local Enforcement Agency early in the process for initial permit or approval, or any other proposed operational change; • Prepare and implement an Odor Impact Minimization Plan; • Prepare and implement a vector control plan, and mitigation against other potential public nuisance; • Maintain appropriate recordkeeping to verify the composting activity's on-site cubic yard capacity and annual tonnage throughput.
EA Notification Tier or "EA Notification"	Local Enforcement Agency		
Registration Tier	Local Enforcement Agency		
Full Solid Waste Facility Permit (SWFP)	Local Enforcement Agency and CalRecycle	For larger composting facilities and those processing nonvegetative food waste.	
Air Quality Permits			
Stationary Sources	Local Air Districts	Composting systems and stationary diesel equipment.	• Estimate the project's Potential-to-Emit (PTE) prior to applying for an air quality permit; • Evaluate the potential ERCs required based on the PTE; • Assume the composting activity meets BACT requirements if utilizing an aerated static pile (ASP) composting system, however, additional emissions reductions may be available depending on specific facility conditions.

Mobile Sources	California Air Resources Board	Portable or mobile equipment.	• Work with the equipment vendor to obtain equipment specifications; • Verify the vendor-provided information (such as equipment ID) match the on-site equipment.
Water Quality Permits			
Compost General Order	Regional Water Quality Control Board	Most operations should seek coverage under the General Order which is a streamlined version of site-specific WDRs.	• Meet with the RWQCB to understand specific region requirements outside the Compost General Order (e.g., storm event requirements); • Perform a geotechnical investigation to understand the groundwater and soil characteristics; • Work with a licensed professional to design the drainage conveyances and containment structures.
Construction General Permit	Regional Water Quality Control Board	Required if disturbing more than one (1) acre of land.	• Inclusion of applicable minimum and advanced stormwater BMPs to minimize the potential impact to stormwater quality discharged from the site; • Inclusion of applicable Compost General Order requirements as related to Construction Quality Assurance and drainage containment and conveyance systems; • Engage a local firm to prepare and implement the site-specific SWPPP.
Industrial General Permit	Regional Water Quality Control Board	Required for composting facilities to develop a site-specific Stormwater Pollution Prevention Plan to minimize potential	

		impact to waterways.	A local company may also conduct stormwater sampling.
Local Construction Permits			
Grading Permits	Local Land Use Authority	May be required for grading working pad surface. Typically include drainage improvements.	• Perform a topographic survey; • Prepare preliminary grading and drainage design early on in the permitting process (e.g., land use approval process) to understand the requirements and site implications; • Use of a licensed professional (e.g., Professional Engineer) to prepare these plans.
Building Permits	Local Land Use Authority	Required for any structure.	• Prepare preliminary building design early on in the permitting process (e.g., land use approval process) to understand the requirements and site implications; • Use of a licensed professional (e.g., Professional Engineer) to prepare these plans.

Appendix E
Planning Agencies Survey

E. Planning Agencies Survey for Small and Medium Composting Activities

Date: Tuesday, March 12, 2024

Project: CalRecycle (Contract DRR23044): Small and Medium Composting Project Permitting

Introduction:

On behalf of CalRecycle (contract DRR23044) Small and Medium Composting Project Permitting, we are soliciting your feedback on a short survey to better understand the permitting requirements for **small and medium** composting activities.
For the purposes of this study, we are defining small and medium composting activities as follows:

- Small composting activities have up to 5,000 cubic yards of material on-site at any given time
- Medium composting activities have up to 12,500 cubic yards of material on-site at any given time
- Both small and/or medium composting activities:
    - Feedstocks include one or more of the following: agricultural material, green material, food material, and vegetative food material.
    - Operate in compliance with Environmental Health Standards as described in 14 CCR, Division 7, Chapter 3.1, Article 7, including:
        - Maximum metal concentrations and pathogen reduction pursuant to Title 14 Section 17868.3 and Section 17868.2
        - Physical contamination limits pursuant to Title 14 Section 17868.3.1
    - Utilize a covered aerated static pile (CASP) or equivalent system.
        - For the purpose of defining what is an equivalent system to CASP, it would be a composting system/technology that provides the same or similar level of efficacy with regard to:
            - Compliance with the composting operating standards (i.e. odors, noise, vectors, etc.) pursuant to (14 CCR Section 17867).
            - Protection from potential harm to public health and safety, and the environment.
            - Time and resources.

Survey:

1. Do you have compost-specific activities specified in your jurisdictions zoning code? Yes or No: _____
2. Do you have compost-specific activities specified in your jurisdictions General Plan? Yes or No: _____

3. Do you have any **small and/or medium** composting activities/facilities in your jurisdiction?
   - o Yes or No: _____
   - o Total number of operations: _____
     - Number of small composting activities: _____
     - Number of medium composting activities:_____
   - o What number use covered aerated static pile (CASP) systems: _____
   - o What number use a composting technology that may be equivalent to CASP? _____
     - Are these:
       - In-vessel? _____
       - Within a fully-enclosed building? _____
       - Other: _____
4. What level of land use permitting and/or CEQA review was required for the small composting activities?
   - o Estimated cost of application fees and CEQA review for small composting activities: _____
   - o Estimated timeline for approval _____
5. What level of land use permitting and/or CEQA review was required for the medium composting activities?
   - o Estimated cost of application fees and CEQA review for medium composting activities: _____
   - o Estimated timeline for approval _____
6. What are your permit fees, estimated typical costs and timeline for the CEQA clearance documents below?
   - o Initial Application
   - o Initial Study
   - o Categorical Exemption
   - o Negative Declaration
   - o Mitigated Negative Declaration
   - o Environmental Impact Report
   - o Environmental Impact Report Addendum
7. Do you have any comments as it relates to the permitting opportunities and challenges for small and medium composting facilities?

   _____
   _____
   _____
   _____
   _____
   _____
   _____

Appendix F
Compost Facilities Surveys

F. Facilities Survey for Small and Medium Composting Activities

Date: Tuesday, March 12, 2024

Project: CalRecycle (Contract DRR23044): Small and Medium Composting Project Permitting

Introduction:

On behalf of CalRecycle (contract DRR23044) Small and Medium Composting Project Permitting, we are soliciting your feedback on a short survey to better understand the permitting requirements for **small and medium** composting activities.

For the purposes of this study, we are defining small and medium composting activities as follows:

- Small composting activities have up to 5,000 cubic yards of material on-site at any given time
- Medium composting activities have up to 12,500 cubic yards of material on-site at any given time
- Both small and/or medium composting activities:
    - Feedstocks include one or more of the following: agricultural material, green material, food material, and vegetative food material.
    - Operate in compliance with Environmental Health Standards as described in 14 CCR, Division 7, Chapter 3.1, Article 7, including:
        - Maximum metal concentrations and pathogen reduction pursuant to Title 14 Section 17868.3 and Section 17868.2
        - Physical contamination limits pursuant to Title 14 Section 17868.3.1
    - Utilize a covered aerated static pile (CASP) or equivalent system.
        - For the purpose of defining what is an equivalent system to CASP, it would be a composting system/technology that provides the same or similar level of efficacy with regard to:
            - Compliance with the composting operating standards (i.e. odors, noise, vectors, etc.) pursuant to (14 CCR Section 17867).
            - Protection from potential harm to public health and safety, and the environment.

- Time and resources.

The results of this project are intended to help further understand the regulatory requirements and cost information related to the development and operation of small and medium composting activities. The information collected at your facility as part of this effort will be used to support the project's main goals, however, certain information will be kept confidential and not included in the report to CalRecycle to maintain anonymity of the source site.

More specifically, we will not be submitting the following in the report:

- Facility name
- Facility operator and owner
- Equipment vendor
- Site address
- Start of operations (e.g., 2020)
- Solid Waste Information System (SWIS) ID Number

The following information will be used in the study and be presented in a public document:

- Capital and operational costs ranges
- Compost product sale prices.
- Successes and barriers provided by the composting operation or vendor.

Also, we intend to inform CalRecycle verbally of which sites are participating if part of your facility was funded by a CalRecycle grant. This is for the state to follow the participation of their funded projects. However, the report will only include the information as described above to maintain anonymity of your site in the public report. It is the intent of the report to ensure anonymity of the participating facilities and focus solely on the data collected.

Survey:

1. Do you own your property or lease?
    - What was the cost for purchase?
        - Under $250,000
        - $250,000 to $500,000
        - $500,000 to $1,000,000
        - Over $1,000,000 for initial purchase
    - Or, what is the monthly lease?

- Under $5,000 per month
- $5,000 to $10,000 per month
- $10,000 to $25,000 per month
- Over $25,000 per month

2. What is your biggest economic burden?
   _____
   - What percent of total annual costs is attributed to this burden?
     _____
3. What is your estimated **initial** cost for project permitting?
   - Under $10,000
   - $10,000 to $50,000
   - $50,000 to $150,000
   - $150,000 to $300,000
   - $300,000 to $500,000
   - Over $500,000
4. What is your estimated **total** cost for project permitting and compliance?
   - Under $10,000
   - $10,000 to $50,000
   - $50,000 to $150,000
   - $150,000 to $300,000
   - $300,000 to $500,000
   - Over $500,000
5. What is your annual operation and maintenance cost?
   - Under $50,000
   - $50,000 to $200,000
   - $200,000 to $500,000
   - Over $500,000
6. Do you have an equipment replacement budget? Yes or No: _____ If Yes, select range below:
   - Less than $5,000
   - $5,000 to $50,000
   - $50,000 to $150,000
   - $150,000 to $300,000
   - $300,000 to $500,000
   - Over $500,000
7. How much do you sell your compost product for? By cubic yard or ton?
   _____
8. Were you required to purchase emission reduction credits from your air district?
   - Yes or No: _____
   - At what cost? _____
9. Were you required to comply with the water board Compost General Order?
   - Yes or No: _____
   - At what cost? _____

10. What successes and/or barriers has your operation faced during development and operations?

_____
_____
_____
_____
_____
_____
_____