

Risk Assessment

Small and Medium Composting Facilities and Operations

Statewide, California

California Department of Resources Recovery and Recycling

Waste Permitting, Compliance, and
Mitigation Division
1001 I Street
Sacramento, CA 95814

September 1, 2026



8801 Folsom Blvd., Suite 265
Sacramento, CA 95826
NCE Project No. 1235.03.55



Collaboration. Commitment. Confidence.SM

Risk Assessment

Small and Medium Composting Facilities and Operations

Statewide, California

September 1, 2026

Prepared for:

California Department of Resources Recovery and Recycling
Waste Permitting, Compliance, and Mitigation Division
1001 I Street
Sacramento, CA 95814

Prepared by:

A handwritten signature in black ink that reads "Ryan Bast".

Ryan Bast, PG
Senior Geologist

A handwritten signature in blue ink that reads "Michael Leacox".

Michael Leacox, PG, CEG
Vice President

With contributions from Yorke Engineering

NCE
8801 Folsom Blvd., Suite 265
Sacramento, CA 95826
(916) 388-5655

NCE Project No. 1235.03.55

Risk Assessment Overview

This Risk Assessment was prepared to evaluate potential risks associated with the development and operation of small and medium composting facilities and operations. The Risk Assessment qualitatively assesses the potential risks to the environment (soil, groundwater, surface water, and air quality) and human population to inform the programmatic Environmental Impact Report (EIR) required by Senate Bill (SB) 1046 to facilitate the development and operation of small and medium composting facilities and operations throughout the State.

Generally, a Risk Assessment is a systematic approach to identify, analyze, and prioritize risk based on site settings, receptors, potential exposure pathways, and adverse effects. The approach to this Risk Assessment includes looking at the environmental settings where future composting facilities and operations could be located, establishing potential receptors and exposure pathways, review of publicly available information related to potential contaminants of concern from composting activities, and assigning qualitative risk levels to composting activities. Development of the Risk Assessment relied on institutional knowledge composting activities and on existing relevant resources including established regulatory composting guidelines and regulations outlined in the State Water Resources Control Board's (SWRCB) General Waste Discharge Requirements for Commercial Composting Operations Order WQ 2020-0012-DWQ (General Order) and CalRecycle regulations pertaining to compostable material handling facilities and operations outlined in California Code of Regulations (CCR) Title 14 Chapter 3.1 Sections 17850 through 17895 (14 CCR). The Risk Assessment presents General Order and 14 CCR requirements that address and reduce risk and concludes with best management practices (BMPs) that could be implemented to further reduce and mitigate potential residual risks associated with composting operations.

Table of Contents

1	Introduction/Purpose	1
2	Program Description and Composting Options	2
2.1	Program Description	2
2.2	Overview of Commercial Composting Options Considered	3
2.3	Feedstock Considered	4
3	Environmental Settings	5
3.1	Geology, Hydrogeology and Air	5
3.2	Geography	8
3.3	Receptors	8
4	Exposure Pathways	10
4.1	Soil	10
4.2	Water	10
4.3	Air	10
5	Evaluation of Risk to the Environment and Human Health	11
5.1	Environment (Soil and Water) Risk Assessment	11
5.2	Human Health Risk Assessment	15
6	BMP Evaluation	22
6.1	Air Toxics	22
6.2	Odors	23
7	References	25

List of Tables

Table 2-1. Small and Medium Composting Facilities and Operations Program	2
Table 5-1. Representative Composting Facility Scenarios	16
Table 5-2. Prioritization Score Thresholds	18
Table 5-3. Minimum Distances to Residential and Worker Receptors for Less Than Significant Impact by Scenario for Four Air Districts	19

List of Appendices

Appendix A

Air Emission Calculations

Appendix B

Air Toxics Prioritization Scores

List of Abbreviations

Abbreviation	Definition
ASPs	aerated static piles
BAAQMD	Bay Area Air Quality Management District
basin plan	Regional Water Quality Control Board water quality control plan
BMPs	best management practices
CAA	Clean Air Act
CalRecycle	California Department of Resources Recovery and Recycling
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CASP	covered aerated static pile
CCAA	California Clean Air Act
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
cy	cubic yards
DPM	diesel particulate matter
DWR	Department of Water Resources
EIR	Environmental Impact Report
EPA	United States Environmental Protection Agency
General Order	General Waste Discharge Requirements for Commercial Composting Operations
NH ₃	ammonia
OEHHA	Office of Environmental Health Hazard Assessment
OIMP	Odor Impact Minimization Plan
program	Small and Medium Composting Facilities and Operations
RWQCB	Regional Water Quality Control Board
SB	Senate Bill

List of Abbreviations

Abbreviation	Definition
SCAQMD	South Coast Air Quality Management District
SDAPCD	San Diego Air Pollution Control District
SJVAPCD	San Joaquin Valley Air Pollution Control District
State	State of California
SWIS	Solid Waste Information System
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminants
tpy	tons per year
VFA	volatile fatty acids
VOCs	volatile organic compounds
WDR	Waste Discharge Requirement
14 CCR	California Code of Regulations Title 14
°C	degrees Celsius
°F	degrees Fahrenheit

1 Introduction/Purpose

With the passage and implementation of Senate Bill (SB) 1383 in 2016, the California Department of Resources Recovery and Recycling (CalRecycle), in consultation with the California Air Resources Board (CARB), developed a series of goals (and associated regulations) to reduce disposal of organic waste (statewide) by 50 percent of 2014 levels by 2020 and 75 percent by 2025. In addition, a recovery goal of at least 20 percent by 2025 of edible food in the organic waste stream was established. CalRecycle prepared an Environmental Impact Report (EIR) related to SB 1383 (certified in 2019) that programmatically evaluated the expansion of composting facilities, as well as other types of waste reduction facilities, throughout the State of California (State) in response to the established goals.

In 2024, CalRecycle prepared an evaluation of current practices and permitting related to the development of small (less than 10,000 tpy; not more than 5,000 cubic yards [cy] at any one time) composting operations and medium (less than 25,000 tpy but more than 10,000 tpy; more than 5,000 cy but not more than 12,500 cy at any one time) composting facilities that accept agricultural, green, and food material (including vegetative food material). As identified in that study, the entitlement and environmental review of small and medium compostable material handling facilities and operations has been historically approached in many different ways with some facilities and operations deemed non-discretionary (i.e., not a project under the California Environmental Quality Act [CEQA]) while others would involve preparation of either a Notice of Exemption, Negative Declaration, Mitigated Negative Declaration pursuant to CEQA requirements. This historic approach has led to challenges associated with permitting and development, following initial approval by the local jurisdiction. For context and since 2021, 10 small and 18 medium composting facilities and operations have been permitted or authorized by the solid waste local enforcement agency and recorded in CalRecycle's Solid Waste Information System (SWIS) database. To ensure that the State continues to achieve and exceed SB 1383 targets, it is reasonably foreseeable that the development of additional small and medium composting facilities is necessary, especially within more rural areas of the State.

To help facilitate the permitting and development of small and medium composting facilities and operations throughout the State, a programmatic EIR is being prepared. An objective of the program is to develop a consistent approach and to facilitate the permitting and regulatory approval process for these small and medium composting facilities and operations. The purpose of this Risk Assessment is to qualitatively assess the potential risks associated with the development and operation of small and medium composting facilities and operations to inform preparation of the programmatic EIR. This Risk Assessment looks at publicly available information related to potential contaminants of concern from the development and operations of compost facilities and operations, identifies potential exposure pathways for those identified contaminants to affect various media including soil, water, and air. Development of the Risk Assessment relied heavily on existing relevant resources including established regulatory composting guidelines and regulations outlined in the State Water Resources Control Board's (SWRCB) General Waste Discharge Requirements for Commercial Composting Operations Order WQ 2020-0012-DWQ (General Order; SWRCB 2020) and CalRecycle regulations pertaining to compostable material handling facilities and operations outlined in California Code of Regulations (CCR) Title 14 Chapter 3.1 Sections 17850 through 17895 (14 CCR). The Risk Assessment concludes with BMPs that could be implemented to reduce and mitigate potential risks associated with the operation of composting facilities and operations.

2 Program Description and Composting Options

2.1 Program Description

Based on the projected need for additional organic waste recycling capacity to achieve and maintain SB 1383 targets, it is estimated that capacity for approximately 506,000 additional tons of compostable material will be necessary by 2034 (CalRecycle n.d). Considering that composting facilities may be located where their target capacity may not be achieved, an additional 25% of capacity need has been applied to the estimated need for a total program volume of 632,500 tpy.

To provide adequate capacity for the forecasted increase in compostable material by 2034, it is estimated that the program may result in an additional 15 small composting operations and 25 medium composting facilities across California. This estimate is derived based on the average permitted capacity for small and medium composting facilities and operations since 2021 (i.e., over the last 5 years). It is also considered likely that small and medium composting facilities and operations would be developed beyond 2034, which are reflected as part of the total potential program development below. Table 2-1 provides estimates for key components of each facility and operation to be developed, the program by 2034, and the entire program.

Table 2-1. Small and Medium Composting Facilities and Operations Program

Per Facility	Small	Medium	
Allowable On-site capacity (at one time)	Up to 5,000 cy	5,000 – 12,500 cy	
Annual tonnage (tpy)	10,000	25,000	
Average acreage per facility	5	11	
Feedstock Type	Agricultural material, Green material, Vegetative food material	Agricultural material, Green material, Vegetative food material, Food material	
Program by 2034	Small	Medium	Total
# of Facilities	15	25	40
# of Facilities per Year (average)	Up to 3	Up to 4	Up to 7
Total acres of development	75	275	350
Annual tonnage (tpy)	150,000	625,000	775,000
Program Total			
# of Facilities	30	50	80

# of Facilities per Year (average)	Up to 3	Up to 4	Up to 7
Total acres of development	150	550	700
Annual tonnage (tpy)	300,000	1,250,000	1,550,000

Source: Data provided by CalRecycle 2026.

As noted in Table 2-1 and since 2021 (i.e., within a 5-year period), solid waste local enforcement agencies have permitted or authorized 10 small and 18 medium composting facilities and operations. Carrying forward that same ratio for small/medium composting facilities and operations over a similar 5-year period, up to 8 small composting operations and 13 medium composting facilities would be permitted or authorized. This would then translate into the projected development of 15 small and 25 medium composting activities by 2034 with additional development of composting facilities and operations beyond 2034 (as shown in Table 2-1). In addition, the program would allow for consistency of approach and mitigation of potentially significant impacts (through implementation of the BMPs and mitigation measures presented herein), which would be anticipated to streamline permitting of facilities developed under the program.

While micro-scale composting activities (i.e., backyard or community garden composting) is encouraged by CalRecycle to increase diversion from landfills, such activities are not subject to CalRecycle/Local Enforcement Agency oversight and are not expected to have a meaningful impact to the development of this Risk Assessment.

2.2 Overview of Commercial Composting Options Considered

This Risk Assessment evaluates the potential risk associated with the 2 basic and most commonly implemented commercial-scale composting methods: windrows and aerated static piles (ASPs). Most facilities/operations (except biosolids and manure composting facilities) start the composting process by grinding, shredding, or otherwise reducing the size of the incoming feedstock (i.e., the stream of organic waste being processed at a facility). Most facilities/operations remove physical contaminants, such as plastic, metal, and glass from incoming feedstock. After feedstock preparation, the materials are moved to the active composting phase.

- **Windrows** are elongated piles of material that can range from 8 to 20 feet wide, up to 10 feet tall, and hundreds of feet long. A machine that straddles the pile turns the windrow by moving along its length, churning the material, breaking up clumps, fluffing the pile, and moving materials to and from the pile core. This action enables all feedstock to be subject to the high internal temperatures of the pile, which reduces pathogens. Fluffing up the pile helps air reach into the pile core, facilitating high temperatures and rapid decomposition. Turning can also be accomplished with front end loaders.
- **Aerated Static Pile** composting, increasingly common in California, uses electric fans to push or pull air through the piles during the active composting phase. Positive aeration occurs when ambient air is blown into the pile; negative aeration occurs when air is drawn through the pile. ASPs are engineered to reduce pollutants such as volatile organic compounds (VOCs) and ammonia. Positive aeration systems may use fabric covers or a thick top layer of finished, unscreened compost that acts a biofilter and are often referred to as covered aerated static pile (CASP) composting. Negative aeration systems discharge air from the piles through a dedicated system that further reduces pollutants. Negative aeration systems

are typically equipped with filtration systems that filter emissions and air prior to discharge to the atmosphere. Therefore, this Risk Assessment assumes negative aeration systems are equipped with emission filtration systems.

Composting occurs in 2 basic phases:

- **Active phase:** Composting begins when temperatures exceed 122 degrees Fahrenheit (°F) or 50 degrees Celsius (°C) and continues as temperatures rise to more than 131°F or 55°C, beginning the Process to Further Reduce Pathogens (14 CCR, Section 17868.3). This stage may last up to a month for windrow composting and can be completed more rapidly for ASP composting. The active phase continues while compost matures. Temperatures decline but are still above ambient levels.
- **Curing phase:** After the initial high-temperature active phase, some facilities/operations cure compost to reduce organic acids and reduce phytotoxic compounds. The length of curing time varies considerably by facility.

After the composting process is completed, the finished compost is screened for size and for contaminants, before being sold. Any material that is screened out is often reprocessed or discarded if it is a physical contaminant. Finished composted material is then sold as a soil amendment for agricultural, landscaping, and horticulture uses. Conventional and organic agricultural operations use most of the compost produced in California; however, it is also bagged and sold or given away to the general public, nurseries, and landscapers.

In-vessel composting is not evaluated for potential risk because it is less common than the methods discussed above and because there is naturally less environmental risk with composting within a containment structure like a vessel.

2.3 Feedstock Considered

Feedstock varies slightly between small and medium composting facilities/operations. For small composting operations, the Risk Assessment assumes feedstock will consist of agricultural material, green material, and vegetative food material. Medium composting facilities assume feedstock will consist of agricultural material, green material, food material, and vegetative food material,

3 Environmental Settings

The program area occurs throughout the State. Based on CalRecycle records, many commercial composting facilities/operations currently operating within the State are located in and around metropolitan centers (Los Angeles, Bay Area, San Diego, and Sacramento) and/or in the San Joaquin Valley. Facilities located outside of major urban areas are primarily located closer to large agricultural areas where compost is used. The location of existing and permitted composting facilities and operations are known within California; however, decisions by future project proponents regarding the precise location of a new composting facility or operation would be speculative at this time. Furthermore, due to local planning, political (i.e., the willingness of jurisdictions to address local opposition to new or expanded facilities/operations), and economic influences, attempting to predict future project approvals about the specific location and design of future composting facilities and operations undertaken in response to SB 1383 and other requirements would also be speculative.

Given the large program area (statewide), the unknown locations of future small and medium composting facilities and operations, and the large variability of environmental and geographic settings present in California, there are a wide range of environmental settings small and medium composting facilities and operations can be sited. To practicably assess risk, this Risk Assessment looks at general composting activities described in Section 2.2 and how those operations potentially affect various media such as soil, water, and air.

3.1 Geology, Hydrogeology and Air

The potential area of development for the additional composting facilities and operations includes the entire state of California. Considering the geologic, geographic, and resource diversity within the State presents challenges in evaluating and assigning risk. As a result, the Risk Assessment considers specific soil, hydrogeologic (groundwater), surface water, and air quality scenarios that could represent potential risk as a result of small/medium composting facilities and operations.

3.1.1 Geology

There are 11 recognized naturally defined geologic regions, known as geomorphic provinces, in California that each display a distinct landscape. These geomorphic provinces vary from low-lying basins consisting of thousands of feet of accumulated sediment to high-elevation mountainous topography with little to no accumulated sediment to variations in between. The geology of each province influences the types of soil present, the hydrogeology of how groundwater flows through the subsurface, and how surface water travels across the landscape.

Types of soil and rocks found in California can be wide-ranging and highly variable depending on the bedrock they originate from, the depositional environment, and the geomorphic process to which they are constantly exposed. Soil can include fine grained sediments such as clays and silts, coarse grained sediments like sands and gravels, or a combination thereof. The complex geologic history of California provides a diverse range of bedrock including igneous rocks such as granite and basalt, metamorphic rocks such as schist and marble, and sedimentary rocks such as limestone and sandstone. For the purposes of this Risk Assessment, the various soil and bedrock types found in California will collectively be referred to as soil and will refer to the top tens of feet of the subsurface because this depth will have the most effect on and be the most affected by composting activities.

Infiltration of leachate generated at a facility into and through the vadose zone is one of the pathways considered. There are many characteristics of soil that affect the fate and transport of composting related contaminants through the vadose zone (unsaturated zone) including grain size, mineral composition, and moisture content. Of the various characteristics of soil that can influence the fate and transport of leachate, the percolation rate is likely the biggest contributor and therefore used as a proxy for assigning risk to soil and groundwater from composting activities. The greater the percolation rate, the greater the ability of soil to transmit leachate. Soil types such as clays, silts, and unfractured bedrock have lower percolation rates and are typically found to retard flow into and/or through the subsurface. Soil types such as coarse sands, gravels, and fractured bedrock typically have higher percolation rates allowing leachate to move relatively faster into and/or through the subsurface. The approach of using percolation rates as a proxy is consistent with the SWRCB's General Order that uses percolation rate for establishing criteria for siting a composting facility and operation to protect water quality. For the purposes of this Risk Assessment, this analysis uses the guidance of the General Order to evaluate risk from small and medium composting facilities and operations.

3.1.2 Hydrogeology (Groundwater and Surface Water)

Statewide water quality is managed by the SWRCB who delegates authority and responsibility to 9 Regional Water Quality Control Boards (RWQCBs). The RWQCB boundaries are geographically differentiated based on watershed and water quality requirements because of the diverse hydrogeologic conditions across the State. Water resources consist of groundwater and surface water including rivers, streams, lakes, reservoirs, wetlands, and coastal water. Groundwater is held within the pore spaces of soil such as sands, gravels, and other sediments commonly referred to as alluvium and within fractured permeable rocks. These natural subsurface storages of groundwater are known as aquifers. The Department of Water Resources (DWR) has identified 515 alluvial groundwater basins across the State, which encompasses over 40% of the State's area (DWR 2026: H-44). Depth to groundwater can range from shallow depths, less than 10 feet like commonly observed in the Bay Area of Northern California, to greater depths of tens to hundreds of feet, like commonly observed in the Central Valley or in desert environments.

The RWQCBs protect water quality across the State by designating current and potential future beneficial uses of groundwater and surface water, establishing water quality objectives, and implementing water quality control plans (basin plans). Common beneficial uses of groundwater include municipal and domestic water supply, agricultural use, industrial water supply, and surface water replenishment. Common beneficial uses of surface waters include municipal and domestic water supply, agricultural supply, industrial water supply, ecological and wildlife habitats, recreational uses, flood protection, groundwater recharge, and water quality enhancement. Water quality objectives are established in the basin plans to set water quality standards that protect beneficial uses. To ensure those water quality standards are met, the RWQCBs issue permits known as Waste Discharge Requirements (WDRs) to regulate land use activities that discharge or have the potential to discharge waste to land, groundwater, or surface water that could degrade water quality. Common land use activities that require a WDR include agricultural and forestry operations, industrial facilities, wastewater treatment plants, landfills, and composting facilities/operations. Many factors influence risk to water quality, such as type and volume of waste, depth to groundwater, distance to surface water, site-specific rainfall amounts, and soil type. To promote composting activities and streamline the permitting process, the SWRCB developed the General Order to protect water quality statewide by establishing guidelines that consider risk to water from composting activities. The General Order establishes percolation rate and minimum depth to groundwater criteria and setback distances to surface water bodies and water supply wells for siting of compost facilities and operations. For the

purposes of this Risk Assessment, this analysis relies upon the guidance of the General Order to evaluate risk to groundwater and surface water from small and medium composting facilities and operations.

3.1.3 Air Contaminants

Program activities may occur in any of California's 15 air basins and within the jurisdiction of any of California's 35 local air districts. The ambient concentrations of air contaminants within these basins are established by the concentration of emissions released by the sources of air contaminants and the atmosphere's ability to transport and dilute such emissions. Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and sunlight. Therefore, existing air quality conditions within California are influenced by such natural factors as topography, meteorology, and climate as well as the concentration of emissions released by existing air contaminant sources. Air pollution can also move freely within and between air basins; therefore, air pollution generated in one basin may degrade the air quality within an adjacent basin. Air quality within California is regulated by the U.S. Environmental Protection Agency (EPA), CARB, and local air districts through and in compliance with a variety of federal, state, regional, and local regulations, including the federal Clean Air Act (CAA), California Clean Air Act (CCAA), and air district rules and regulations pertaining to ambient air quality standards (both national and state). For the purposes of this Risk Assessment, this analysis uses the guidance of and evaluates potential risks associated with Bay Area Air Quality Management District (BAAQMD), South Coast Air Quality Management District (SCAQMD), San Joaquin Valley Air Pollution Control District (SJVAPCD), and San Diego Air Pollution Control District (SDAPCD).

Within the context of this Risk Assessment, the potential risks of a particular set of air contaminants is considered. Toxic Air Contaminants (TACs) are air contaminants that may cause adverse health effects, including cancer and non-cancer health impacts. Diesel particulate matter (DPM), a common TAC emitted by diesel-fueled vehicles and equipment, is often the primary contributor to health risk impacts from facility operations. Long-term exposure to elevated TAC concentrations may increase cancer risk and contribute to respiratory and other chronic health effects.

3.1.4 Odors

An odor is the sensation that the human brain generates in response to certain chemicals breathed in through the nose. The perception of odor depends on both the characteristics and concentration of the odorant and the characteristics of the person smelling the odorant. An objectionable odor to one person can be tolerable to another.

The occurrence and severity of odor impacts depend on numerous factors, including the nature, frequency, and intensity of the source; wind speed and direction; and the presence of (and distance to) sensitive receptors. Offensive odors can be unpleasant, leading to considerable distress and often generating citizen complaints to local governments and regulatory agencies. Projects with the potential to frequently expose individuals to objectionable odors are deemed to have a significant impact. Typical facilities that generate odors include wastewater treatment facilities, sanitary landfills, composting facilities, petroleum refineries, chemical manufacturing plants, and food processing facilities.

Many compounds formed during composting are "odorous," which are considered offensive by at least some people. Several individual compounds that can be emitted from a compost facility stand out as odorous, such as ammonia and hydrogen sulfide. However, because of the large number of chemical species involved with composting, odorous compounds are frequently identified by categories of similar chemicals. The primary

categories associated with organic materials present in the feedstock and byproducts of decomposition include mercaptans, organic sulfides, ammonia, amines, indoles, volatile fatty acids (VFAs), terpenes, alcohols, ketones and aldehydes. Mercaptans, organic sulfides, and hydrogen sulfide are compounds that contain sulfur. Amines, indoles, and ammonia are nitrogen-based compounds. VFAs are most closely associated with carbohydrates and lipids (i.e., fats and oils). The remaining groups are common organic compounds with volatile members.

3.2 Geography

California geography consists of mountainous terrain, arid low-land and high-land deserts, coastal and alpine forests, deltaic landscapes, and large valleys resulting in different climates found within the State. These varying climates can have large temperature differences and significant annual precipitation amounts within relatively proximity to each other. Local geographic, geologic, hydrogeologic, and meteorological conditions can affect how contaminants are transported, dispersed, transformed, and removed from the environment, ultimately influencing contaminant concentrations at receptor locations. Factors such as distance from the source, prevailing wind patterns, atmospheric conditions, terrain, land use, soil and hydrogeologic conditions, and release characteristics may affect the distribution of contaminants in the surrounding area. The State is also home to large metropolitan areas with millions of residents as well as smaller rural communities. To meet the program's goal of 40 new composting facilities and operations by 2034, the development of small and medium composting facilities and operations will likely occur in both urban and rural areas. These new composting facilities and operations may be constructed to expand existing solid waste operations/facilities or may consist of new sites constructed on vacant native land and/or on vacant land previously used for other purposes. This Risk Assessment evaluates risk associated with the construction and operation of composting facilities in urban and rural areas as well as native and previously developed land.

The Prioritization Score methodology used in the air quality portion of this Risk Assessment does not account for geographic features such as local terrain, topography, meteorology, or other factors that may influence contaminant dispersion. The methodology is intended to provide a conservative screening-level assessment of potential health impacts and does not incorporate local dispersion characteristics. These site-specific factors can be evaluated through refined air dispersion modeling.

3.3 Receptors

Receptors considered for this Risk Assessment are divided into 2 categories, 1) the environment and 2) human population. The environmental receptors include soil, groundwater, surface water, and air. Evaluation of risk to receptors looks at how composting activities could potentially affect the environment (soil, water, and air) and how human receptors may be exposed to the potentially contaminated environment. Risk to soil from composting activities is considered limited in extent to soil at the facility. Therefore, risk from contaminated soil is only considered for facility workers.

With respect to the human population category and specific to air quality and odors, the assessment is primarily oriented towards facility workers. This Risk Assessment evaluates potential air quality/odor risks to several receptor types. The methodology follows the Emissions and Potency Procedure in the California Air Pollution Control Officers Association's (CAPCOA's) guidelines, where emission data are combined with applicable Office of Environmental Health Hazard Assessment (OEHHA) health values and receptor distance adjustment factors to calculate separate Prioritization Scores for residential cancer, worker cancer, chronic non-cancer, and acute non-

cancer risk. The worker cancer Prioritization Score was calculated using SDAPCD's method of applying a 0.3 factor to the residential cancer Prioritization Score.

- Residential Cancer Risk: Evaluates health risk from lifetime exposure to emissions at residential and other sensitive receptor locations. Other sensitive receptors include hospitals, K-12 schools, daycare centers, and elder care facilities. Residential cancer risk is typically assessed using a 30-year exposure duration.
- Worker Cancer Risk: Evaluates health risk from long-term exposure to individuals at long-term business locations (i.e., commercial office and retail). Worker cancer risk is typically assessed using a 25-year exposure duration.
- Chronic Risk: Evaluates health risk from long-term (1-year) exposure to emissions. Chronic receptors include locations where an individual could reasonably be expected to spend time over the better part of the year.
- Acute Risk: Evaluates health risk from short-term (1-hour) exposure to emissions. Acute receptors include any location where an individual could reasonably be present for at least 1 hour during a day.

4 Exposure Pathways

Contaminants associated with compost and the operation of a compost activity can migrate into the environment in a variety of ways including direct contact, leaching, wind dispersion, and run-off discharge into surface water which can then ultimately be exposed to the human population through dermal contact, inhalation, and ingestion and potentially cause adverse effects. The following sections discuss potential exposure pathways to each environmental media from composting facilities and operations and how contaminated environmental media can result in human exposure.

4.1 Soil

Soil can be impacted by feedstock from direct contact and leachate from feedstock moving through the soil column. Humans can be exposed to contaminated soil through direct contact, ingestion, and inhalation of dust.

4.2 Water

4.2.1 Groundwater

Groundwater can be exposed to contaminants associated with the operation of a composting activity from leachate migrating through the subsurface. Exposure pathways from contaminated groundwater to humans consist of ingestion and direct contact from contaminant plume migration to water supply wells.

4.2.2 Surface Water

Exposure of surface water bodies to contaminants associated with the operation of a composting activity consist of run-off of leachate and stormwater that has contacted feedstock, discharge of contaminated groundwater into surface water bodies, and wind dispersion of contaminated soil, compost, and feedstock particulates. Humans can be exposed to contaminated surface water through direct contact and ingestion.

4.3 Air

Exposure of affected air quality and odors from the operation of a composting activity to the human population can occur through inhalation. However, with respect to air quality and odors, the Prioritization Score methodology does not evaluate exposure pathways and instead considers contaminant potency, toxicity, emission rates, and proximity to receptors.

5 Evaluation of Risk to the Environment and Human Health

The following sections discuss potential risks to the environment and human health based on the exposure pathways discussed above and consider commercial composting options including windrow, ASP, and CASP, and the contaminants typically associated with the feedstock considered under this program (agricultural material, green material, and food material (including vegetative food material)). Because specific locations or facility designs are unknown, this Risk Assessment evaluates the general operations of small and medium composting facilities and operations and identifies potential risk to the environment and human health. The current regulatory permitting requirements for the development and operation of composting facilities in the State were reviewed to evaluate how they addressed the identified risks. These regulatory frameworks include the SWRQCB General Order and 14 CCR Chapter 3.1 Sections 17850 through 17895 for soil, groundwater and surface water, and BAAQMD, SCAQMD, SJVAPCD, and SDAPCD for air quality and odors.

Small composting operations under this program may receive feedstock consisting of agricultural material, green material and vegetative food material, and medium composting facilities may receive the same feedstocks with the addition of food material. The source and type of feedstock are the primary factors in which contaminants may be found in composting materials. Contaminants commonly associated with agricultural material, green material, food material, and vegetative food material feedstocks include plastics, metals, pesticides, nutrients and salts, and pathogens (Chm2Hill 2004: 11 and Governo 2003: 23). The contaminants for both the small and medium composting facilities and operations are generally the same, however, there is greater potential for pathogens to be present at medium composting facilities due to the food material they can receive.

5.1 Environment (Soil and Water) Risk Assessment

The most significant risk to soil and water comes from leachate generated during composting. Leachate is the liquid from feedstock and compost material that is generated either from the moisture of the feedstock and compost or from water that contacts and passes through the feedstock and compost material. Leachate may contain dissolved metals, salts, plastics, suspended solids, and pathogens. The risk of leachate contaminating the environment is the mobilization of contaminants present in leachate as it drains from feedstock and compost piles and can be of greater concern in localities that receive higher amounts of precipitation, have shallow groundwater, have soil with high permeability, or during storm events. This discussion considers the degree to which existing regulation, especially the General Order, addresses risk.

The General Order uses a tiered system to classify composting facilities based on potential risk to the environment. The General Order classifies composting activities into 2 tiers (Tier 1 and Tier 2) based on volume and type of feedstock, proximity to surface water and water supply wells, and depth to groundwater versus soil percolation rates. Tier 1 composting activities are considered less likely to affect water quality than Tier 2 composting activities. Assuming small composting operations meet the minimum setback distance to surface water and water supply wells of 100 feet and the soil percolation rate and minimum depth to groundwater criteria, they would classify as a Tier 1 composting activity. If they cannot meet the minimum setback distance and soil percolation rate and minimum depth to groundwater, they would be classified as a Tier 2 composting activity. Medium composting facilities would fall under Tier 2 because they could accept food material. The different requirements between Tier 1 and Tier 2 composting activities and how they address potential risk are discussed further in the following sections.

5.1.1 Soil

Soil can be contaminated from composting operations by leachate migrating into the underlying surface soil and, to a lesser extent, from direct contact between the surface soil and feedstock and compost material. Composting activities generally will not be a source of widespread soil contamination and will likely be limited to localized areas where feedstock and compost are stored. Windrow, ASP, and CASP composting methodologies are commonly performed on areas of bare soil. The repeated long-term use of these areas can contribute to the accumulation of plastics, metals, pesticides, nutrients, and pathogens on shallow and surficial soil, and into deeper subsurface soil from leachate. Soil with low percolation rates will have low risk from leachate infiltration and soil with high percolation rates will have high risk from leachate infiltration. Additionally, poor facility surface drainage may promote leachate to pond and infiltrate into the subsurface. Ponding in compost storage and process areas with high percolation rates can create conditions conducive to contaminant migration into the subsurface. If left unmitigated, risk to soil at composting facilities and operations facilities will be present.

Exposed surface soil that may contain contaminants can be subject to increased erosion during precipitation and storm events. Stormwater that enters a facility as run-on and leaves a facility as run-off has the potential risk to mobile soil contaminated by the operation of a composting activity. If a minimal amount of stormwater is able to contact soil, the risk of contaminated soil erosion is low. If a large amount of stormwater is able to contact soil, the risk of contaminated soil erosion is high.

The General Order focuses on protection of groundwater and surface water. However, compliance with requirements of Tier 1 and Tier 2 composting activities would address the potential risk to soil from composting activities. These include:

- Design of facilities and operations to manage a 25-year, 24-hour peak storm event at a minimum to prevent or limit sediment laden stormwater run-on and/or run-off.
- Grade working surfaces to facilitate drainage and minimize ponding by sloping or crowning composting pads to reduce infiltration.
- For Tier 1 composting activities, meet the soil percolation rate and minimum depth to groundwater criteria.
- For Tier 2 composting activities, surfaces and drainage ditches to be constructed of compacted fine grained soil (like clay), asphaltic-concrete, or equivalent.
- Requires routine inspection and monitoring of all facility and operation drainage systems and engineered working surfaces.

These General Order requirements address the risk to soil by requiring adequate facility drainage to minimize ponding on composting pads to limit the infiltration of leachate into the subsurface, ensuring facilities can handle stormwater run-on and run-off from a moderately-sized precipitation event, and establishing minimum soil and depth to groundwater criteria that must be met to demonstrate low risk. If the minimum soil and depth to groundwater criteria cannot be met, then an engineered surface with low percolation rates must be constructed.

5.1.2 Water

The primary objective of the General Order is to protect water quality, both surface water and groundwater. The potential risks to surface water and groundwater are identified within the following applicable sections, Surface Water and Groundwater.. The requirements of the General Order were developed to be protective of water quality across the State based on geologic and hydrogeologic conditions and can be applied statewide where a composting facility and operation may be sited. Because the locations of composting facilities and operations under this program are unknown, the General Order proves to be a useful tool to provide mitigation measures to the risks identified in this Risk Assessment. Compliance with the General Order requirements by the program's future composting facilities and operations will reduce potential risk to water from composting operations.

Surface Water

Risk to surface water from small and medium composting facilities and operations comes from run-off of stormwater that has interacted with composting material or contaminated soil, and run-off of leachate. If a minimal amount of stormwater is able to contact compost material or contaminated soil, the risk to surface water from contaminated run-off is low. If a large amount of stormwater is able to contact compost material or contaminated soil, the risk to surface water from contaminated run-off is high. Improperly graded compost facilities and operations could promote run-off if graded too steeply and/or if the site is designed with inadequate drainage capacity and conveyance infrastructure. Compost facilities and operations in localities with little to no topographical relief have a low risk to surface water from contaminated run-off. Compost facilities and operations located in localities with large topographical relief have a high risk to surface water from contaminated run-off. Additionally, risk to surface water is influenced by the distance to a composting facility and operation due to potentially contaminated run-off. Compost facilities and operations sited further away than the minimum setback distance of 100 feet (per the General Order) have a low risk of affecting a surface water body from run-off. Compost facilities and operations sited closer than the minimum setback distance of 100 feet have a high risk of affecting a surface water body from run-off.

The General Order addresses these potential risks through the following requirements:

- A setback distance of at least 100 feet to the nearest surface water body.
- Facilities are to be designed and constructed to control and manage all run-off for a 25-year, 24-hour peak storm event, at a minimum.
- A Water and Wastewater Management Plan must be prepared and approved demonstrating how the facility and operation will manage run-off and run-on.
- Berms must be constructed to prevent run-off/run-on from a 25-year, 24-hour peak storm event, at a minimum. In addition, the soil percolation rate and depth to groundwater criteria for Tier 1 activities must be met, or the facility surface must be engineered with low percolation rates to prevent or limit infiltration of leachate into the subsurface.
- Drainage systems must be properly designed and constructed and must be inspected and cleaned out annually prior to wet season.
- Routine inspection and monitoring of all facility and operation drainage systems and engineered working surfaces.

The General Order addresses risk to surface water by establishing requirements that can handle wastewater as well as stormwater run-on and run-off from a moderately-sized precipitation event, and siting distances to provide a distance buffer. In addition, the General Order requires facilities to ensure on-site water management systems operate as intended through routine inspection and maintenance.

Groundwater

Risk to groundwater from small and medium composting facilities and operations comes from leachate infiltration through the subsurface and into the water table, as well as leachate reaching the water table through a preferential pathway such as a water supply well. Leachate can transport elevated levels of dissolved metals, salts, suspended solids, plastics, and pathogens into the water table that can exceed water quality objectives established in basin plans. Soil percolation rate coupled with depth to groundwater are primary factors that influence risk to groundwater quality from composting facilities and operations, as demonstrated in the General Order's soil percolation rate ranges and depth to groundwater criteria for Tier 1 activities. Soils with a low percolation rate and deep depth to groundwater have low risk to groundwater. Soils with a low percolation rate and shallow depth to groundwater have a low to moderate risk to groundwater. Soils with a high percolation rate and deep depth to groundwater have a low to moderate risk to groundwater. Soils with a high percolation rate and a shallow depth to groundwater have a high risk to groundwater.

The General Order addresses these potential risks through the following requirements:

- Facility and operation siting conditions must meet soil percolation rates and depths to groundwater criteria to be classified as Tier 1. The higher the soil percolation rate (i.e. the faster a liquid can move through soil) the deeper the required minimum depth to groundwater. For example, a soil percolation rate of less than 1 minute per inch is required to have a minimum depth to groundwater of 50 feet and a soil percolation rate of greater than 30 minutes per inch is required to have a minimum depth to groundwater of 5 feet.
- If manure is a component of the feedstock from agricultural material, a Groundwater Protection Monitoring Plan is required to monitor and identify any potential impacts to groundwater before they occur. This would include installing a network of groundwater monitoring wells that must be monitored and sampled on a routine basis.
- Composting facilities and operations that do not meet the soil percolation and depth to groundwater criteria are classified as Tier 2 and require additional engineering controls such as clay liners and geomembrane underlying compost processing areas with associated subsurface monitoring points.
- Routine inspection and monitoring of all facility and operation drainage and monitoring systems.

The General Order addresses risk to groundwater by reducing or eliminating the likelihood of leachate reaching groundwater through soil percolation rates and depth to groundwater setback limits. Required monitoring directly below engineering controls such as clay liners and geomembrane identifies leachate infiltration before reaching groundwater.

5.2 Human Health Risk Assessment

This human health risks assessment looks at potential risks from environmental media (soil, water, and air) that may be contaminated from composting facilities and operations and directly from the compost and feedstock material.

5.2.1 Air

TAC emissions from small and medium composting facilities and operations include DPM, a known carcinogen, from haul truck activity, mobile sources including front end loaders, and stationary sources such as the engines driving screens and grinders. Composting may emit TAC from the decomposition of organic waste, and material handling operations may emit TAC in the form of dust. TAC emissions are evaluated to ensure that adverse acute, chronic, and carcinogenic health risk impacts exceeding regulatory thresholds do not occur as a result of the program.

Small and medium composting facilities and operations would result in stationary source emissions of TACs. However, these composting activities would be expected to be sited within an appropriate land use (i.e., industrial) and typically would not be located within 1,000 feet of a sensitive receptor. The stationary sources would be subject to permitting as required by the applicable air district. To obtain a stationary source permit from an air district, the facility operator would have to demonstrate that operations do not expose sensitive receptors to an incremental increase in cancer risk (e.g., one that exceeds 10 in one million) or hazard index value (e.g., 1.0 or greater). Therefore, operation of a composting facilities and operations under the proposed program would likely not expose off-site sensitive receptors to TAC concentrations due to stationary source emissions. Nonetheless, because operation of small or medium compost facility and operation constructed under the proposed program would require the operation of diesel-fueled vehicles and heavy-duty equipment, compost facilities and operations could emit mobile-source TAC emissions resulting in health risk impacts exceeding an applicable threshold of significance. Therefore, evaluation of health risk impacts due to air emissions is appropriate.

Toxics

Methodology

Because of the statewide nature of the program and the fact that it does not identify specific locations or operational designs, this air toxics risk analysis was based on a series of representative composting scenarios. The scenarios were developed to capture the range of facility sizes, feedstocks, and composting technologies anticipated under the program.

Six scenarios were evaluated, representing small and medium composting facilities and operations utilizing windrow, positive CASP, and negative ASP systems. Small composting operations were assumed to have an on-site capacity of up to 5,000 cy and process up to 10,000 tpy of green material, agriculture material and vegetative food material). Medium composting facilities were assumed to have an on-site capacity of up to 12,500 cy and process up to 25,000 tpy of green material, agriculture material, food material (including vegetative food material). The scenarios and associated operating assumptions are included in Appendix A. Simplified descriptions of the scenarios are listed in Table 5-1.

Table 5-1. Representative Composting Facility Scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Facility Type	Small	Small	Small	Medium	Medium	Medium
Composting Technology	Windrows	Positive CASP	Negative ASP with Filter	Windrows	Positive CASP	Negative ASP with Filter
Throughput	10,000 tpy	10,000 tpy	10,000 tpy	25,000 tpy	25,000 tpy	25,000 tpy

Operation of a compost facility and operation would produce emissions of air contaminants from fuel combustion in stationary and mobile sources, decomposition of organic materials, and use of processing equipment. Toxics emissions estimates were prepared for the mobile and stationary emission sources required to operate the 6 representative composting scenarios described in Table 5-1. Emissions estimates have been prepared for the following stationary source categories:

- Stationary diesel engine exhaust criteria pollutant emissions for grinders, screens, stackers, colorizers, and emergency engines;
- Feedstock storage, composting, curing, and finished compost storage VOC, organic TAC and ammonia (NH₃) emissions;
- Grinding, screening, material handling, and wind erosion Dust and Particulate TAC Emissions; and
- Stationary diesel engine exhaust DPM emissions.

And the following mobile-source categories:

- Vehicle and Equipment Exhaust TAC Emissions:
 - Diesel Exhaust Emissions (i.e., DPM); and
 - Gasoline Exhaust Emissions;
- Paved Road Dust TAC Emissions; and
- Unpaved Road Dust TAC Emissions.

For each category of emissions, emission calculation worksheets including the data and assumptions used in the calculations are provided in Appendix A.

Baseline operations for all scenarios assume that the feedstock would otherwise be sent to a landfill. For this analysis, it was assumed that TAC emissions at a compost facility and operation would be new emissions, and landfill emissions of these contaminants are not estimated. As a practical matter, the TAC emissions have localized impacts, thus emissions of these contaminants from a remote landfill would not factor into the analyses of impacts at the composting sites.

For feedstock truck trips, there are 3 possibilities: 1) the distance to a new composting facility and operation is shorter than the distance to a landfill; 2) the distance is the same as the distance to a landfill; and 3) the distance to a new composting facility and operation is greater than the distance to a landfill. In the first 2 possibilities,

emissions from truck travel would decrease or be unchanged. To ensure that project emissions are not underestimated, only the third possibility was included in emission calculations; feedstock truck trip distance to a landfill was subtracted from the truck trip distance to a composting facility and operation. This difference from baseline is incorporated into the project emissions by using the difference in distance in the calculations; the baseline emissions from feedstock trucks are not presented separately.

It is likely that composting facilities and operations will be located closer to feedstock sources than landfills because the largest feedstock sources (i.e., agriculture facilities) are also often the largest users of finished compost, which provides additional incentive to locate composting facilities and operations facilities close to the feedstock sources.

Risk Evaluation

To assess the potential health risks from a project to sensitive receptors, the TAC emissions from the implementation of the program are assessed in accordance with regulatory guidelines. This analysis is based on the OEHHA “Hot Spot” guidance document (OEHHA 2015) and the CAPCOA “Air Toxics ‘Hot Spots’ Program Facility Prioritization Guidelines” (CAPCOA 2016).

The CAPCOA prioritization guidelines outline a technique for calculating a Prioritization Score that helps air districts identify priority compost activities for Risk Assessment, which involves consideration of TAC potency, toxicity, quantity of emissions, and proximity to sensitive receptors, such as hospitals, schools, daycare centers, worksites, and residences.

As noted above, Prioritization Scores were calculated using the Emissions and Potency Procedure in the CAPCOA’s guidelines. Emission data are combined with applicable OEHHA health values and receptor distance adjustment factors to calculate separate Prioritization Scores for residential cancer, worker cancer, chronic non-cancer, and acute non-cancer risk. The worker cancer Prioritization Score was calculated using the SDAPCD method of applying a 0.3 factor to the residential cancer Prioritization Score.

- Residential Cancer Risk: Evaluates health risk from lifetime exposure to emissions at residential and sensitive receptor locations. Sensitive receptors include hospitals, K-12 schools, daycare centers, and elder care facilities. Residential cancer risk is typically assessed using a 30-year exposure duration.
- Worker Cancer Risk: Evaluates health risk from long-term exposure to individuals at long-term business locations. Worker cancer risk is typically assessed using a 25-year exposure duration.
- Chronic Risk: Evaluates health risk from long-term (1-year) exposure to emissions. Chronic receptors include locations where an individual could reasonably be expected to spend time over the better part of the year.
- Acute Risk: Evaluates health risk from short-term (1-hour) exposure to emissions. Acute receptors include any location where an individual could reasonably be present for at least 1 hour during a day.

TAC emissions calculations are provided in Appendix A. TAC emission sources include the DPM emissions from the diesel engines used to screen and grind waste materials and compost, on-road haul trucks, and off-road mobile equipment (e.g., loaders), and NH₃ and organic TACs from composting activities, and toxic components of dust from material handling activities.

To assess the potential health risk from the 6 composting scenarios, Prioritization Scores were calculated at various receptor distances using the TAC emissions estimated for that scenario. Additionally, receptor distances

were back-calculated for each scenario to determine the minimum distances at which the facility would be classified as high, intermediate, or low priority based on the applicable Prioritization Score thresholds. Detailed information/results by scenario and distance are presented in Appendix B.

Each air district sets their Prioritization Score thresholds to be used for project-specific evaluations. Table 5-2 summarizes the thresholds for the 4 districts reviewed.

Table 5-2. Prioritization Score Thresholds

Air District	Prioritization Score Threshold Category	Prioritization Score Cancer Risk Thresholds	Prioritization Score Chronic/Acute Risk Threshold	Potentially Significant?
BAAQMD, SJVAPCD, and SCAQMD	High	≥ 10	≥ 10	Yes
	Intermediate	≥ 1 and < 10	≥ 1 and < 10	Yes
	Low	< 1	< 1	No
SDAPCD	High	≥ 100	≥ 10	Yes
	Intermediate	≥ 1 and < 100	≥ 1 and < 10	Yes
	Low	< 1	< 1	No

The significance of the thresholds are described below:

- **High Score:** Projects having a high Prioritization Score may have high risk. A refined Health Risk Assessment is recommended to determine if a Project's TAC emissions would have significant health risk impacts. Thus, this score is considered to have a Potentially Significant human health impact and would necessitate a more detailed analysis for a project-level CEQA review.
- **Intermediate Score:** Projects with an intermediate Prioritization Score, may require further analysis to determine if the Project's TAC emissions would have significant health risk impacts. Many air districts consider projects with an intermediate Prioritization Score to be unlikely to have an adverse health risk, although some districts may require additional analysis. Consultation with the local air district or lead agency would be required to determine if the Project's TAC emissions have a less than significant human health impact. Therefore, this score is considered to have a Potentially Significant impact on human health and would necessitate a more detailed analysis for a project-level CEQA review.
- **Low Score:** Projects with a low Prioritization Score are unlikely to have an adverse health risk, thus are considered to have a Less Than Significant human health impact.

The Health Risk Assessment screening conducted for this study estimates the residential and worker cancer risk, as well as potential chronic and acute non-cancer risks, associated with the 6 scenarios. The results were then used to establish screening distances (i.e., minimum distances from source to receptor) to ensure less than significant health risks impacts to residential and worker receptors would occur. The results of this are shown in

Table 5-3 for each scenario. These distances were determined using the Prioritization Score calculation methodology. Scenarios that achieved a low priority score are assigned a significance determination of Less Than Significant, which is the same across all air districts evaluated (BAAQMD, SJVAPCD, SCAQMD, and SDAPCD), as well as most other districts.

In cases where the distance between the source (i.e., the project) and the nearest receptor is less than the distance shown in Table 5-3 (which indicates a potentially significant impact), individual project proponents should conduct Health Risk Assessment modeling pursuant to the most recent guidance published by OEHHA. Each Health Risk Assessment should incorporate TAC emissions from the proposed project sources specific to that facility, including mobile and stationary sources.

For example, under Scenario 1, if there are no residential receptors within 2,185 feet and, no worker receptors within 1,198 feet of a proposed facility, that project would be considered to have less than significant health risk impacts associated with air toxics. If there are residential receptors within 2,185 feet, or worker receptors within 1,198 feet, that project would be considered to have potentially significant health risk impacts associated with air toxics, and a project-specific Health Risk Assessment should be conducted in accordance with OEHHA and CAPCOA guidelines. The same interpretation applies to the remaining scenarios using the corresponding distances shown in the table. The results of the detailed analysis for each scenario is provided in Appendix B.

Table 5-3. Minimum Distances to Residential and Worker Receptors for Less Than Significant Impact by Scenario for Four Air Districts

Scenario	Minimum Distance to Residential Receptors for Less Than Significant Impact (feet)	Minimum Distance to Worker Receptors for Less Than Significant Impact (feet)
1 (Small Windrow Operation)	2,185	1,198
2 (Small CASP Operation)	1,906	1,043
3 (Small, Negative ASP w/ Filter Operation)	1,874	1,027
4 (Medium Windrow Facility)	3,268	1,792
5 (Medium CASP Facility)	2,792	1,528
6 (Medium, Negative ASP w/ Filter Facility)	2,740	1,500

Note: Residential and worker receptor distances correspond to the residential cancer risk and worker cancer risk thresholds, respectively. For all scenarios, the calculated acute and chronic non-cancer risk distances were less than the corresponding cancer risk distances; therefore, cancer risk is the limiting criterion. Compliance with the cancer risk distance also ensures compliance with the acute and chronic non-cancer risk distance thresholds.

Odor

Construction activities are not a substantial source of objectionable odors. Temporary exhaust emissions from construction equipment may be noticeable in the immediate vicinity of active construction areas, but such emissions would be localized and short-term in duration. Accordingly, construction-related odor impacts would not be considered substantial.

With respect to operation, composting facilities and operations have the potential to generate objectionable odors associated with feedstock handling, active composting, curing, screening, product storage, and other operational activities. The magnitude of potential odor impacts depends on facility size, composting technology, operating practices, meteorological conditions, and the proximity of sensitive receptors. Local jurisdictions with land use authority can and should require individual projects to be consistent with applicable local plans, policies, regulations, and development standards, including any applicable setbacks or buffer zones for potentially odorous operations, as part of project approval and environmental review processes.

The implementation of BMPs for composting facilities and operations would help to minimize the potential for objectionable odors to be perceived off-site from small and medium composting facilities and operations. These measures may be incorporated into permit conditions by the air districts for permitted facilities, into the Odor Impact Minimization Plan (OIMP), implemented voluntarily by a facility and operation as a BMP to minimize odor impacts, or required as CEQA mitigation. With proper site selection, implementation of the required OIMP, and adoption of the appropriate BMPs (either required by permit conditions or adopted voluntarily), odor impacts would be less than significant.

5.2.2 Soil

Because soil contamination from composting facilities and operations is likely to be limited to the immediate vicinity of compost material storage and processing, the greatest risk from contaminated soil is to facility personnel. Facility personnel are performing the feedstock receiving and processing, staging the compost piles, turning and fluffing the piles (if using the windrow methodology), and preparing the mature compost for distribution. Facility personnel could come into direct contact with contaminated surface soil accumulated in the composting storage and processing areas. Dry soil conditions could create a potential inhalation hazard from contaminated dust.

The most effective mitigation measures to protect human health from contaminated soil are to mitigate the potential risk to soil from composting activities by controlling the source of contamination and implementing the General Order requirements list above in Section 5.1.1.

5.2.3 Water (Surface and Groundwater)

Risk to human health from impacted surface water and groundwater can result from contact and ingestion during common uses such as recreational, agricultural, and domestic and municipal supply. The degree of risk is dependent upon many factors including the source and feedstock type as this will influence the potential contaminants present, the contaminant concentrations effecting water quality, the receiving water chemistry, the sensitivity of the receptors, and the exposure duration.

The most effective mitigation measures to protect human health from contaminated surface water and groundwater are to mitigate the potential risk to water from composting activities by controlling the source of contamination by implementing the General Order requirements list above in Section 5.1.2.

5.2.4 Compost and Feedstock

Feedstock and compost are the source of contamination to the environment and ultimately to human health. However, these materials can directly have adverse health effects on compost facility/operation personnel and end users of the mature compost. These risks include physical contaminants (plastics, glass, debris, etc.) present in the feedstock, the inclusion of feedstock types not covered under this program such as animal carcasses and biosolids, and elevated contaminant concentrations in feedstock before reduction during the composting process. Compost facility/operation personnel and end users may come into direct contact with these contaminants if the feedstock is improperly processed, screened, and composted. Improperly screened and processed feedstock has a high risk of exposure to physical contaminants in compost. Properly screened and processed feedstock has a low risk of exposure to physical contaminants in compost. Compost that has not gone through the Process to Further Reduce Pathogens long enough has a high risk of containing elevated pathogen levels. Compost that has gone through Process to Further Reduce Pathogens long enough has a low risk of containing elevated pathogen levels.

Composting facilities and operations are regulated by 14 CCR and are required to perform the following procedures which greatly reduce the risk associated with compost and feedstock.

- Random and routine load checks of feedstocks for contaminants (14 CCR Section 17867).
- Ensure maximum allowable metal concentrations in compost prior to distribution (14 CCR Section 17868.2).
- Pathogen reduction procedures (14 CCR Section 17868.3) including:
 - Windrow process must keep compost at a temperature of 155 °F or higher from at least 15 days
 - ASP or CASP must have at least 6 to 12 inches of insulating material and keep compost at a temperature of 155 °F or higher from at least 3 days
- Establish limits of physical contaminant concentration and processing, sorting, and sizing of feedstock (14 CCR Section 17868.3.1).
- Visual observation of incoming feedstock to identify unacceptable feedstock material (14 CCR Section 17868.5).

14 CCR addresses these risks by ensuring only acceptable feedstocks are received by composting facilities and operations through inspection and monitoring, setting physical contaminant and metal concentration levels, and ensuring compost going through the Process to Further Reduce Pathogens process long enough (depending on compost technology).

6 BMP Evaluation

The General Order and 14 CCR establish requirements that mitigate much of the risk associated with small and medium composting facilities and operations that would be covered by this program. This section discusses additional BMPs that can be considered in conjunction with General Order and 14 CCR requirements to further mitigate risk. BMPs can consist of practices, procedures, and engineering and institutional controls. The BMPs listed may be applicable to mitigate risk associated with more than one media.

- **Use of impermeable or low permeable surfaces:** Use impermeable (asphalt concrete) or low permeable surfaces (compacted clay layer) beneath areas of a facility or operation that will receive, store, and process feedstock and where composting will occur to prevent or limit infiltration of leachate into the subsurface. This should be used particularly when the soil percolation rate and minimum depth to groundwater criteria in the General Order cannot be met.
- **Scraping or cleaning surface of compost/feedstock areas:** Scrape or clean residual feedstock and compost off surface between composting cycles to mitigate potential accumulation of contaminants.
- **Watering of unpaved surfaces:** Adequately water unpaved surfaces, without oversaturating, to mitigate the generation of dust during movement of heavy equipment and facility traffic.
- **Use of detention ponds and surface drainage:** Construct surface drainage ditches around feedstock and compost pads that convey surface water and leachate to detention ponds to prevent run-off.
- **In-vessel composting:** When General Order setback distance criterion of 100 feet from nearest surface water and water supply well cannot be met, utilize in-vessel composting to mitigate run-off of leachate and stormwater that has been in contact with feedstock and compost.
- **Covering feedstock and compost piles:** Cover feedstock and compost piles to limit exposure during storm events by constructing permanent roof structures over these areas or temporarily covering with material such as visqueen, tents, or tarps.
- **Personal Protective Equipment:** Utilize personal protective equipment for facility/operation personnel that handle feedstock and compost material such as nitrile gloves, safety glasses, and face masks to limit direct contact, ingestion, and inhalation exposure.

6.1 Air Toxics

Applicants shall conduct composting activities outside of the minimum screening distances (based on size and facility type) shown in Table 5-3. In the event that a project would be sited within the minimum screening distances, that project should prepare a project-specific Health Risk Assessment to determine whether or not health risks may occur (specific to that project's site conditions). If the Health Risk Assessment modeling determines that a project under the program may result in incremental health risks associated with TAC emissions, additional measures/BMPs should be implemented to avoid or minimize impacts from operation-related TAC emissions.

- Project proponents shall consider use of a different composting method that results in lesser TAC emissions (e.g., Negative ASP with a filter versus windrows);

- Project proponents shall use additional components either as a component of the compost mix or as a surface layer to reduce on-site emissions (e.g., biochar);
- Project proponents shall install diesel particulate filters or implement other CARB verified diesel emission control strategies for heavy-duty equipment;
- Project proponents shall apply U.S. EPA Tier 3 or 4 emissions standards to off-road heavy-duty equipment;
- Project proponents shall use haul trucks with on-road engines instead of off-road engines for on-site hauling;
- Project proponents shall establish an electricity supply and use electric-powered equipment instead of diesel-powered equipment, if feasible;
- Project proponents shall apply on-road diesel PM mitigation measures consistent with CARB's Diesel Certification Program; and
- Project proponents shall utilize renewable natural gas to power on-road vehicles accessing future project sites.

6.2 Odors

BMPs applicable to odor prevention include the following:

- Site selection: Odor impacts can be minimized by ensuring that the site selected for a new compost facility and operation is sufficiently distant from potential receptors. The SJVAPCD GAMAQI recommends a setback distance of 1 mile for a compost facility and operation from potential receptors (SJVAPCD 2015a), which may be unreasonable for many potential compost sites. The GAMAQI has applied that setback distance for several decades, beginning when windrow technology dominated the composting industry, pre-dating modern ASP composting techniques. A modern ASP compost facility and operation will typically have 80% lower emission levels than a comparably sized windrow compost facility and operation. Accordingly, a 1-mile setback distance may be appropriate for a windrow compost facility and operation, but is likely unnecessary for an ASP compost facility and operation. In its Rule 1133 staff report, the SCAQMD recommends a 1/4-mile setback distance (SCAQMD 2011), which would be more appropriate for an ASP compost facility and operation.
- Feedstock storage limitation: Although feedstock composition can determine odor to a large extent, management practices can also have a large impact, and in some cases mitigate odor production.
 - Offensive odors from manure, food, and liquid waste can be minimized by incorporating the waste into a compost pile on the same day they are received.
 - Limiting feedstock storage of green waste and biosolids prior to introducing the material into the compost pile will reduce the occurrence of decomposition, reducing emissions and odors. The BACT standard in air districts that impose permit requirements on feedstock storage is 2 days.
- Develop a compost blend to optimize conditions:

- Balancing the carbon and nitrogen of the initial feedstock, and mixing different types of organic material in quantities to achieve a carbon to nitrogen ratio at a range between 20:1 to 40:1.
 - Ensuring particle size is large enough to allow airflow. This can be accomplished by blending woodchips into dense feedstocks.
 - Add water to the feedstock, as needed, to maintain a moisture content between 40% to 60%.
- Well-constructed, properly aerated static compost piles produce fewer odors.
 - Forcing air through the piles, using either a positive aeration system (pushing air up through the pile) or negative aeration system (pulling air down through the pile) maintains aerobic conditions within the piles.
 - Turning or aerating a windrow at a frequency to maintain a center pile temperature between 110°F to 140°F or an oxygen content greater than 5% will minimize odor emissions.
- Covering piles using breathable fabrics (e.g., the Gore® system) or a finished compost biofilter layer reduces odors as well as VOCs and NH₃ emissions from the piles. The finished compost biofilter layer on compost piles for a positively aerated CASP, or a fixed bed biofilter (mulch, engineered fill, or other binding material) for negatively aerated ASP, further reduces emissions.
- Ensure that the biofilter layer (positive aeration) or the fixed bed biofilter (negative aeration) is properly wetted at all times using a sprinkler system.
- Aerate water retention basins to reduce the occurrence of strong odors (CIWMB 2007, pgs. 27-38).

7 References

- CalRecycle. n.d. SB 1383 Capacity Planning Data by County. Available:
<https://www2.calrecycle.ca.gov/LGCentral/datatools/reports/capacityplanning>. Accessed July 8, 2026.
- California Air Pollution Control Officers Association (CAPCOA). 2016. Air Toxic “Hot Spots” Program, Facility Prioritization Guidelines, August. <https://capcoa.org/wp-content/uploads/2024/07/CAPCOA-Prioritization-Guidelines-August-2016-FINAL.pdf>
- Ch2mHill 2004. Commercial Composting Water Quality Permit Development. Oregon Department of Environmental Quality, Land Quality and Water Quality Divisions. May 12.
- Department of Water Resources (DWR). 2026. California’s Groundwater 2025 Update Highlights. Groundwater: The Foundation of California’s Resilience. March.
- Governo et al. 2003. The Compost White Paper Large-Scale Composting in Georgia. The University of Georgia College of Agricultural & Environmental Science. October.
- Office of Environmental Health Hazard Assessment (OEHHA). 2015. Air Toxics Hot Spots Program, Guidance Manual for Preparation of Health Risk Assessment, February.
<https://oehha.ca.gov/sites/default/files/media/downloads/crnrr/2015gmappendicesaf.pdf>.
- State Water Resources Control Board (SWRCB). 2020. General Wate Discharge Requirements for Commercial Composting Operations, State Water Resources Control Board Order WQ 2020-0012-DWQ. April 7.

Appendix A

Air Emission Calculations

The attachments to this report are available upon request. If you would like to view the modeling outputs, please contact Jeffery Esquivel at permittrainingassistance@calrecycle.ca.gov.

Appendix B

Air Toxics Prioritization Scores

The attachments to this report are available upon request. If you would like to view the modeling outputs, please contact Jeffery Esquivel at permittrainingassistance@calrecycle.ca.gov.