



**OCTOBER 2020 REPORT TO THE STATE WATER BOARD: IMPLEMENTATION OF GENERAL WASTE DISCHARGE REQUIREMENTS FOR COMMERCIAL COMPOSTING OPERATIONS**



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## 1. EXECUTIVE SUMMARY

On August 4, 2015, the State Water Resources Control Board (State Water Board) adopted General Waste Discharge Requirements for Composting Operations, Order WQ 2015-0121-DWQ; a revision to the Composting General Order was adopted on April 7, 2020 (collectively, Composting General Order). Upon adoption of the Composting General Order in 2015, the State Water Board directed staff to work with stakeholders to develop performance measures and report on its implementation. The adoption of the 2020 revisions did not modify the goals or performance measures developed for the Composting General Order. This report presents information on the performance measures and implementation of the Composting General Order through June 2020. The 2021 report will incorporate the implementation of the revised Composting General Order.

The Composting General Order was developed to efficiently support the diversion of organic material from landfills to composting operations while providing requirements to protect water quality. The Composting General Order applies to facilities that compost materials such as green waste, manure, anaerobic digestate, biosolids, food scraps, and paper products. Some composting operations are implementing requirements through other orders and/or may be exempt from the Composting General Order. As of June 2020, there are 120 compost facilities enrolled or are in process of enrolling under the Composting General Order, operating pursuant to individual waste discharge requirements (WDRs), or identified as exempt.

The goals developed in collaboration with stakeholders are:

1. Assess water quality protection;
2. Provide effective and transparent communication of permit requirements and compliance information between regulators and stakeholders;
3. Support diversion of organic materials to composting and anaerobic digestion facilities and engage in the Healthy Soils Initiative; and
4. Assess implementation costs.

State Water Board staff continue to monitor the effectiveness of the Composting General Order through performance measures that include data collection and reporting. In addition, staff continue to conduct outreach and regularly participate in interagency work groups on organics management, the Healthy Soils Initiative, and engage in collaborative activities with other agencies and groups to promote sustainable organics management and remain receptive to industry stakeholders and emerging concerns.

## 2. INTRODUCTION

The State Water Board adopted the Composting General Order on August 4, 2015. Resolution No. 2015-0054 certified the Environmental Impact Report (EIR), State Clearinghouse No. 2015012021. Resolution No. 2015-0054 directed staff to report to the State Water Board on the development and progress of performance measures and the status of enrollment and compliance with the Composting General Order. The State Water Board adopted a Supplemental EIR and revisions to the Composting General Order on April 7, 2020. The accompanying Resolution certified the Supplemental EIR but did not modify the direction to report on the performance of the Composting General Order, nor did the revisions necessitate modifying the performance measures and goals. This is the third annual report presenting an update on performance measures, compliance with the Composting General Order, and education and outreach activities conducted for organic materials management.

Compost contains beneficial micro-organisms and can be useful as a humus-rich soil amendment. To create compost, organic substances are biologically decomposed in a controlled manner to produce a stabilized product. The process of generating compost can produce a leachate. Without adequate controls, leachate can pose a threat to water quality.

The Composting General Order was adopted to provide measures to protect water quality, streamline the permitting process, and support diversion of organic materials away from landfills to composting operations. Depending on the types of feedstocks used, volume of materials on site, and hydrogeologic site conditions, facilities enrolled under the Composting General Order may need to comply with either Tier 1 or Tier 2 requirements. The requirements of the Composting General Order are not intended to be applied to all composting activities; rather, the tiered requirements are intended to apply to most commercial composting operations. Some composting operations are issued individual WDRs or agriculture-specific WDRs, are implementing requirements through other orders, and/or may be exempt from the Composting General Order. Owners of facilities with exempt activities may file a Notice of Non-Applicability (NONA) with the applicable Regional Water Quality Control Board (Regional Water Board) detailing the reasons for exemption from the Composting General Order. Composting facilities operating pursuant to conditional waivers, individual WDRs, or other general orders applicable to composting operations may be able to continue operations in accordance with those orders.

This report includes a discussion of performance measures associated with the Composting General Order, a description of composting operations enrolled under the Composting General Order, the permitting of composting operations statewide, and organic materials management.

### **3. GOALS AND PERFORMANCE MEASURES**

Developing performance measures and providing subsequent reports is important for communicating to the public the effectiveness of the Water Boards in protecting California's waters. Establishing and using performance measures to track and report progress in meeting goals and targets helps to better manage and evaluate our programs, activities, priorities, and efficiency. Development of performance measures is intended to improve communication and transparency between state regulators and the regulated community, to demonstrate the State Water Board's support for diversion of organic materials to composting and anaerobic digestion facilities, and to assess compliance with the Composting General Order.

State Water Board staff collaborated with stakeholders in 2016 to develop performance measures for the implementation of the Composting General Order. Performance deliverables are summarized in Table 1, Composting General Order Implementation Performance Plan Deliverables. Additional details on the development process for goals and performance measures are provided in previous annual reports. Because the goals and performance measures were established in 2016 and haven't changed, the focus of these annual reports will be on compliance with the Composting General Order, the goals, and the performance measures. Below is a discussion of the actions taken by State Water Board staff in support of set goals.

#### **Goal 1: Assess Water Quality Protection**

The Composting General Order was developed to provide streamlined requirements for most composting facilities to implement to protect water quality. This report presents regulatory compliance information from facilities enrolled in the Composting General Order and an evaluation of water quality monitoring data from enrolled facilities, with identification of potential incidences of groundwater impacts when evident. Evaluating facility and monitoring information will aid in assessing the adequacy of Composting General Order requirements. Four Tier 2 facilities had groundwater monitoring wells in place prior to enrollment; a summary of groundwater monitoring results is included in Appendix C. Two other Tier 2 facilities proposed to install groundwater monitoring wells in lieu of working surface hydraulic conductivity improvements. As groundwater monitoring data become available, the information will be added to the annual report.

Prior to adoption of the Composting General Order, the requirements for many facilities were inconsistent. There are 86 facilities enrolled or in the process of enrolling in the Composting General Order. Most of these facilities are making structural improvements to protect water quality. The details of the structural improvements are discussed in Section 4.2.2, Compliance Approaches. These facilities process more than half of the approximately 6 million tons of organic materials composted in California per year.

## **Goal 2: Effective and Transparent Communication of Permit Requirements and Compliance Information between Regulators and Stakeholders**

Stakeholders expressed concern that requirements of the Composting General Order may be inconsistent with other regulations. State Water Board staff are developing, in collaboration with CalRecycle staff, an online, interactive tool for the composting community. This tool will guide the user through a series of questions to give the user an idea of what permits may be needed for a composting operation from both CalRecycle and the Water Boards. The objectives of the tool are to 1) assist the composting community to navigate the requirements of both agencies, 2) help streamline the permitting process, and 3) increase transparency and consistency in agency staff's application of requirements. This tool is anticipated to be available in late 2020.

To foster consistency and transparency, State Water Board staff meet frequently with state and local agencies to discuss composting-related regulations and associated interagency issues. State Water Board staff meet with smaller stakeholder groups, engage in continuous communication with Regional Water Board staff and individual stakeholders about Composting General Order implementation and applicability, and engage in a variety of organics management-related conferences and training courses. The [State Water Board compost website](http://www.waterboards.ca.gov/water_issues/programs/compost/) ([http://www.waterboards.ca.gov/water\\_issues/programs/compost/](http://www.waterboards.ca.gov/water_issues/programs/compost/)) includes frequently asked questions and responses and a list of facilities fully enrolled under the Composting General Order.

## **Goal 3: Support Diversion of Organic Materials to Composting and Anaerobic Digestion Facilities and Engage in the Healthy Soils Initiative**

Stakeholders expressed concern that costs of compliance with the Composting General Order may result in green waste materials currently received at composting facilities to be redirected to landfills or directly applied to land with no composting or pathogen reduction. Stakeholders were also concerned that the flow of organic materials was unknown and that the Composting General Order would not prove to be an efficient regulatory mechanism to meet the expected increase in organic materials to be diverted from landfills.

The Composting General Order was developed to support the diversion of organic materials from landfills to composting operations and provide streamlined requirements to protect water quality at composting facilities. Of the estimated statewide composting throughput, more than 50% is processed at 84 composting facilities operating or planning to operate pursuant to the Composting General Order. Approximately 30% of the statewide composting throughput is processed at 26 composting facilities operating pursuant to individual WDRs. These percentages are estimates as specific throughput data are not available during the transition period of AB 901 regulation implementation

(Assembly Bill No. 901; Gordon. Solid waste: reporting requirements: enforcement. 2015–2016 Reg. Sess., Stats. 2015, ch. 746). The Composting General Order requires reporting of maximum on-site volume while throughput metrics will be reported to CalRecycle following full implementation of AB 901. Once AB 901 is fully implemented, organic material managers will be required to report information to CalRecycle to track the flow of organic materials and better understand organic materials lifecycles. These efforts are ongoing and CalRecycle staff are coordinating with State Water Board staff on the implementation of AB 901 and Senate Bill No. 1383 (SB 1383; Lara. Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills. 2015–2016 Reg. Sess., Stats. 2016, ch. 395) which support California’s statewide diversion and recycling goals.

State Water Board staff continue to collaborate with CalRecycle and Local Enforcement Agency (LEA) staff, conduct education and outreach regarding proper land application practices and applicable regulations, encourage the responsible management of organic material through composting and anaerobic digestion, and communicate enforcement on illegal dumping. A discussion on land application and organics management is included in this report in Section 5, Organic Materials Management.

Staff are also engaged in the California Healthy Soils Initiative. Water Board staff meet with staff from the California Department of Food and Agriculture (CDFA), CalRecycle, California Environmental Protection Agency (CalEPA), California Air Resources Board (CARB), and the California Natural Resources Agency at numerous interagency meetings as composting operations are critical in supporting both diversion goals and the Healthy Soils Initiative. State Water Board staff serve on the CDFA Environmental Farming Act Science Advisory Panel, the CDFA On-Farm Composting Committee, and participate in groups such as the CARB SB 1383 Dairy and Livestock Subgroups discussing research needs and alternate manure management practices.

#### **Goal 4: Assess Implementation Costs**

Stakeholders expressed concern that the cost to comply with hydraulic conductivity requirements of the Composting General Order may negatively impact the composting industry and compost use by either making the cost to comply more than is economically viable or driving the price of compost higher than what consumers are willing to pay. State Water Board staff understand that compliance modifications come at a cost. To make financial assistance information more readily accessible, links to [funding sources and financial aid](#) available from multiple state agencies are posted on the State Water Board compost website ([https://www.waterboards.ca.gov/water\\_issues/programs/compost/#resources](https://www.waterboards.ca.gov/water_issues/programs/compost/#resources)). State Water Board staff received estimates for costs to modify two existing facilities and included this information in the 2018 report to the State Water Board. Staff have not received estimates of the real costs of continuing business while implementing modifications, the real costs to construct a new facility, the costs of



engineered alternatives, or information indicating whether the costs to comply with the requirements of the Composting General Order resulted in facilities modifying operations. If this information becomes available, it will be included in the annual report.

**Table 1. Composting General Order Implementation Performance Plan Deliverables**

Number	Performance Deliverables	Status
1.1	Beginning in August 2017, report the number of enrolled facilities and their compliance approaches.	Ongoing
1.2	By August 2017, report the number of enrolled facilities that were previously unregulated.	Completed
1.3	Beginning in August 2017, report to the State Water Board the statewide volume of organic materials processed at composting operations.	Ongoing
1.4	Provide an annual report to the State Water Board every autumn beginning in 2017.	Ongoing
1.5	Report incidences of groundwater impacts in the annual update of the report to the State Water Board every autumn beginning in 2018.	Ongoing
1.6	Beginning in autumn 2018, report on water quality monitoring data gathered from enrolled operations in the annual update of the report to the State Water Board	Ongoing
2.1	Continue educating regulators and stakeholders on the implementation of the Composting General Order by posting frequently asked questions and fact sheets on the State Water Board compost website by the end of 2016.	Completed
2.2	Maintain an updated list of enrolled facilities on the State Water Board compost website to improve access and communication of enrollment information beginning in September 2016.	Ongoing
3.1	Beginning in August 2017, report to the State Water Board on education and outreach activities coordinated with CalRecycle; provide an annual update.	Ongoing
3.2	Beginning in the autumn of 2018, report the number of enforcement actions in the annual update of the report to the State Water Board.	Ongoing
3.3	Starting with the 2018 annual report to the State Water Board, report actions taken in coordination with CalRecycle on AB 901 implementation. As reporting in accordance with AB 901 regulations will not commence until 2019, the 2020 annual report will be the first to include an update on the reporting information.	Ongoing
3.4	Beginning in August 2017, report to the State Water Board the facilities enrolled and compliance information; update annually.	Ongoing
3.5	Provide GeoTracker deployment and training to compost operators for the utilization of the database to upload required documents. Phase-in to begin August 2017.	Completed
3.6	Report by August 2017 a comparison of the amount of time it takes to issue notices of applicability for enrollment under the Composting General Order relative to the amount of time it generally takes to issue individual Waste Discharge Requirements for composting facilities.	Completed
3.7	Starting with the 2018 annual report to the State Water Board (and CalEPA), report enforcement actions or recommendations to ensure responsible management of organic material.	Ongoing

Number	Performance Deliverables	Status
4.1	Starting with the 2018 report to the State Water Board, report known costs of compliance with the Composting General Order; update annually.	Ongoing
4.2	Beginning with the 2018 report to the State Water Board, report if any facilities are closing or reducing/changing feedstock due to specific cost of compliance with the Composting General Order; update annually.	Ongoing
4.3	Provide information for potential funding sources on the State Water Board compost website by August 2017.	Completed and Ongoing
4.4	Beginning with the 2018 report to the State Water Board, report known engineered alternatives and associated costs; update annually.	Ongoing

## 4. COMPOSTING OPERATIONS

### 4.1 COMPOSTING STATEWIDE

Composting operations are typically regulated through WDRs. As shown in Table 2, Statewide Enrollees for the Composting General Order, 84 composting facilities are enrolled or are in the process of enrolling under the Composting General Order. Approximately 26.5% of enrolled facilities are in Tier 1 and 73.5% are in Tier 2. An [interactive map and list of enrolled facilities](#) is available on the State Water Board compost website and includes links to facility information in both the GeoTracker and CIWQS databases ([https://www.waterboards.ca.gov/water\\_issues/programs/compost/#map](https://www.waterboards.ca.gov/water_issues/programs/compost/#map)). Operations in the process of enrolling under the Composting General Order, facilities with a notice of non-applicability (NONA), and facilities with individual WDRs are not included in the list on the State Water Board compost website. As shown in Table 3, Facilities Not Enrolled Under the Composting General Order, there are approximately 26 composting facilities operating pursuant to individual WDRs and 10 facilities with a NONA submitted to the Regional Water Board and determined to be exempt from the Composting General Order. Of the 10 NONA facilities, 4 are exempt due to small volume, 3 are fully enclosed composting operations, 1 is no longer composting, 1 is a chip and grind operation, and 1 has a paved working surface and is operating pursuant to the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Industrial Activities, Order 2014-0057-DWQ (Industrial General Permit).

**Table 2. Statewide Enrollees for the Composting General Order**

Regional Water Board	Tier 1 Enrollees	Tier 2 Enrollees	Enrollment in Process	General Order Total
1 – North Coast	0	0	5	5
2 – San Francisco	1	3	0	4
3 – Central Coast	1	6	2	9
4 – Los Angeles	1	2	2	5
5 – Central Valley	4	21	9	34
6 – Lahontan	0	2	1	3
7 – Colorado River	0	2	0	2
8 – Santa Ana	7	2	2	11
9 – San Diego	0	1	10	11
<b>TOTAL</b>	<b>14</b>	<b>39</b>	<b>31</b>	<b>84</b>

Tables 2 and 3 were compiled for the purpose of tracking Composting General Order enrollment and do not represent all composting facilities statewide. These tables show 120 compost facilities enrolled or are in process of enrolling under the Composting General Order, operating pursuant to individual WDRs, or identified as exempt. Approximately 170 composting facilities are listed in CalRecycle and Water Board databases. Because of limitations inherent in database outputs, these numbers are not intended to be inclusive of all composting activities in the state.

**Table 3. Facilities Not Enrolled Under the Composting General Order**

<b>Regional Water Board</b>	<b>Individual WDRs</b>	<b>NONA</b>
1 – North Coast	0	0
2 – San Francisco	2	0
3 – Central Coast	1	0
4 – Los Angeles	3	0
5 – Central Valley	11	5
6 – Lahontan	3	0
7 – Colorado River	2	0
8 – Santa Ana	4	5
9 – San Diego	0	0
<b>TOTAL</b>	<b>26</b>	<b>10</b>

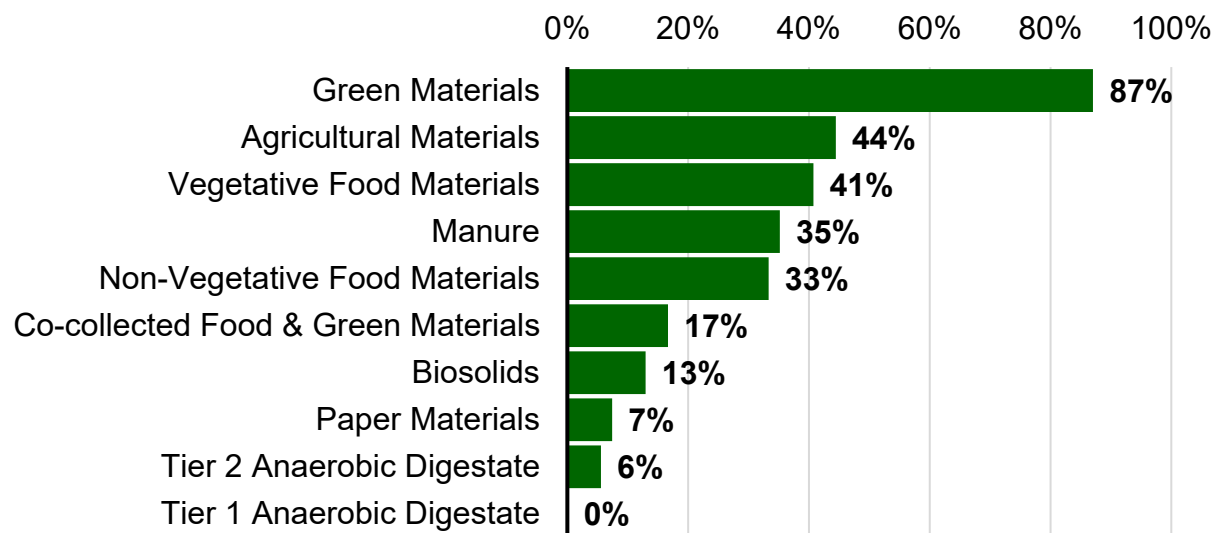
Site-specific conditions at composting operations may further complicate a comprehensive database search for composting sites. For example, Regional Water Board staff may determine that some composting operations operating pursuant to the Industrial General Permit have sufficient measures in place to protect water quality, the requirements of the Composting General Order may not be applicable, and/or the owner may submit a NONA. Composting operations with NONAs do not always have database records and these notices are not required to be tracked in State Water Board databases. Therefore, the combined totals of composting facilities from Tables 2 and 3 do not match the estimated number from available databases. State Water Board staff will work to continue to improve transparency, communication, and collaboration with other regulatory agencies and stakeholders to clarify apparent discrepancies.

## 4.2 COMPOSTING FACILITIES ENROLLED UNDER THE COMPOSTING GENERAL ORDER

### 4.2.1. Feedstocks

A variety of feedstocks are allowed under the Composting General Order. Tier 1 facilities may accept agricultural materials, green materials, paper materials, vegetative food materials, residentially co-collected food and green materials, and anaerobic digestate derived from Tier 1 feedstocks. Manure may be accepted as a feedstock at a Tier 1 facility if a groundwater protection monitoring plan is also implemented. In addition to Tier 1 feedstocks, Tier 2 facilities may accept non-vegetative food materials, biosolids (Class A, B, and/or Exceptional Quality [EQ]), and anaerobic digestate derived from Tier 2 feedstocks. As shown in Figure 1, Frequency of Allowable Feedstocks Used at Enrolled Facilities, most facilities compost green materials, including 10 that accept green materials as their only feedstock. Very few accept anaerobic digestate. Most enrolled facilities accept a combination of materials for composting.

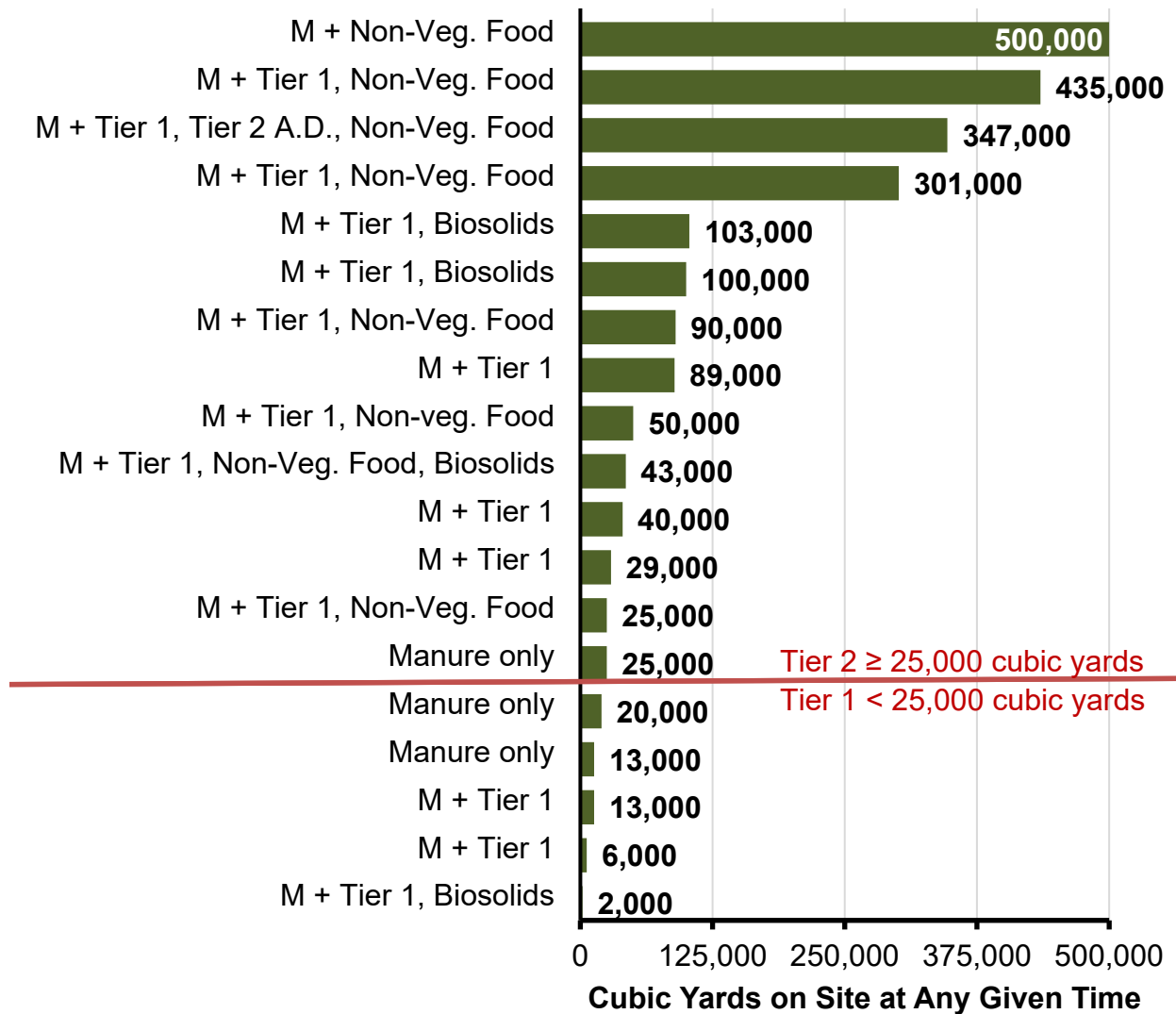
**Figure 1. Frequency of Allowable Feedstocks Used at Enrolled Facilities**



Of the 39 Tier 2 composting facilities enrolled under the Composting General Order, 19 facilities include manure as a feedstock. Manure is the only feedstock at three of these facilities. Figure 2, Volume and Feedstocks Composted at Manure-Composting Facilities, compares the approximate volumes of materials on site and the types of feedstocks received at the 19 facilities. Facilities with greater than or equal to 25,000 cubic yards on-site are required to meet Tier 2 specifications, regardless of the feedstocks. Facilities with less than 25,000 cubic yards on-site and accepting only Tier 1 feedstocks may be eligible for Tier 1. The Composting General Order was revised on April 7, 2020, to allow manure to be composted at a Tier 1 facility if a groundwater protection monitoring plan is implemented and the facility has less than 25,000 cubic

yards of material on site at any given time. Five facilities enrolled in the Composting General Order that compost manure have less than 25,000 cubic yards on site. One of these accepts Tier 2 materials and is ineligible for the revised Tier 1. The remaining four facilities, located near confined animal operations, are now potentially eligible for Tier 1. Each facility is implementing a phased approach to compliance with Tier 2; the path to compliance may be modified to meet the revised Tier 1 if chosen and as appropriate.

**Figure 2. Volume and Feedstocks Composted at Manure-Composting Facilities**



Abbreviations Used in Figure 2:

- |              |   |
|--------------|---|
| M            | Manure  |
| Tier 1       | Tier 1 feedstocks   |
| Non-Veg Food | Non-vegetative food material                                  |
| Tier 2 A.D.  | Anaerobic digestate derived from allowable Tier 2 feedstocks. |
| Biosolids    | Class A, B, and/or Exceptional Quality (EQ) biosolids.        |

#### 4.2.2. Compliance Approaches

The Composting General Order allows composters to achieve compliance in a phased approach. If this option is pursued, a plan must be submitted with proposed schedules for implementation of planned collection, control, and monitoring practices. Compliance schedules must not exceed six years from the date the notice of intent was submitted to the Regional Water Board, be supported with appropriate technical or economic justification, and be as soon as practicable. The Regional Water Board Executive Officer may modify the schedules based on evidence that meeting the compliance date is technically or economically infeasible.

Most composting operations enrolled under the Composting General Order proposed compliance schedules within the six-year timeframe. Figure 3, Scheduled Year for the Completion of Compliance Modifications at Enrolled Facilities, presents a breakdown of the compliance schedules for the 53 enrolled composting facilities. About 60 percent of enrolled Tier 1 and Tier 2 facilities are compliant with the Composting General Order. Compliant facilities are either new facilities under development and constructed to the design specifications of the Composting General Order, existing facilities compliant upon enrollment, or existing facilities that completed compliance modifications by 2019.

**Figure 3. Scheduled Year for the Completion of Compliance Modifications at Enrolled Facilities**

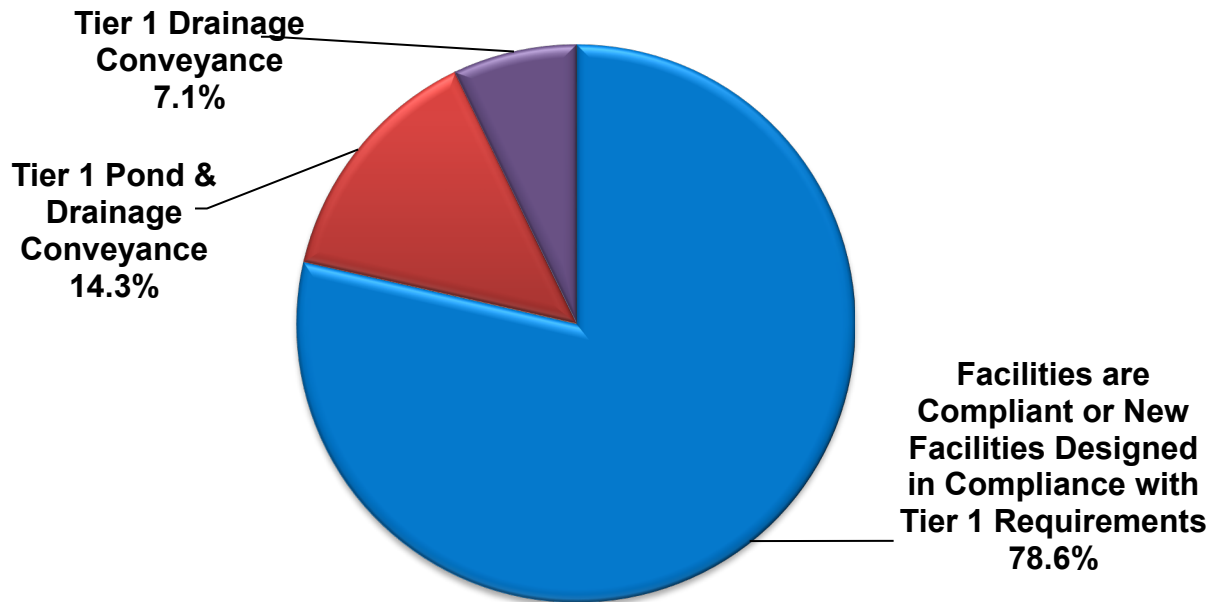


The following figures show the compliance modifications proposed to meet the requirements of the Composting General Order at enrolled Tier 1 and Tier 2 facilities. Figures 4 and 5 show the combinations of modifications within each tier compared with the percentages that met the requirements upon enrollment. Figures 6 and 7 show Tier 2 compliance approaches in further detail, divided by working surfaces and wastewater pond modifications. Dischargers may propose engineered alternatives for the design and construction of ponds, working surfaces, and drainage ditches to demonstrate compliance with the requirements of the Composting General Order.



As shown in Figure 4, Proposed Compliance Modifications at Tier 1 Facilities, most Tier 1 facilities were already in compliance with Tier 1 specifications upon enrollment or are new facilities being designed to comply. Tier 2 facilities may require additional modifications to meet Composting General Order specifications.

**Figure 4. Proposed Compliance Modifications at Tier 1 Facilities**



As shown in Figure 5, Proposed Compliance Modifications at Tier 2 Facilities, most Tier 2 facilities need to adjust their structural design. About 31% of Tier 2 facilities were compliant upon enrollment or were new facilities being designed to comply. Of the enrolled Tier 2 facilities, about 28% are modifying all three containment features (working surfaces, drainage conveyance, and wastewater pond) and 20.5% will make improvements to wastewater ponds alone.

**Figure 5. Proposed Compliance Modifications at Tier 2 Facilities**

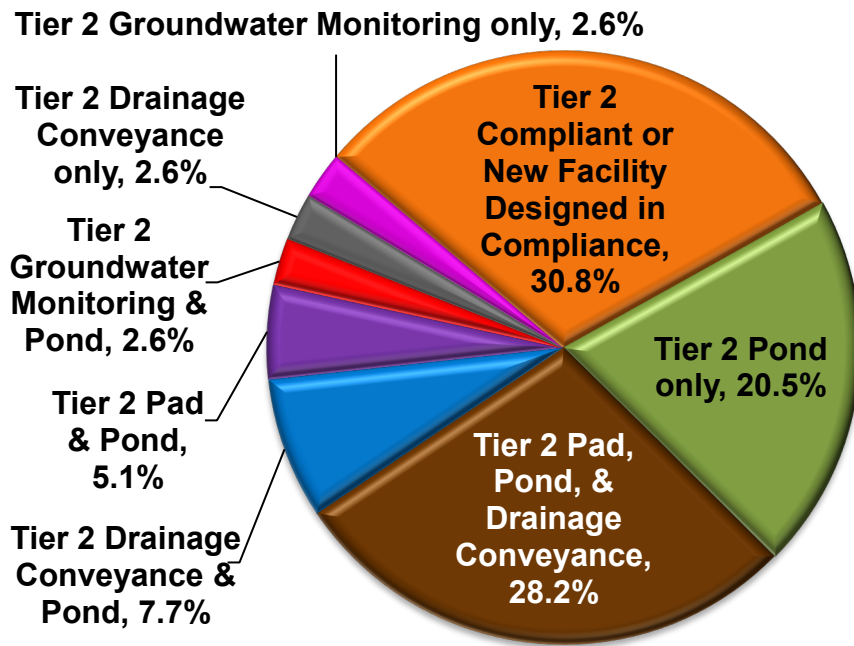
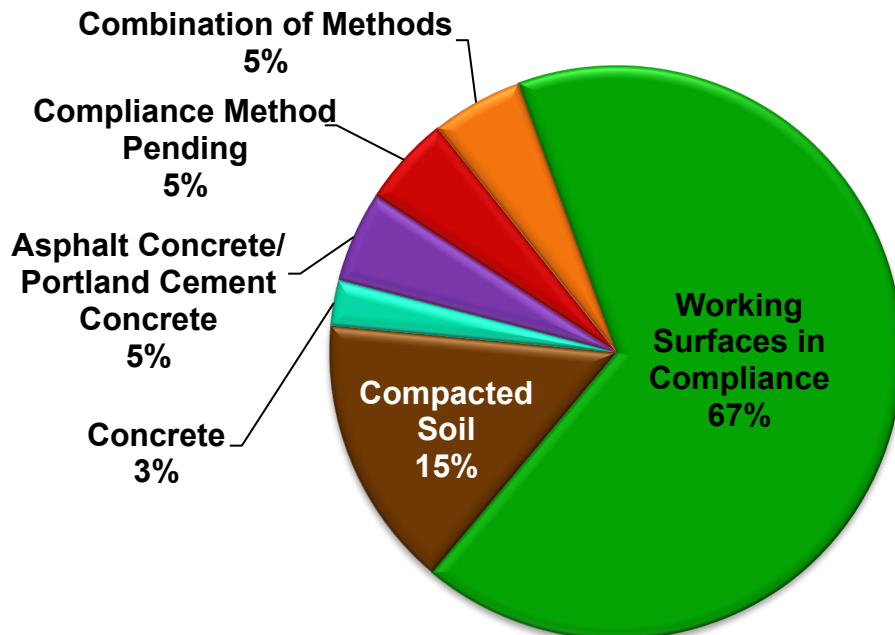


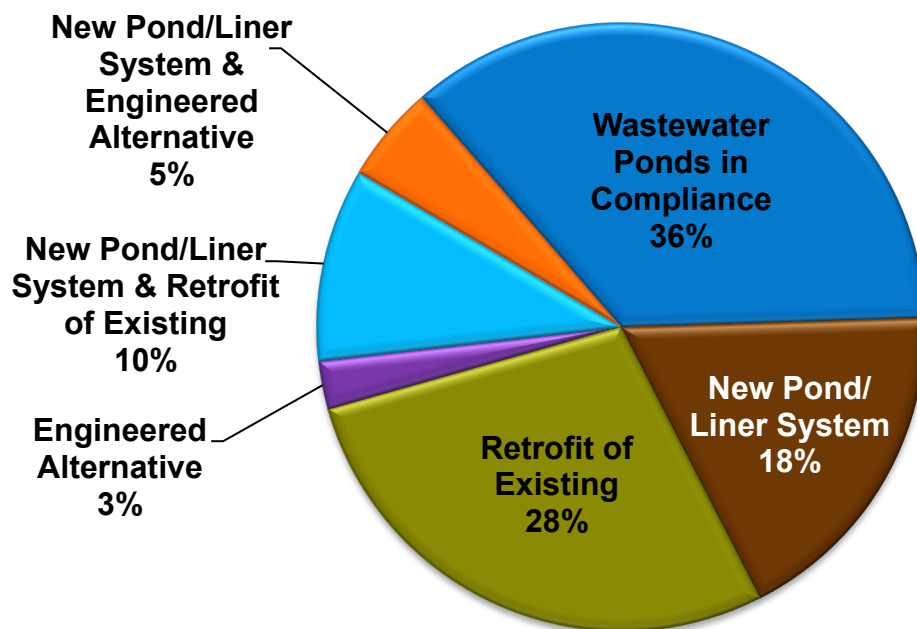
Figure 6, Proposed Working Surface Improvements at Tier 2 Facilities, shows that 67% had compliant working surfaces and 33% were proposing modifications. Compacted soil is chosen by about half of the Tier 2 facilities proposing working surface improvements.

**Figure 6. Proposed Working Surface Improvements at Tier 2 Facilities**



As shown in Figure 7, Proposed Wastewater Pond Improvements at Tier 2 Facilities, approximately 64% of Tier 2 facilities will modify existing wastewater ponds or build new ones. Including those with alternative methods of wastewater handling, 36% of Tier 2 facilities had wastewater containment systems which met the requirements of the Composting General Order upon enrollment. Approximately 28% will retrofit existing ponds, 18% will install new ponds or liner systems, and 10% will both retrofit existing ponds and build new pond systems. Together Figures 5 and 7 show that pond modifications are a major factor for compliance at Tier 2 facilities.

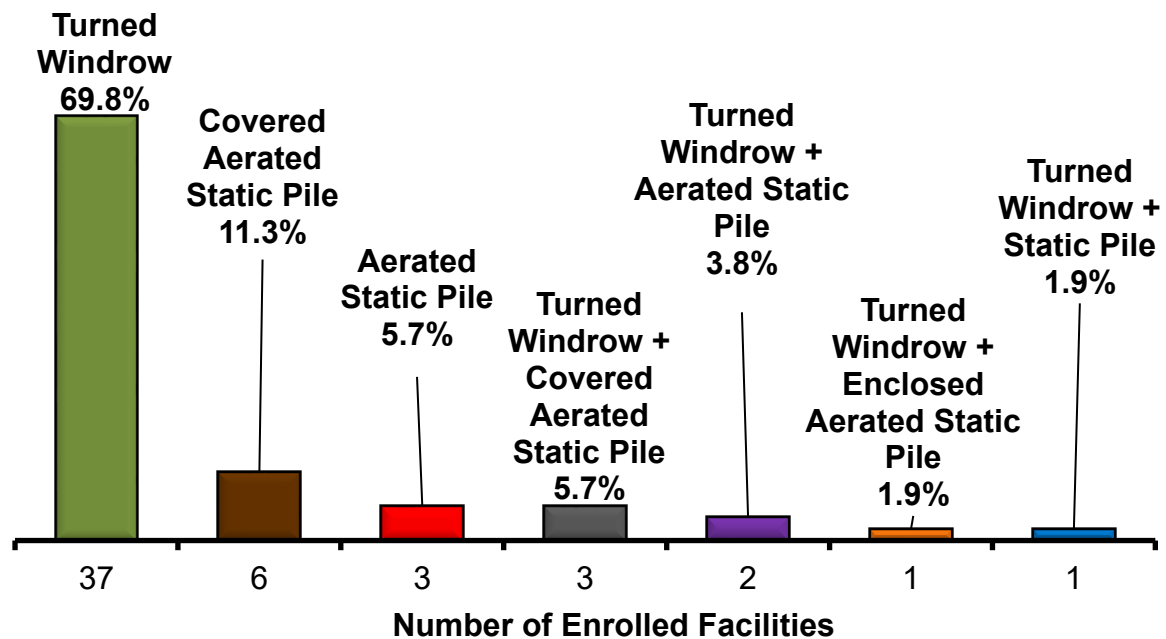
**Figure 7. Proposed Wastewater Pond Improvements at Tier 2 Facilities**



#### 4.2.3. Composting Methods

A variety of composting methods are chosen to suit specific operations, feedstocks, and local conditions. As shown in Figure 8, Composting Methods at Enrolled Facilities, the most common composting methods are turned windrow and aerated static pile (covered or uncovered). Some facilities use a combination of methods.

**Figure 8. Composting Methods at Enrolled Facilities**



#### **4.3 COMPOSTING OPERATIONS WITH INDIVIDUAL WDRs OR REGION-SPECIFIC GENERAL WDRs**

There are at least 26 composting facilities operating pursuant to individual WDRs. Many of these individual WDRs are in accordance with California Code of Regulations, title 27, to require more protective measures due to siting considerations and/or the materials accepted. Eight are co-located at landfills and requirements for the composting operations are incorporated into the WDRs for the landfill. Composting activities may also take place at other facilities such as confined animal facilities or publicly owned treatment works where compostable materials handling is regulated through operation-specific WDRs. In 2014, the San Diego Regional Water Board adopted a general conditional waiver of WDRs for composting operations in the San Diego region. The conditional waiver expired in 2019; eligible operations began enrolling under the Composting General Order in 2019.

## **5. ORGANIC MATERIALS MANAGEMENT**

### **5.1 GENERAL OVERVIEW**

The requirements in the Composting General Order are intended to protect against potential threats to water quality from discharges from composting operations. The Composting General Order was developed to streamline permitting of composting operations with similar materials and operations. Other operations, such as chip and grind facilities and land application activities, use similar materials as those used at composting facilities; however, these activities are regulated differently because the operations are different from the composting process operation. This section discusses management of organic materials not occurring at composting facilities.

### **5.2 CHIP AND GRIND FACILITIES**

The chip and grind process involves mechanically reducing the size of green materials including tree and yard trimmings, untreated wood wastes, and natural fiber products. Organic material from chip and grind facilities can be used as feedstock for biomass energy, composting, or anaerobic digester facilities; or may be applied directly to land as a soil amendment. CalRecycle requires that chip and grind material not be on site for more than 48 hours (or up to 7 days with LEA approval) and must not reach active composting temperatures. The material holding time and temperature restrictions reduce the potential for materials to start composting.

Although organic materials do not remain for long periods of time at chip and grind facilities, the materials may pose a threat to waters of the state unless managed appropriately. The material holding time and temperature restrictions at these facilities limit the biological decomposition of organic materials and the generation of leachate which reduce the threat to groundwater quality. However, the operations may pose a threat to surface water from runoff of sediment and organic particulates. Chip and grind facilities may be more appropriately regulated under the Industrial General Permit or individual WDRs. During the Composting General Order outreach process, State Water Board staff became aware that few chip and grind facilities were enrolled under the Industrial General Permit. In response to this, State Water Board staff began education and outreach efforts to chip and grind operators in 2017 by sending notification letters with information regarding the Industrial General Permit and applicability of the permit to the operation. Staff will continue outreach efforts to increase Industrial General Permit enrollment.

### 5.3 LAND APPLICATION OF UNCOMPOSTED ORGANIC MATERIALS

Land application is the spreading of uncomposted organic materials on land such as rangeland and cropland. These materials are often size-reduced prior to spreading and may include materials from curbside green waste collection or agricultural activities such as grass clippings, leaves, garden waste, plant trimmings, bark, agricultural plants, or food waste. Uncomposted organic materials may contain metals, pathogens, nutrients (e.g. nitrate), salts, or other waste constituents, and may harbor damaging insects. In addition, uncomposted organic materials from sources such as curbside waste collection may include contaminants such as trash, plastics, glass, metals, pet waste, and other materials. If not conducted appropriately, the application of uncomposted organic materials to land may impact surface and groundwater. Land application of uncomposted organic materials may be considered a discharge of waste to land subject to regulation by the Water Boards. For example, the Regional Water Boards are adopting orders which include requirements for irrigation and nutrient application to agricultural land in the Irrigated Lands Regulatory Program. The application of green waste to agricultural lands must be accounted for in a grower's nutrient management plan. Orders for land application of organic material require implementation of best management practices, and include conditions requiring water quality monitoring of receiving waters and corrective action when impairment is found.

Stakeholders expressed concern that the increased costs of producing compost due to meeting the requirements in the Composting General Order would create an incentive to directly land apply organic materials. State Water Board staff are working in close coordination with CARB, CalRecycle, and LEA representatives on issues related to land application and organic materials management. State Water Board staff conducted joint education and outreach meetings with the State Water Board's Office of Enforcement and CalRecycle staff in response to stakeholder concerns. The first phase of education and outreach involved joint training for Regional Water Board and LEA staff in addition to presentations LEA roundtables; this phase began in January 2016. State Water Board staff also published and distributed an informational pamphlet, also available on the [State Water Board compost website](#). A hyperlink to the CalEPA Environmental Complaint System was added to the State Water Board compost website. The second phase involved delivering the same message to the regulated community and other involved/interested parties.

Since 2016, State Water Board staff have coordinated with CalRecycle staff to provide education and outreach on land application issues and regulations. CalRecycle and State Water Board staff collaborated on a land application training series in 2018. As a result of the outreach program, State Water Board staff were notified of several land application locations with potential water quality issues. Some of the sites were known and investigations and enforcement actions are ongoing. Preliminary investigations

revealed that land application activities have been occurring for nearly a decade, prior to the development of the Composting General Order.

Several sites were identified as potential illegal applications of uncomposted organic materials to land that may pose a threat to water quality and beneficial uses, as shown in Table 4, Summary of Land Application Enforcement Cases Since the Adoption of the Composting General Order (2015 to 2020). Sites include ongoing cases, sites discovered by Regional Water Board staff or the LEA, or sites identified and reported by the public. These activities are known to be taking place primarily in the Central Coast, Los Angeles, Central Valley, Santa Ana, and San Diego Regions. The Water Boards may decide to pursue further enforcement actions such as issuing notices of violation (NOVs), California Water Code Section 13260 or 13267 violations, cleanup and abatement orders (CAOs), or Administrative Civil Liabilities (ACLs). There continues to be active enforcement on sites statewide involving collaboration with the LEA. Some land application activities may be in violation of one agency's regulations/requirements but not the other. And at some sites, both agencies may determine that the land application of uncomposted organic material was conducted at a proper rate, meets CalRecycle's land application standards, and does not pose a threat to water quality or public health.

Water Board enforcement staff actively investigate complaints as resources allow and will continue collaboration with CalRecycle and LEA staff on land application activities and enforcement issues. Water Board and CalRecycle staff recognize that enforcement is a necessary component of ensuring compliance; however, staff are focusing on education to prevent contamination and dumping in land application areas. CalRecycle is developing protocols for determining levels of contaminants in compostable materials by weight. The Composting General Order provides exemptions for on-site composting which may encourage responsible on-site management of organic waste and reduce off-site disposal.

Notes for Table 4 below:

- Totals included in the “No. of Cases” column are active and inactive cases as recorded by the Regional Water Boards between 2015 and 2020. An individual case may include multiple enforcement actions.
- Totals included in the "Active Cases" column are cases that are currently active or pending enforcement.
- Totals included in the “Pending Inspection and Violation Determination” column are the number of cases the Regional Water Boards have been informed of and are pending inspection or the violation type is pending determination.
- Totals included in the “Regional Water Board Determined No Threat to Water Quality” column are the number of sites the Regional Water Boards have inspected in coordination with other agencies (e.g. LEA) and determined there were no violations or threats to water quality.

**Table 4. Summary of Land Application Enforcement Cases Since the Adoption of the Composting General Order (2015 to 2020)**

Regional Water Board	No. of Cases	Notices of Violation (NOV)	Clean Water Code Section 13260 & 13267 Violation Letters	Cleanup and Abatement Orders (CAO)	Active Cases	Regional Water Board Determined No Threat to Water Quality
North Coast	-	-	-	-	-	-
San Francisco	-	-	-	-	-	-
Central Coast	2	-	2	-	-	-
Los Angeles	1	-	-	-	-	1
Central Valley	3	7	-	-	-	1
Lahontan	-	-	-	-	-	-
Colorado River Basin	-	-	-	-	-	-
Santa Ana	2	1	-	-	-	-
San Diego	3	2	-	1	1	-
<b>TOTAL</b>	<b>11</b>	<b>10</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>



## 5.4 MANURE MANAGEMENT

California's agriculture contributes significantly to the state economy and commodity export. The Central Valley is the largest agricultural region in California and is one of the world's most productive agricultural areas. In addition to crop production, agricultural operations include animals such as chickens, cows, sheep, goats, and pigs. Many of these operations are known as confined animal facilities, which are farms or ranches, including dairies, where livestock are held for a significant part of the time and are provided food, as opposed to grazing. These operations produce large quantities of manure that must be managed appropriately to prevent water quality impairment. Materials such as manure may pose a higher threat to water quality due to concentrations of pathogens, nitrates, and salts.

To reduce impacts to water quality from manure, the Central Valley Regional Water Board adopted a comprehensive Dairy General Order, Waste Discharge Requirements General Order No. R5-2013-0122 for Existing Milk Cow Dairies. The Dairy General Order includes requirements for corrals, production areas, ponds, and land application areas. Any new dairies, or dairies that expanded since 2005, may not be eligible for coverage under the Dairy General Order and may be subject to individual WDRs. The Central Valley Regional Water Board also adopted general WDRs applicable to feedlots in the Confined Bovine Feeding Operations General Order on June 8, 2017. The Dairy Representative Monitoring Program evaluated manure management at dairies and made recommendations for best management practices. The goal of the Representative Monitoring Program is to identify on-farm management practices that are protective of groundwater quality. Data and analysis from the final report will aid in determining appropriate protective requirements for manure management at dairies. Those requirements will be incorporated into the upcoming revised Dairy General Order.

At agricultural operations, a variety of methods are used to manage manure, including land spreading, anaerobic digestion, and composting. As shown in Figure 1 of Section 4.2.1, approximately 35% of enrolled composting facilities use manure as feedstock. Stakeholders are concerned that the requirements of the Composting General Order are cost-prohibitive to compost manure on farms. The Composting General Order was not intended to apply to composting conducted on farms to manage manure or create compost for on-farm use. The State Water Board revised the exemption in the Composting General Order to support on-farm composting practices. Waste discharge requirements for confined animal facility operations address manure handling and storage; therefore, additional coverage under the Composting General Order may not be necessary.

Stakeholders expressed concern with imposing the same requirements on herbivore manure composting as non-herbivore manure composting. The 2015 EIR analysis discussed that composting nutrient-rich feedstocks on coarse-textured soils where there are no barriers to soil-water movement has the potential to create elevated nitrate

concentrations in groundwater. The State Water Board revised the Composting General Order to allow animal manure as a Tier 1 feedstock if a groundwater protection monitoring plan is implemented. Through a contract with the State Water Board, the University of California at Davis is conducting research on manure best management practices. The results of this research are anticipated to be reported in 2022 and may inform future revisions of the Composting General Order and the Dairy General Order.

## **5.5 CALIFORNIA HEALTHY SOILS INITIATIVE**

CDFWA is the agency responsible for leading California's Healthy Soils Initiative. In collaboration with other state agencies and departments, the goal of the Healthy Soils Initiative is to promote the development of healthy soils on California's natural and working lands. Health of agricultural soil relates to its ability to build and retain adequate soil organic matter through the activity of plants and soil organisms. Soils with adequate soil organic matter have the capacity to function as vital living ecosystems that sustain and produce food for plants, animals, and humans, and increase carbon sequestration and reduce overall greenhouse gas emissions. The proper application of compost can increase soil organic matter and contribute to soil health. The Composting General Order streamlines permitting of composting facilities and may contribute to more compost use.

State Water Board staff are engaged in the California Healthy Soils Initiative and meet regularly for interagency meetings with staff from CDFWA, CalRecycle, CalEPA, CARB, Department of Pesticide Regulation, and the California Natural Resources Agency. Meetings include the Environmental Farming Act Science Advisory Panel, California Agriculture Partnership Forum, workgroups associated with Assembly Bill No. 1045 (Irwin; Organic waste: composting. 2015–2016 Reg. Sess.; Stats. 2015, ch. 596), the California Roundtable on Agriculture and the Environment, meetings for the Healthy Soils Initiative and on-farm composting work groups, and CARB SB 1383 subgroup meetings regarding alternate manure management practices and dairy digester research needs.

## 6. SUMMARY

The application of compost is one of several sustainability practices promoted by California's Healthy Soils Initiative. Agronomically-applied compost helps retain soil moisture, provides nutrients, and may reduce irrigation needs and runoff potential. With several goals for diversion of organic materials from landfills, composting operations are critical in supporting both diversion efforts and soil health. Although compost is a beneficial product, composting operations may pose a threat to water quality through the discharge of leachate or wastewater with high concentrations of nitrogen, phosphorus, metals, and pathogens. The State Water Board adopted the Composting General Order to provide a streamlined mechanism to support the production of compost while providing minimum standards for water quality protection.

The Composting General Order was developed concurrently with CalRecycle's efforts to divert organic materials from landfills and in support of the Healthy Soils Initiative. Stakeholders were concerned that implementing the Composting General Order will impact the statewide composting infrastructure as well as the attainment of legislative mandates for waste diversion. Most of the focus centered on the timing and costs of compliance, the ability of the composting facilities to construct the required protection measures, and the diversion of organic material away from composting facilities to related activities such as chip and grind facilities and direct application of uncomposted materials to land. In order to address these concerns, State Water Board staff met with industry stakeholders to develop performance measures. The performance measures included reporting requirements for enrollment in the Composting General Order and collaborating with other agencies to ensure consistent and transparent communication and regulation.

Through education and outreach activities, State Water Board staff became aware of land application activities that were previously unknown to the state. Some of these activities have been occurring for years prior to the development of the Composting General Order. State Water Board staff are collaborating with other agencies for further investigation and enforcement action as necessary. State Water Board staff continue to meet with other agencies and interested stakeholders on topics such as organics management, Healthy Soils, sustainable agriculture, and tracking of organic material through diversion efforts to ensure transparency and collaborative communication. The State Water Board adopted revisions to the Composting General Order related to agricultural operations and manure management practices on April 7, 2020. State Water Board staff intend to annually update this report to reflect current activities related to organic materials management and the Composting General Order.

## APPENDIX A - GLOSSARY OF TERMS

- Beneficial Uses** – potential uses of waters of the state to be protected against quality degradation. Beneficial uses include but are not limited to domestic, municipal, agricultural and industrial supply, power generation, recreation, aesthetic enjoyment, navigation, and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. (Wat. Code, § 13050)
- CIWQS** – The California Integrated Water Quality System (CIWQS) is one of the Water Board’s primary systems for tracking regulatory data for several programs including land disposal and WDR programs. It is also used to track municipal and regionally issued stormwater permit information, and some irrigated lands and timber harvest information. It also accepts certain types of electronically submitted data from the regulated community.
- Composting** – Composting is the biological decomposition of organic materials by microorganisms under controlled aerobic conditions to create a product (e.g., soil amendment or soil blend). Compostable materials comprise a wide range of material types: grass, leaves, branches, prunings, stumps, wood waste, agricultural materials, manure, food, and biosolids.
- Discharger** – any person who discharges waste that could affect the quality of waters of the state and includes any person who owns a waste management unit or who is responsible for the operation of a unit. (Cal. Code Regs., tit. 27, § 20164)
- General WDRs** – a regulatory order that pertains to a group of waste management units that employ similar operations, waste types, and treatment standards. (Wat. Code, § 13263, subd. (i))
- GeoTracker** – an internet-accessible database system used by the Water Boards and local agencies to track and archive compliance data from authorized or unauthorized discharges of waste to land, or unauthorized releases of hazardous substances from underground storage tanks. GeoTracker consists of a relational database, on-line compliance reporting features, a geographic information system (GIS) interface, and other features utilized to input, manage, or access compliance and regulatory tracking data. (Cal. Code Regs., tit. 23, §§ 3891–3895)
- Groundwater** – water below the land surface that is at or above atmospheric pressure. (Cal. Code Regs., tit. 27, § 20164)
- Leachate** – any liquid formed by drainage of liquids from waste or the percolation of liquid through waste, including any dissolved or suspended constituents extracted from waste. (Cal. Code Regs., tit. 27, § 20164)

**Liner** – a continuous layer of natural or artificial material, a continuous membrane of flexible artificial material, or a continuous composite layer consisting of a membrane of flexible artificial material directly overlying a layer of engineered natural material. The liner is installed beneath or on the sides of a waste management unit and acts as a barrier to both vertical or lateral fluid movement (Cal. Code Regs., tit. 27, § 20164)

**Operator** – the person(s) responsible for the overall operation of a facility or part of a facility. (40 C.F.R., § 258 (1996))

**Owner** – the person(s) who owns a facility or part of a facility. (40 C.F.R. § 258 (1996))

**Publicly Owned Treatment Works** – i.e. wastewater treatment facilities

**Threat to Water Quality** – a rating used to determine the relative threat of discharges of waste that could cause the degradation, impairment, or long-term loss of a designated beneficial use of the receiving water. (Cal. Code Regs., tit. 23, § 2200)

**Waiver** – a regulatory order that may be issued in lieu of WDRs for a specific discharge or a specific type of discharge. Requirements for WDRs may be waived by the Regional Water Board if it determines that the waiver is consistent with any applicable water quality control plan and is in the public interest. (Wat. Code, § 13269)

**Waste Discharge Requirements (WDRs)** – a formal set of requirements prescribed and adopted by the Regional Water Boards as to the nature of any proposed discharge, existing discharge, or material change in an existing discharge, with relation to conditions existing in the disposal area or receiving waters upon, or into which, the discharge is made or proposed. The requirements implement any relevant water quality control plans that have been adopted and take into consideration the beneficial uses. (Wat. Code, § 13263; Cal. Code Regs., tit. 27, § 21720).

**Waters of the State** – any surface water or groundwater, including saline waters, within the boundaries of the state (Wat. Code, § 13050).

## **APPENDIX B – LIST OF ACRONYMS AND ABBREVIATIONS**

AB 901	Assembly Bill No. 901 (Gordon)
CalEPA	California Environmental Protection Agency
CalRecycle	California Department of Resources Recycling and Recovery
CARB	California Air Resources Board
CDFA	California Department of Food and Agriculture
EIR	Environmental Impact Report
LEA	Local Enforcement Agency
NONA	Notice of Non-Applicability
Regional Water Board	Regional Water Quality Control Board
SB 1383	Senate Bill No. 1383 (Lara)
State Water Board	State Water Resources Control Board
Wat. Code	California Water Code
WDRs	Waste Discharge Requirements

## **APPENDIX C – GROUNDWATER MONITORING RESULTS SUMMARY**

The following groundwater monitoring results include summary tables from four Tier 2 facilities showing data for 2017 through the first quarter of 2019. Analytical data was collected from groundwater monitoring wells on site. Each well was sampled for the parameters listed in Table B-3 of the Composting General Order Monitoring and Reporting Program. These parameters may be used to indicate a release from the facility and include pH, total dissolved solids, nitrate (as N), sodium, chloride, and total coliform organisms.

Some of the results were compared to recommended action levels found in Basin Plan Water Quality Objectives (WQOs) or primary and secondary maximum contaminant levels (MCLs) included in the California Code of Regulations, Title 22, for municipal drinking water.

### **Site 1**

For the 2017 through 2019 monitoring periods, total dissolved solids levels in each sample exceeded MCLs at Site 1. The discharger indicated in the monitoring report that high total dissolved solids levels are existing conditions not attributable to facility operations and do not indicate releases from the sites. Recommended action levels were not exceeded for any of the other parameters listed in Table B-3 of the Composting General Order.

### **Site 2**

The groundwater monitoring program at Site 2 has been discontinued. Groundwater monitoring was required under previous individual WDRs and samples were analyzed annually for pH, total dissolved solids, nitrate, sodium, and chloride. Site 2 meets the requirements for working surface compaction, therefore, groundwater protection monitoring is not required. Future reports will omit groundwater monitoring results for Site 2.

### **Site 3**

Throughout the 2017 and 2018 monitoring periods, Site 3 was sampled semi-annually for pH, total dissolved solids, and nitrate but was not sampled for sodium, chloride, or total coliform organisms. In 2018, some samples exceeded primary MCLs for total dissolved solids. In 2019, more monitoring points were added, and samples were analyzed quarterly for each of the parameters listed in Table B-3 of the Composting General Order. In 2019, some pH values were below the lower WQO, and some samples exceeded recommended action levels for total dissolved solids, nitrate, and total coliform organisms. Future sampling may determine if these concentrations are indicative of a release.

## **Site 4**

From the fourth quarter of 2018 through 2019, about a third of samples taken measured pH values below the lower WQO.

Total dissolved solids concentrations exceeded recommended action levels at Site 4 in more than 75% of samples from 2017 through 2019.

Nitrate levels exceeded the MCL at Site 4 in two thirds of the samples from one cross-gradient well between 2017 and 2019. Exceedances did not occur in samples from other wells.

Chloride was detected above the secondary MCL twice in samples from one downgradient well, once in 2017 and once in 2019.

Total coliform organisms were detected at Site 4 with concentrations greater than 1,600 most probable number per 100 milliliters. High concentrations of total coliform organisms were detected in all wells.

For each of the exceeded constituents, it appears there are generally higher concentrations in downgradient relative to upgradient wells. The monitoring reports for Site 4 indicate that exceedances of total dissolved solids and nitrate levels may be existing conditions not attributable to facility operations and results from samples collected from the wastewater pond do not appear to show correlated concentrations for chloride. Additional sampling and trend evaluation are needed to determine if the concentrations detected in groundwater are indicative of a release from the facility.

## **Groundwater Data Tables**

The following six tables include summarized data from four Tier 2 composting operations that implement groundwater monitoring programs. Each of these Tier 2 composting operations had groundwater monitoring programs in place prior to enrollment under the Composting General Order. The high and low results for each parameter were included when available. Most data were rounded to the nearest whole number and pH values were rounded to the nearest tenths. Where "0" values are indicated, the measured value was below 0.5, rounded down for this summary. Data are summarized from upgradient, downgradient, and cross-gradient groundwater monitoring wells.



**Table C-1. pH**

pH is measured in pH units.

<b>Quarter &amp; Year</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>
Quarter 1, 2017	7.5 to 7.5	7 to 7.9	7.4 to 8	6.9 to 8
Quarter 2, 2017	7.4 to 7.8	—	—	7.2 to 7.7
Quarter 3, 2017	7.5 to 7.8	—	7.7 to 7.8	7 to 7.4
Quarter 4, 2017	7.4 to 7.7	—	—	6.6 to 7.3
Quarter 1, 2018	7.2 to 7.5	6.5 to 6.6	7.4 to 7.6	6.7 to 7.3
Quarter 2, 2018	7.1 to 7.4	—	—	6.9 to 7.3
Quarter 3, 2018	7 to 7.5	—	7.2 to 7.9	6.5 to 6.7
Quarter 4, 2018	7.1 to 7.4	—	—	6.3 to 6.6
Quarter 1, 2019	7 to 7.4	—	7.3	6.4 to 7
Quarter 2, 2019	7.5 to 7.9	—	7.4 to 7.6	7.1 to 7.8
Quarter 3, 2019	7.2 to 7.5	—	6.3 to 7.9	6 to 6.4
Quarter 4, 2019	6.8 to 7.2	—	6.3 to 7.9	6.4 to 6.8

**Table C-2. Total Dissolved Solids**

Total Dissolved Solids are measured in milligrams per liter (mg/L).

<b>Quarter &amp; Year</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>
Quarter 1, 2017	700 to 1240	180 to 1110	440 to 450	380 to 2200
Quarter 2, 2017	680 to 1230	—	—	260 to 2000
Quarter 3, 2017	680 to 1220	—	470 to 480	440 to 2400
Quarter 4, 2017	710 to 1240	—	—	290 to 1600
Quarter 1, 2018	690 to 1130	200 to 260	490 to 510	430 to 1600
Quarter 2, 2018	720 to 1200	—	—	340 to 1900
Quarter 3, 2018	670 to 1120	—	440 to 520	420 to 1900
Quarter 4, 2018	710 to 1240	—	—	380 to 1700
Quarter 1, 2019	710 to 1100	—	390 to 460	310 to 2100
Quarter 2, 2019	720 to 1100	—	430 to 540	270 to 1900
Quarter 3, 2019	730 to 1050	—	390 to 1300	450 to 2000
Quarter 4, 2019	560 to 980	—	420 to 1400	480 to 2500

**Table C-3. Nitrate (as N)**

Nitrate (as N) is measured in milligrams per liter (mg/L).

<b>Quarter &amp; Year</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>
Quarter 1, 2017	0 to 1	1 to 10	2	0 to 20
Quarter 2, 2017	1 to 2	—	—	0 to 21
Quarter 3, 2017	0 to 1	—	1	0 to 12
Quarter 4, 2017	0 to 1	—	—	0 to 12
Quarter 1, 2018	0 to 1	3 to 6	1	0 to 6
Quarter 2, 2018	0 to 1	—	—	0 to 15
Quarter 3, 2018	0 to 1	—	1	0 to 14
Quarter 4, 2018	0 to 2	—	—	0 to 9
Quarter 1, 2019	0 to 2	—	2 to 7	0 to 7
Quarter 2, 2019	0 to 2	—	1 to 6	0 to 21
Quarter 3, 2019	0 to 1	—	0 to 49	0 to 13
Quarter 4, 2019	0 to 1	—	0 to 45	0 to 7

**Table C-4. Sodium**

Sodium is measured in milligrams per liter (mg/L).

<b>Quarter &amp; Year</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>
Quarter 1, 2017	220 to 554	7 to 37	—	1 to 69
Quarter 2, 2017	220 to 409	—	—	8 to 74
Quarter 3, 2017	223 to 417	—	—	10 to 65
Quarter 4, 2017	230 to 422	—	—	9 to 150
Quarter 1, 2018	240 to 421	9 to 11	—	11 to 81
Quarter 2, 2018	225 to 384	—	—	11 to 66
Quarter 3, 2018	210 to 376	—	—	11 to 49
Quarter 4, 2018	219 to 389	—	—	15 to 58
Quarter 1, 2019	211 to 375	—	72 to 93	7 to 59
Quarter 2, 2019	210 to 373	—	97 to 140	8 to 57
Quarter 3, 2019	206 to 353	—	33 to 380	10 to 46
Quarter 4, 2019	236 to 412	—	38 to 430	11 to 270

**Table C-5. Chloride**

Chloride is measured in milligrams per liter (mg/L).

<b>Quarter &amp; Year</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>
Quarter 1, 2017	130 to 170	5 to 181	—	8 to 140
Quarter 2, 2017	130 to 190	—	—	15 to 170
Quarter 3, 2017	130 to 170	—	—	18 to 250
Quarter 4, 2017	130 to 170	—	—	8 to 600
Quarter 1, 2018	130 to 170	8 to 10	—	22 to 190
Quarter 2, 2018	130 to 160	—	—	19 to 150
Quarter 3, 2018	140 to 170	—	—	20 to 160
Quarter 4, 2018	140 to 170	—	—	22 to 180
Quarter 1, 2019	130 to 160	—	24 to 25	11 to 200
Quarter 2, 2019	130 to 160	—	24 to 25	17 to 170
Quarter 3, 2019	130 to 160	—	11 to 200	23 to 250
Quarter 4, 2019	140 to 160	—	12 to 220	25 to 1100

**Table C-6. Total Coliform Organisms**

Total Coliform Organisms are measured in most probable number per 100 milliliters (MPN/100 mL).

<b>Quarter &amp; Year</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>
Quarter 1, 2017	—	—	—	13 to 920
Quarter 2, 2017	—	—	—	2 to 240
Quarter 3, 2017	—	—	—	2 to 49
Quarter 4, 2017	—	—	—	2 to >1600
Quarter 1, 2018	—	—	—	2 to 920
Quarter 2, 2018	—	—	—	2 to 33
Quarter 3, 2018	—	—	—	2 to 540
Quarter 4, 2018	—	—	—	8 to >1600
Quarter 1, 2019	—	—	<2 to 130	13 to 350
Quarter 2, 2019	—	—	<2 to 23	<2 to 33
Quarter 3, 2019	—	—	<2 to 240	<2 to 130
Quarter 4, 2019	—	—	<2 to 13	23 to >1600

