BACWA
BAY AREA
CLEAN WATER
AGENCIES

# Bay Area Clean Water Agencies
# 2021 Biosolids Trends Survey Report

Photo: Upgraded Digesters for Temperature Phased Anaerobic Digestion at San José-Santa Clara Treatment Plant. Source: City of San José.

December 28, 2021

# Contents

## 1. Introduction

Biosolids management programs at Publicly Owned Treatment Works (POTWs) in the San Francisco Bay Region continue to be challenged by rapidly rising costs and a complex regulatory environment. Biosolids programs are affected by changes to solid waste disposal, air quality, and water quality regulations. From the solid waste disposal side, legislation and regulation aimed at diverting organic material from landfills will phase out landfill burial and Alternative Daily Cover (ADC) beginning January 1, 2022. The California Association of Sanitation Agencies' (CASA's) *Summary of SB 1383 and its Implementation*[1] outlines the regulatory challenges facing biosolids reuse and management alternatives for California agencies. Diverting food waste and biosolids from landfills will require greater on-site production and use of biogas, increased land application of treated biosolids, and deployment of new technologies.

Bay Area Clean Water Agencies (BACWA) is a joint powers agency whose members own and operate POTWs and sanitary sewer systems that collectively provide sanitary services to over 7.1 million people in the nine-county San Francisco Bay Area (Bay Area). In summer 2021, BACWA distributed a survey[2] to its member agencies to better understand the state of the biosolids treatment, disposal, and reuse in the Bay Area. The survey is a repeat of previous surveys conducted in 2016[3] and 2018[4]. The intent of this survey was to quantify specific biosolids information and track industry trends for the following issues:

- *Biosolids production volumes*
- *Treatment and dewatering technologies*
- *End use and disposal options*
- *Biosolids management technologies and destination*
- *Hauling and tipping costs*
- *Agency challenges*
- *Strategies for SB 1383 compliance*
- *Marketing and public outreach*

The Survey includes responses from the following 31 agencies, representing more than 95 percent of the total flow of BACWA member agencies, plus the City of Santa Rosa (which is not a BACWA member):

- Central Contra Costa Sanitary District
- Central Marin Sanitation Agency
- City of American Canyon
- City of Benicia
- City of Hayward
- City of Livermore
- City of Millbrae

[1] https://bacwa.org/wp-content/uploads/2020/11/SB-1383-and-its-Implementation-CASA-2020.pdf
[2] https://bacwa.org/wp-content/uploads/2021/07/Biosolids-Survey-2021-Nonfillable-PDF-Version.pdf
[3] https://bacwa.org/wp-content/uploads/2017/08/BACWA-2016-Biosolids-survey-report-1.pdf
[4] https://bacwa.org/wp-content/uploads/2020/12/9-BACWA-2018-Biosolids-Survey-Report-Final-2020-12-10.pdf

- City of Palo Alto
- City of Petaluma
- City of San Jose
- City of San Leandro
- City of San Mateo
- City of Santa Rosa
- City of South San Francisco - San Bruno Water Quality Control Plant
- City of Sunnyvale
- Delta Diablo
- Dublin San Ramon Services District
- East Bay Municipal Utility District
- Fairfield-Suisun Sewer District
- Las Gallinas Valley Sanitary District
- Mt. View Sanitary District
- Napa Sanitation District
- Novato Sanitary District
- Oro Loma Sanitary District
- San Francisco Public Utilities Commission
- Sewer Authority Mid-Coastside
- Sewerage Agency of Southern Marin
- Silicon Valley Clean Water
- Union Sanitary District
- Vallejo Flood & Wastewater District
- West County Wastewater District

The list of respondents above is the same as a prior version of this survey conducted in 2016 and 2018.The body of the report summarizes the data provided by agencies, while data on reuse and disposal destinations is presented in full in **Appendix A**. It is BACWA's intention to conduct this survey every 2-3 years. Agency responses will be used as part of a regional conversation about the future of biosolids management in Northern California, to identify regional needs, and to support efforts to identify and develop additional sustainable biosolids reuse alternatives. The survey was coordinated with the Southern California Alliance of Publicly Owned Treatment Works (SCAP) Biosolids Trends Survey[5] and allows data comparisons between northern and southern California agencies.

BACWA wishes to thank all agencies that took the time and effort to assist with the production of this survey and report.

## 2. Treatment Technology

Survey respondents reported the technology used to produce and treat biosolids at each facility. Most facilities (26 out of 31 respondents) use mesophilic anaerobic digestion, as shown below in **Figure 1**. Many facilities reported using more than one method of treatment, including both on-site treatment and treatment that occurs after hauling to another facility, as noted below:

- City of San Jose uses mesophilic anaerobic digestion, lagoon stabilization, and air drying.
- East Bay Municipal Utility District and San Francisco Public Utilities Commission operate both thermophilic and mesophilic digestion.

[5] SCAP Biosolids Trends Survey https://bacwa.org/wp-content/uploads/2020/11/2018_SCAP_BIOSOLIDS_BIENNIAL-2020_01_14-FINALv3.pdf

- West County Wastewater District, Sunnyvale, and Dublin San Ramon Services District use mesophilic anaerobic digestion followed by pond or lagoon stabilization.
- Oro Loma Sanitary District, City of Hayward, City of San Leandro, and Silicon Valley Clean Water reported use of air drying following anaerobic digestion.
- 9 facilities reported hauling to another facility for further treatment by Thermal Hydrolysis (i.e., Lystek). This is an increase over the 6 facilities that reported hauling to Lystek in the 2018 survey.
- 6 facilities reported hauling to another facility for further treatment via composting.

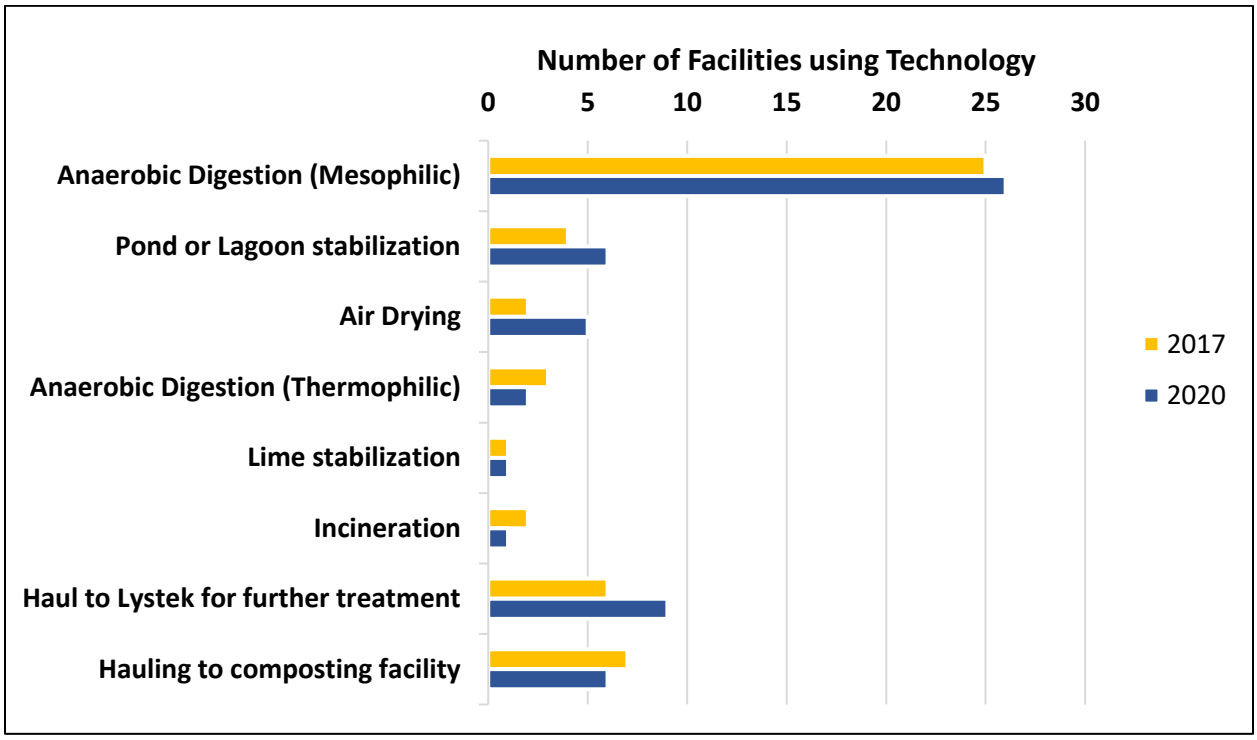


**Figure 1. Technology used for biosolids production and management by survey respondents.**

Compared to 2017, the 2020 survey showed slight changes in the number of agencies using mesophilic and thermophilic anaerobic digestion, pond and lagoon stabilization, and air drying. These adjustments appear to be related to changes in the survey responses, rather than being tied to actual facility changes.

## 3. Annual Biosolids Production

Survey respondents reported their biosolids production for the 2018, 2019, and 2020 calendar years. **Table 1** lists the type of biosolids produced by each agency, based on the classifications defined by EPA Rule 503[6]. Solids designated as EQ are "Exceptional Quality" biosolids, and "Other Quality" solids do not need to meet the 503 Rules, due to their final disposition. **Figure 2** and **Figure 3** compare the total tonnage of wet and dry tons, respectively. The dry tonnage reported in Figure 3 for 2018 and 2019 assumes that percent solids were approximately the same as 2020.

About half of the biosolids produced in the San Francisco Bay Region are Class B, while Class A accounts for about 40% of production. Production of Class A biosolids dropped dramatically in 2016 and 2017, but has since rebounded. There are two principal reasons for this trend. First, Dublin San Ramon Services District reported that their treated biosolids are Class A in this survey, but they were tracked as "other" in the survey covering 2016 and 2017. Second, the City of San Jose temporarily ceased testing its biosolids to demonstrate that they meet Class A quality. Testing was ceased because their biosolids were not going to Class A re-use and the cost of the additional testing was providing no tangible benefits. San Jose resumed testing in 2018. For both Dublin San Ramon Services District and San Jose, the solids were the same quality throughout this period, despite changes in classification.

**Table 1. Classes of biosolids produced by respondents**

| Agency | Biosolids Class |
|---|---|
| **American Canyon, City of** | B |
| **Benicia, City of** | B |
| **Central Contra Costa Sanitary District** | Other (Incineration) |
| **Central Marin Sanitation Agency** | B |
| **Delta Diablo** | B |
| **Dublin San Ramon Services District** | A |
| **East Bay Municipal Utility District** | B |
| **Fairfield-Suisun Sewer District** | A |
| **Hayward, City of** | A |
| **Las Gallinas Valley Sanitary District** | B |
| **Livermore, City of** | B |
| **Millbrae, City of** | B |
| **Mt. View Sanitary District** | B |
| **Napa Sanitation District** | B |
| **Novato Sanitary District** | B |
| **Oro Loma Sanitary District** | A (in 2020) and B (in 2018, 2019) |

[6]See the "Plain English Guide to the EPA Part 503 Biosolids Rule" at https://www.epa.gov/sites/production/files/2015-05/documents/a_plain_english_guide_to_the_epa_part_503_biosolids_rule.pdf

| Agency | Biosolids Class |
|---|---|
| **Palo Alto, City of** | Other (Incineration in 2018 and 2019, then off-site treatment to Class A in 2020) |
| **Petaluma, City of** | B |
| **San Francisco Public Utilities Commission** | B |
| **San Jose, City of** | A[a] |
| **San Leandro, City of** | A and B |
| **San Mateo, City of** | B |
| **Santa Rosa, City of** | B |
| **Sewer Authority Mid-Coastside** | B |
| **Sewerage Agency of Southern Marin** | B |
| **Silicon Valley Clean Water** | B |
| **South San Francisco - San Bruno WQCP, City of** | B |
| **Sunnyvale, City of** | B |
| **Union Sanitary District** | B |
| **Vallejo Flood & Wastewater District** | B |
| **West County Wastewater District** | B |

[a] In 2018, City of San Jose biosolids were reported as Class B because pathogen testing was not performed. Testing to demonstrate Class A quality resumed in 2019.

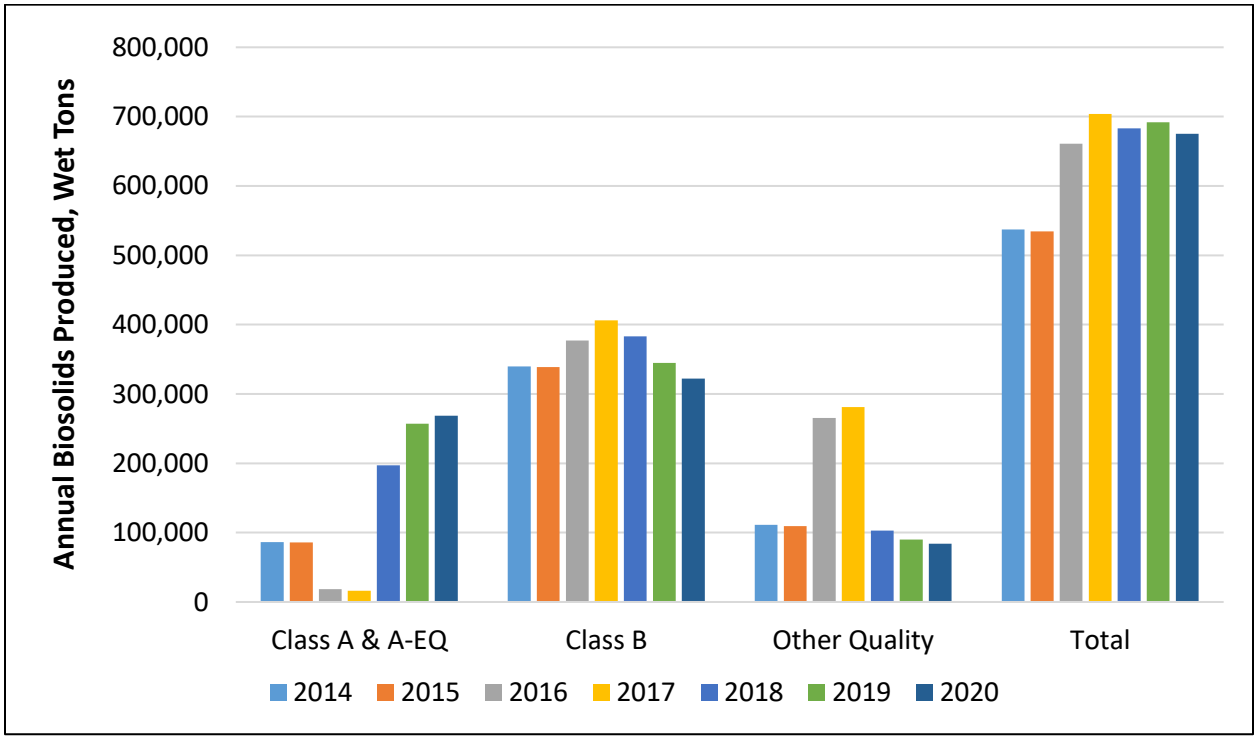


**Figure 2. Aggregate wet tons of biosolids of different classes produced by survey respondents.**

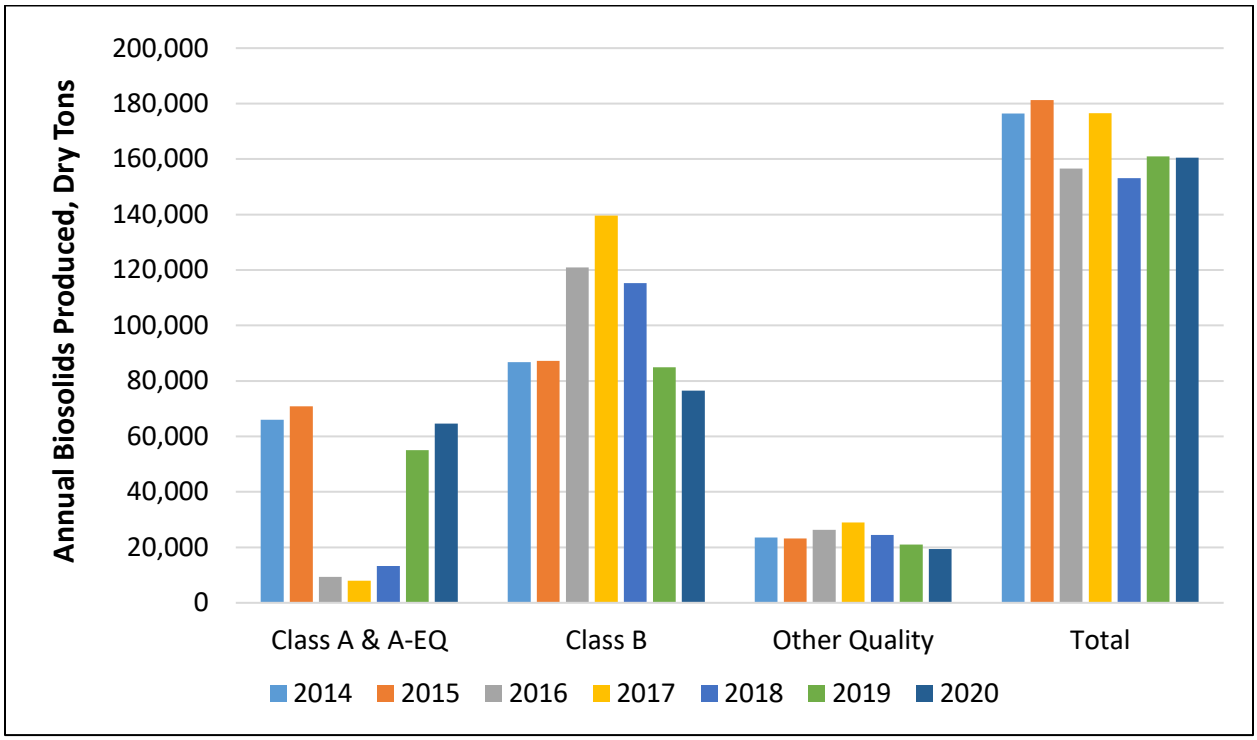


**Figure 3. Aggregate dry tons of biosolids of different classes produced by survey respondents.**

## 4. Management Options, Management Costs and Dewatering Statistics

**Biosolids Reuse and Disposals Options**

The amount of biosolids sent to each type of reuse and disposal destination by each responding agency is reported in **Table 2.** The accompanying **Figure 4** and **Figure 5** illustrate the relative importance of each reuse and disposal method for wet and dry tons, respectively. Reuse via landfill ADC receives the largest amount of dry tonnage of biosolids in the region, followed by land application. Onsite disposal accounts for a large amount of wet tonnage, but a small amount of dry tonnage because of the low solids content.

The change in reuse and disposal methods over time is illustrated in **Figure** 6 (wet tons) and **Figure 7** (dry tons) (see page 11). From 2017 to 2020, there was a significant drop in the wet and dry tonnage of biosolids sent to landfill ADC. By tonnage, the largest reductions were due to changes in biosolids management practices at San Francisco Public Utilities Commission, East Bay Municipal Utility District, and the City of Petaluma. In addition, four agencies (Benicia, Delta Diablo, Livermore, and Union Sanitary District) sent biosolids to landfill disposal or ADC in 2017, but not in 2020.

**Table 2. Wet tons of biosolids delivered by usage, 2020.**

| Agency | ADC | Landfill Disposal | Land Application | Compost | Lystek | Biochar | Incineration | Onsite Disposal | Storage | Sum |
|---|---|---|---|---|---|---|---|---|---|---|
| American Canyon, City of | 0 | 131 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 131 |
| Benicia, City of | 0 | 0 | 0 | 0 | 2,488 | 0 | 0 | 0 | 0 | 2,488 |
| Central Contra Costa Sanitary District | 0 | 0 | 0 | 0 | 206 | 0 | 66,310[a] | 0 | 0 | 66,516 |
| Central Marin Sanitation Agency | 2,415 | 0 | 1,540 | 0 | 1,775 | 0 | 0 | 0 | 0 | 5,730 |
| Delta Diablo | 0 | 0 | 13,615 | 23 | 0 | 0 | 0 | 0 | 0 | 13,638 |
| Dublin San Ramon Services District | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 174,329 | 0 | 174,329 |
| East Bay Municipal Utility District | 19,463 | 0 | 44,411 | 5,738 | 0 | 0 | 0 | 0 | 0 | 69,612 |
| Fairfield-Suisun Sewer District | 0 | 0 | 0 | 0 | 22,668 | 0 | 0 | 0 | 0 | 22,668 |
| Hayward, City of | 4,222 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4,222 |
| Las Gallinas Valley Sanitary District | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6,255 | 0 | 6,255 |
| Livermore, City of | 0 | 0 | 9,164 | 0 | 0 | 0 | 0 | 0 | 0 | 9,164 |
| Millbrae, City of | 0 | 0 | 1,464 | 0 | 0 | 0 | 0 | 0 | 0 | 1,464 |
| Mt. View Sanitary District | 937 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 937 |
| Napa Sanitation District | 0 | 0 | 19,721 | 0 | 0 | 0 | 0 | 0 | 0 | 19,721 |
| Novato Sanitary District | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12,865 | 0 | 12,865 |
| Oro Loma Sanitary District | 0 | 0 | 5,229 | 0 | 0 | 0 | 0 | 0 | 0 | 5,229 |
| Palo Alto, City of | 0 | 0 | 0 | 11,321 | 6,218 | 0 | 0 | 0 | 0 | 17,539 |
| Petaluma, City of | 2,935[b] | 0 | 3,072[b] | 0 | 1,286[b] | 0 | 0 | 0 | 0 | 7,293 |
| San Francisco Public Utilities Commission | 7,259 | 0 | 21,722 | 0 | 11,458 | 0 | 0 | 0 | 11,168 | 51,607 |
| San Jose, City of | 59,972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 59,972 |
| San Leandro, City of | 0 | 0 | 3,167 | 0 | 0 | 0 | 0 | 0 | 0 | 3,167 |
| San Mateo, City of | 3,814 | 0 | 3,907 | 0 | 0 | 0 | 0 | 0 | 0 | 7,721 |
| Santa Rosa, City of | 1,255 | 1,255 | 21,235 | 2,297 | 5,214 | 0 | 0 | 0 | 1,418 | 32,673 |
| Sewer Authority Mid-Coastside | 2,171 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,171 |

| Agency | ADC | Landfill Disposal | Land Application | Compost | Lystek | Biochar | Incineration | Onsite Disposal | Storage | Sum |
|---|---|---|---|---|---|---|---|---|---|---|
| Sewerage Agency of Southern Marin | 1,479 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,479 |
| Silicon Valley Clean Water | 63 | 0 | 12,259 | 66 | 0 | 260 | 0 | 0 | 0 | 12,648 |
| South San Francisco - San Bruno WQCP, City of | 9,730 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9,730 |
| Sunnyvale, City of | 207 | 0 | 5,574 | 0 | 0 | 0 | 0 | 0 | 0 | 5,781 |
| Union Sanitary District | 0 | 0 | 14,452 | 6,342 | 0 | 0 | 0 | 0 | 0 | 20,793 |
| Vallejo Flood & Wastewater District | 0 | 0 | 10,910 | 0 | 1,099 | 0 | 0 | 0 | 0 | 12,009 |
| West County Wastewater District | 0 | 22,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22,000 |
| **Total** | **115,921** | **23,386** | **191,441** | **25,786** | **52,412** | **260** | **66,310** | **193,449** | **12,586** | **681,551** |

[a] Calculated based on survey response for total biosolids generated minus the amount sent to Lystek.

[b] Calculated based on survey response for deliveries of dry biosolids and percent solids.

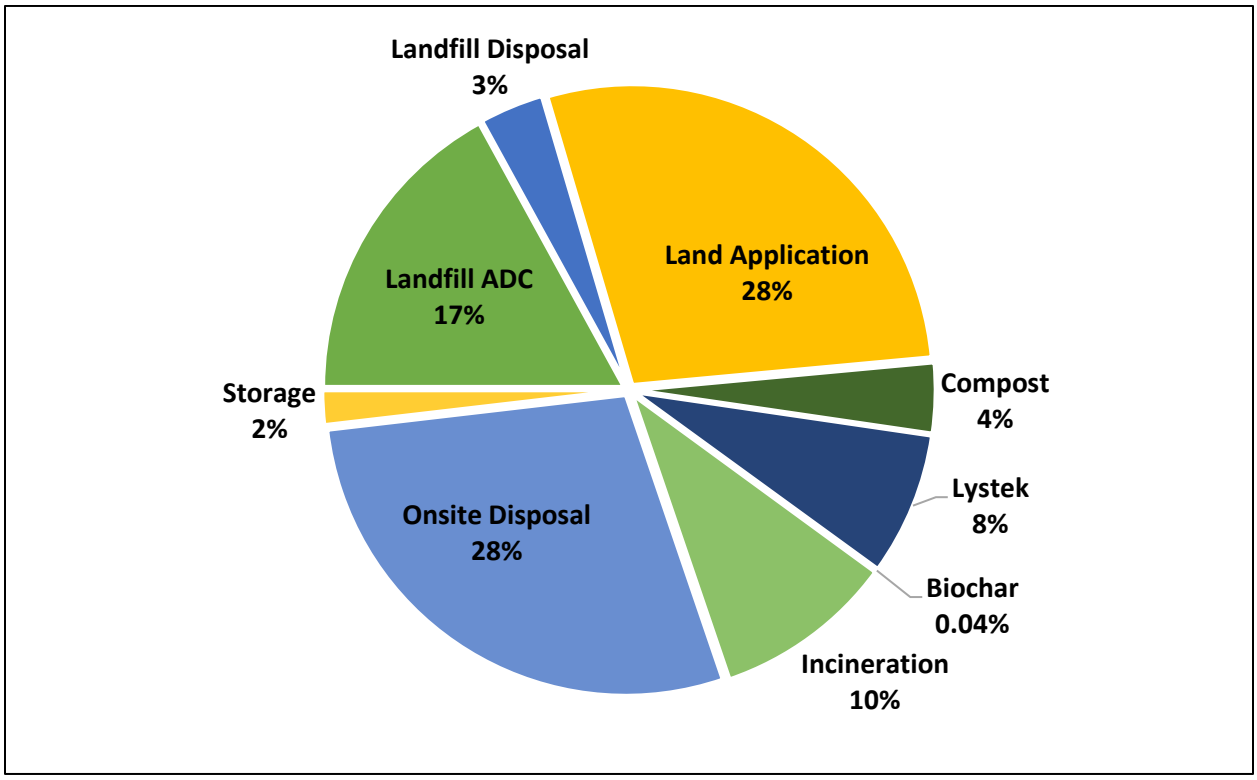


**Figure 4. Relative wet tonnage of biosolids per reuse and disposal method in 2020.**

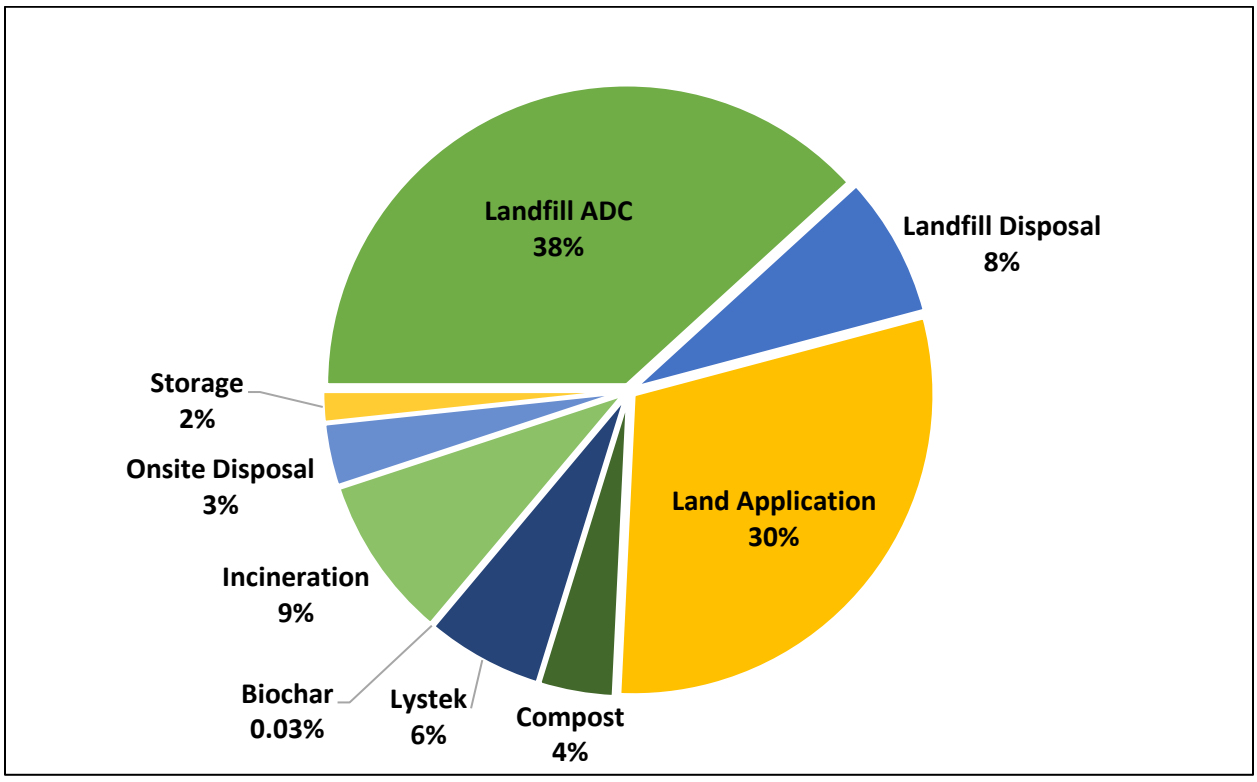


**Figure 5. Relative dry tonnage of biosolids per reuse and disposal method in 2020.**

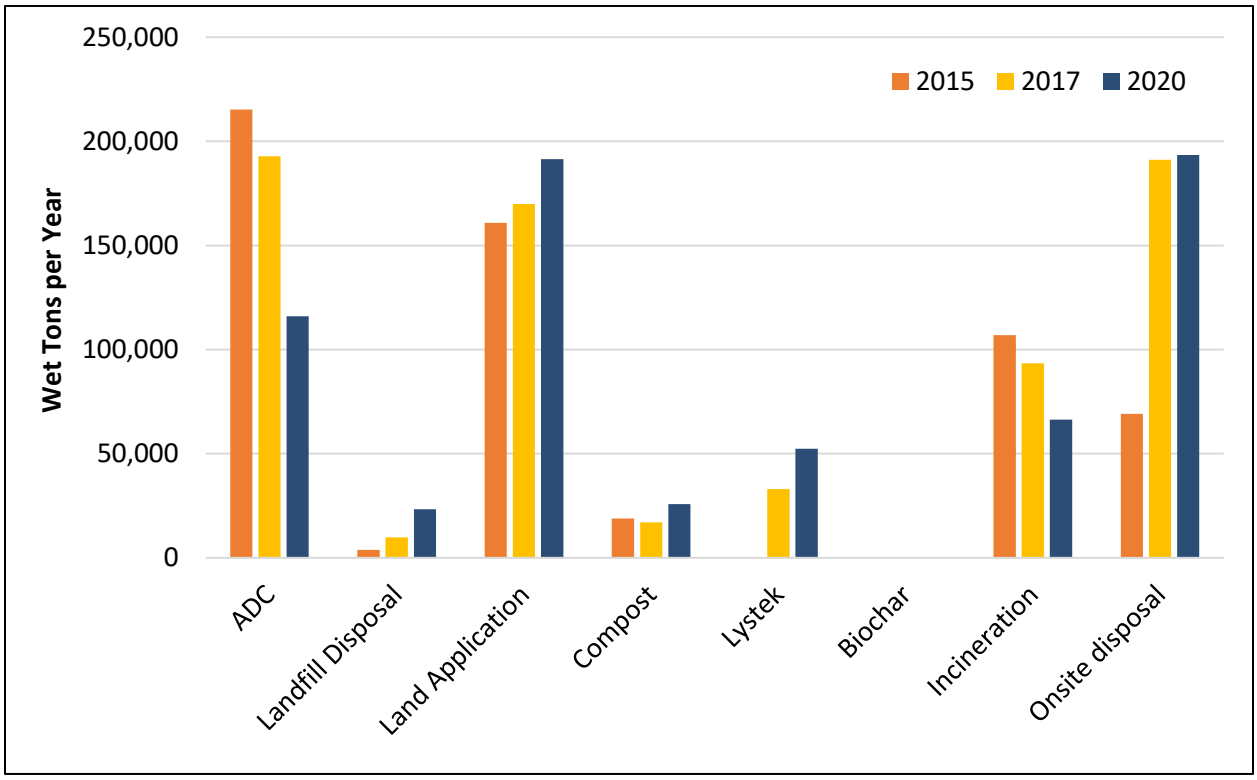


**Figure 6. Wet tonnage of biosolids per reuse and disposal method, 2015 to 2020.**

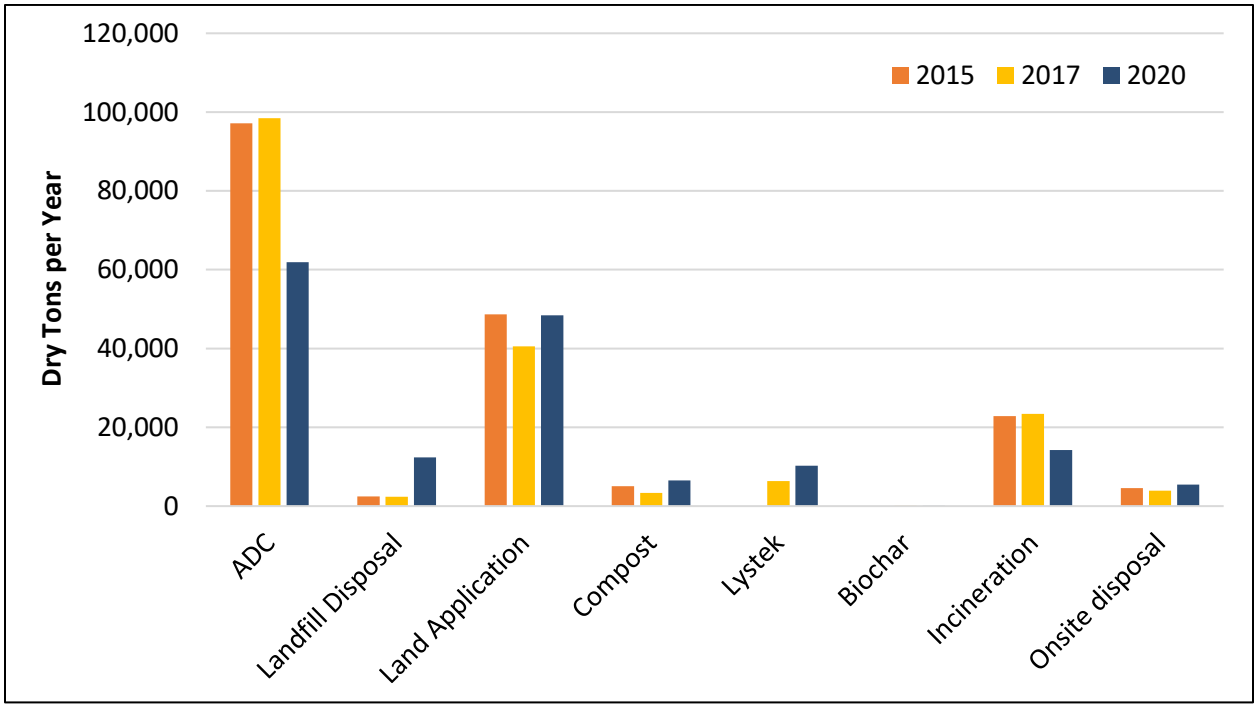


**Figure 7. Dry tonnage of biosolids per reuse and disposal method, 2015 to 2020.**

Another way to measure the relative importance of reuse and disposal methods is by counting the number of agencies that employ each, as illustrated in **Figure 8**. As can be seen in **Table 2**, many agencies use more than one reuse or disposal management strategies. Out of the thirty-one responding agencies, sixteen used land application, making it the most popular management strategy. Landfill ADC was the most popular management strategy in both previous surveys, but it was the second-most popular in the 2020 survey. Treatment at Lystek was the next most popular, followed by composting. Landfill disposal and onsite disposal were by three agencies each. Incineration and biochar production were used by one agency each.

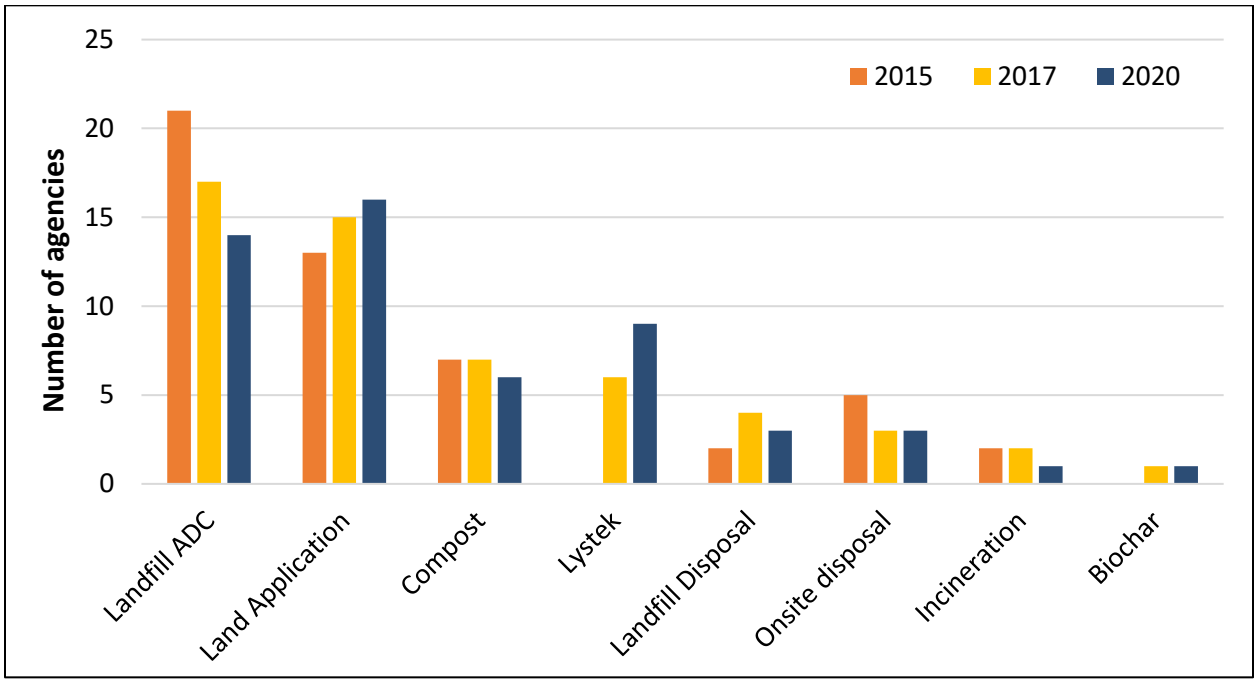


**Figure 8. Changes in biosolids management practices for 31 survey respondents, 2015 to 2020.**

As of 2020, nine agencies were sending biosolids to the Lystek Organic Materials Recovery Center (OMRC) located in Fairfield. The OMRC began processing biosolids to produce Class A-EQ liquid fertilizer in 2016, and in 2020 it accounted for 8% of total wet tonnage produced by survey respondents (6% of total dry tonnage).

While Lystek grew in popularity as a biosolids reuse option, landfill ADC continued to become less popular: In 2015, 21 agencies sent biosolids to landfill ADC, while in 2020, just 14 agencies sent biosolids to landfill ADC. Benicia, Delta Diablo, Livermore, and Union Sanitary District sent biosolids to landfill disposal or ADC in 2017, but not in 2020. More agencies (most notably San Jose) are expected to move away from landfill ADC and disposal in the future due to SB 1383 (see **Table 6**).

**Management Costs**

Agencies that send biosolids to multiple destinations report a range of costs per ton. Minimum and maximum reported hauling and tipping costs for each agency are reported in **Table 3**. Where costs were provided by the respondent as a range, the mean of the range was used for that destination. Total costs per agency are calculated by multiplying tons of solids by cost per ton for each destination and summing the destinations. Average costs for each agency are calculated by dividing total cost by tons of biosolids.

**Table 3. Hauling and tipping costs for agencies**

| Agency Name | Minimum Cost ($/Ton) | Maximum Cost ($/Ton) | Average Cost ($/Ton) | Approx. Total Cost ($/Yr) |
|---|---|---|---|---|
| American Canyon, City of | Not provided. Hauling included in City's waste disposal contract. | | | |
| Benicia, City of | $139 | $139 | $139 | $346,000 |
| Central Contra Costa Sanitary District | Not Avail. | $93 (Lystek) | Onsite incineration. Cost information not provided. | |
| Central Marin Sanitation Agency | $50 | $99 | $66 | $381,000 |
| Delta Diablo | $50 | $80 | $50 | $683,000 |
| Dublin San Ramon Services District | Onsite disposal. Cost information not provided. | | | |
| East Bay Municipal Utility District | $35 | $68 | $54 | $3,744,000 |
| Fairfield-Suisun Sewer District | Not provided. Lystek facility is located onsite. | | | |
| Hayward, City of | Not provided. Hauling included in City's waste disposal contract. | | | |
| Las Gallinas Valley Sanitary District | $14 | $14 | $14 | $88,000 |
| Livermore, City of | $41 | $41 | $41 | $376,000 |
| Millbrae, City of | $76 | $76 | $76 | $111,000 |
| Mt. View Sanitary District | $54 | $54 | $54 | $51,000 |
| Napa Sanitation District | Onsite disposal. Cost information not provided. | | | |
| Novato Sanitary District | $17 | $17 | $17 | $220,000 |
| Oro Loma Sanitary District | $40 | $40 | $40 | $209,000 |
| Palo Alto, City of | $67 | $98 | $78 | $1,364,000 |
| Petaluma, City of | $61 | $117 | $75 | $546,000 |
| San Francisco Public Utilities Commission | $65 | $101 | $84 | $4,356,000 |
| San Jose, City of | $26 | $26 | $26 | $1,535,000 |
| San Leandro, City of | $53 | $53 | $52 | $166,000 |
| San Mateo, City of | $30 | $47 | $39 | $64,000 |
| Santa Rosa, City of | $4 | $115 | $31 | $1,007,000 |
| Sewer Authority Mid-Coastside | $68 | $68 | $68 | $147,000 |
| Sewerage Agency of Southern Marin | $324 | $324 | $323 | $478,000 |
| Silicon Valley Clean Water | $49 | $80 | $54 | $685,000 |

| Agency Name | Minimum Cost ($/Ton) | Maximum Cost ($/Ton) | Average Cost ($/Ton) | Approx. Total Cost ($/Yr) |
|---|---|---|---|---|
| South San Francisco - San Bruno WQCP, City of | $62 | $62 | $62 | $607,000 |
| Sunnyvale, City of | $161[a] | $212[a] | $163[a] | $940,000[a] |
| Union Sanitary District | $35 | $61 | $43 | $895,000 |
| Vallejo Flood & Wastewater District | $25 | $75 | $30 | $356,000 |
| West County Wastewater District[b] | Not provided | $162[b] | Not provided | Not provided |
| **Subtotal (25 of 31 agencies reporting)** | | | | **$20,655,000** |

[a] Cost has been converted to equivalent for wet biosolids, although City pays based on dry weight basis. Dewatering is included in cost.

[b] West County Wastewater District reported costs for biosolids dewatered and hauled by a contractor. Additional biosolids disposal services for most of the District's biosolids are covered under a separate franchise agreement.

For the 23 agencies that reported costs in both 2017 and 2020, total costs rose about 12%, from about $17M in 2017 to $19M in 2020. This represents at 12% increase in costs over three years; by comparison, the U.S. inflation rate was about 6% over the 3-year period from 2017 to 2020. Cost increases significantly higher than the rate of inflation were also reported in the 2017 biosolids survey report (12% increase in cost, vs. 3% inflation over 2 years).

The range of hauling and tipping costs associated with each reuse and disposal alternative are plotted in **Figure 9**. For agencies with available land, onsite disposal is by far the lowest-cost option. As in the previous survey, unit costs for landfill ADC and land application showed a very large range, with landfill ADC (median cost: $65/ton) proving to be more expensive than land application (median cost: $54/ton). Costs increased dramatically for both landfill ADC (increase from $48 to $65/ton, or a 36% increase in 3 years) and for land application (increase from $33 to $54/ton, or a 64% increase over 3 years).

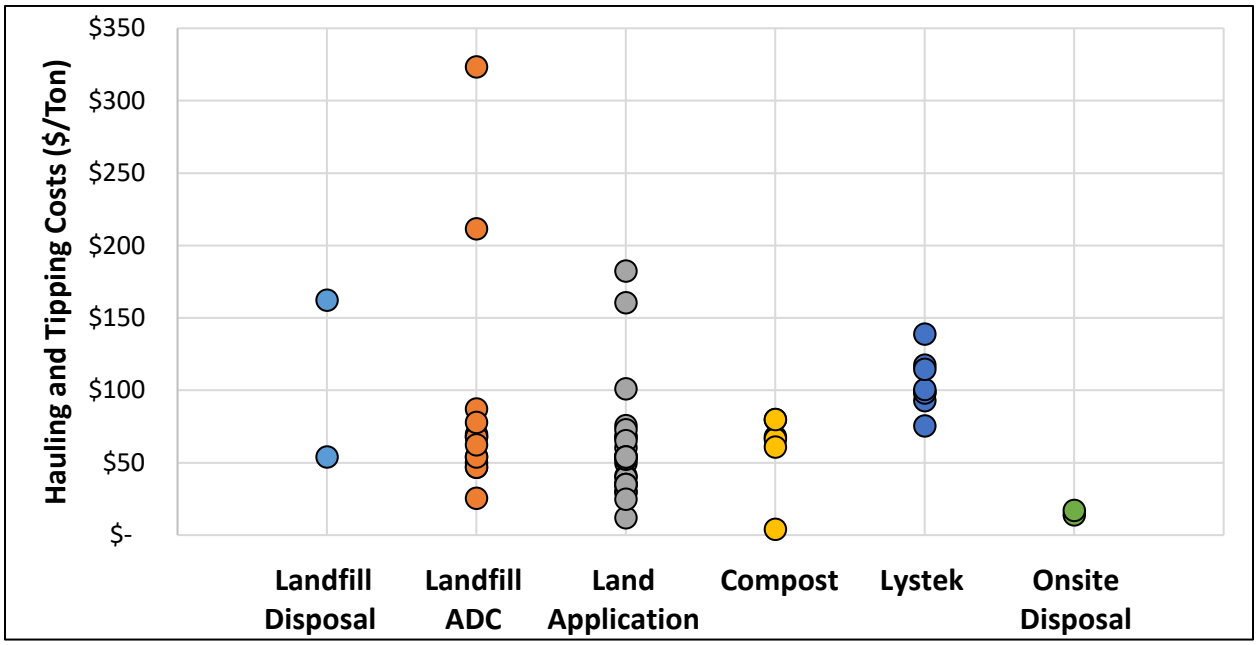


**Figure 9. Tipping and Hauling Costs for each reuse/disposal alternative.**

## Hauling Distance

The range of round-trip hauling distances for each agency, as well as total ton-miles, are listed in **Table 4.** The ton-miles provides a metric for the total hauling burden for each agency. The combined hauling burden for all survey respondents (45.2 million ton-miles) is within 1% of the total 2017 value of 45.0 million ton-miles.

**Table 4. Round-trip Distance Hauled**

| Agency | Minimum Distance Hauled (Round Trip, miles) | Maximum Distance Hauled (Round Trip, miles) | Total Ton-Miles |
|---|---|---|---|
| American Canyon, City of | 63 | 63 | 8,400 |
| Benicia, City of | 40 | 40 | 99,600 |
| Central Contra Costa Sanitary District | 0 (On-site incineration) | 46 (Lystek) | 9,400 |
| Central Marin Sanitation Agency | 36 | 110 | 405,400 |
| Delta Diablo | 300 | 480 | 4,095,400 |
| Dublin San Ramon Services District | 0 | 0 | 0 |
| East Bay Municipal Utility District | 80 | 270 | 13,915,000 |
| Fairfield-Suisun Sewer District | 0 | 0 | 0 |
| Hayward, City of | 64 | 64 | 270,200 |
| Las Gallinas Valley Sanitary District | 0 | 0 | 1,800 |
| Livermore, City of | 150 | 150 | 1,374,600 |
| Millbrae, City of | 240 | 240 | 351,400 |
| Mt. View Sanitary District | 58 | 58 | 54,400 |

| Agency | Minimum Distance Hauled (Round Trip, miles) | Maximum Distance Hauled (Round Trip, miles) | Total Ton-Miles |
|---|---|---|---|
| Napa Sanitation District | 0 | 6 | 49,200 |
| Novato Sanitary District | 0 | 0 | 0 |
| Oro Loma Sanitary District | 120 | 120 | 627,400 |
| Palo Alto, City of | 148 | 228 | 3,501,400 |
| Petaluma, City of | 76 | 218 | 701,000 |
| San Francisco Public Utilities Commission | 52 | 242 | 5,671,200 |
| San Jose, City of | 4 | 4 | 239,800 |
| San Leandro, City of | 170 | 170 | 538,400 |
| San Mateo, City of | 140 | 252 | 1,672,600 |
| Santa Rosa, City of | 1 | 96 | 1,631,000 |
| Sewer Authority Mid-Coastside | 10 | 10 | 21,800 |
| Sewerage Agency of Southern Marin | 45 | 45 | 66,800 |
| Silicon Valley Clean Water | 0 | 282 | 2,841,200 |
| South San Francisco - San Bruno WQCP | 106 | 106 | 1,035,400 |
| Sunnyvale, City of | 176 | 240 | 1,263,200 |
| Union Sanitary District | 158 | 242 | 4,479,000 |
| Vallejo Flood & Wastewater District | 26 | 34 | 321,000 |
| West County Wastewater District | Not Avail. | Not Avail. | Not Avail. |
| **Total (30 of 31 agencies reporting)** | | | **45,246,000** |

**Dewatering Statistics**

The on-site methods employed by agencies to dewater biosolids prior to final use included drying beds, centrifuges, presses, and dryers. Dewatering equipment employed by each agency, as well as the resulting percentage of solids, is listed in **Table 5.**

**Table 5. Percentage Solids, Dewatering technology type and manufacturer for each agency**

| Agency | Percent Solids | Dewatering Technology | Equipment Manufacturer |
|---|---|---|---|
| American Canyon, City of | 25% | Screw Press | - |
| Benicia, City of | 14-16% | Belt Filter Press | Ashbrook press |
| Central Contra Costa Sanitary District | 22% | Centrifuge | Sharples, being replaced with Andritz within next 5 years |
| Central Marin Sanitation Agency | 27% | Centrifuge | Centrisys CS18-4 |
| Delta Diablo | 25% | Centrifuge | Flottweg centrifuges |
| Dublin San Ramon Services District | 2.6% | No dewatering | N/A |
| East Bay Municipal Utility District | 24% | Centrifuge | Humbolt and Flottweg |
| Fairfield-Suisun Sewer District | 16% | Drying Bed, Screw Press | FKC Screw Press |
| Hayward, City of | >80% | Drying Bed | N/A |

| Agency | Percent Solids | Dewatering Technology | Equipment Manufacturer |
|---|---|---|---|
| Las Gallinas Valley Sanitary District | 3.3% | Thickening in Storage Lagoon | N/A |
| Livermore, City of | 16.2% | Belt Filter Press | Simon Ashbrook |
| Millbrae, City of | 19% | Belt Filter Press | Andritz |
| Mt. View Sanitary District | 25-49% | Centrifuge, Drying Bed | Centritech centrifuge |
| Napa Sanitation District | 17-30% | Belt Filter Press. Contractor used centrifuges to dewater pond solids. | Ashcroft |
| Novato Sanitary District | 5.5% | Sludge Lagoons | N/A |
| Oro Loma Sanitary District | 80% | Belt Filter Press, Drying Bed, Belt Press to approx 13%, air drying to 80% | BDP Belt press |
| Palo Alto, City of | 29% | Belt Filter Press | 4 belt filter presses manufactured by Andritz |
| Petaluma, City of | 18-19% | Screw Press | FKC Screw Press and USGI Polyblend liquid polymer feed system |
| San Francisco Public Utilities Commission | 23% | Centrifuge, Screw Press | FKC - Screw Press, Humboldt and Sharpels - Centrifuges |
| San Jose, City of | 79% | Drying Bed | A capital project (Digested Sludge Dewatering Facility) is currently underway to install centrifuges that will replace the current lagoon and drying bed process. Future centrifuges have not yet been purchased. |
| San Leandro, City of | 50-80% | Belt Filter Press | BDP |
| San Mateo, City of | 22% | Centrifuge | GEA Westfalia Centrifuge model CC 458-00-32 |
| Santa Rosa, City of | 15-16% | Belt Filter Press | Ashbrook |
| Sewer Authority Mid-Coastside | 17% | Belt Filter Press | Ashbrook |
| Sewerage Agency of Southern Marin | 20% | Belt Filter Press | BDP |
| Silicon Valley Clean Water | 19-44% | Fournier Rotary Fan Press | Fournier Rotary Fan Press, Bioforce Tech Bio-dryers & Pyrolysis |
| South San Francisco - San Bruno WQCP, City of | 14-18% | Belt Filter Press | Komoline-Sanderson |
| Sunnyvale, City of | 22-29% | Centrifuge, Belt Filter Press | Dewatering equipment is owned and operated by the contractor, Synagro |

| Agency | Percent Solids | Dewatering Technology | Equipment Manufacturer |
|---|---|---|---|
| Union Sanitary District | 24% | Centrifuge | Andritz D5LL Decanter Centrifuges |
| Vallejo Flood & Wastewater District | 30% | Belt Filter Press | Ashbrook |
| West County Wastewater District | 17-77% | Belt Filter Press, Drying Bed | Not Avail. |

## 5. Challenges and Future Planning

**Challenges**

Agencies were asked to rank the challenges facing their biosolids program. The following challenges are ranked from the aggregate responses from most to least important:

1. Securing sustainable use and disposal options
2. Rising costs
3. Hauling distance
4. Public health concerns regarding land application (PFAS, microplastics, pathogens, etc.)
5. Regulatory Restrictions on using Biosolids for Alternative Daily Cover (SB 1383)
6. Local restrictions on land application
7. Public perception/relations
8. Space for drying operations
9. Wet weather impeding drying operations

Reasons listed as "other" included:

- Accommodating local trash haulers that need to divert organic waste from landfills
- Limitations on future land application
- Odor concerns from the public
- Concern that PFAS and microplastics could be challenges in the future
- Air regulations associated with incineration
- The lack of local disposal options, which drives up costs

Overall, securing sustainable use and disposal options was the top concern. This differs from the 2016 and 2018 surveys, when rising costs were cited as the top concern overall. 11 of 31 agencies listed "securing sustainable use and disposal options" as the #1 concern, while 10 of 31 agencies listed "rising costs" as the top concern.

**Future Biosolids Management Plans**

The survey asked respondents about their plans for biosolids management in 2021. 28 of 31 respondents selected the response "Same plan/strategy as 2020." The remaining 3 agencies had the following responses:

- Delta Diablo: "*We will start sending a portion of our biosolids to Lystek."* Starting July 1, 2021, Delta Diablo began sending two truckloads per month to the Lystek facility at Fairfield Suisun Sewer District for further processing to Class A standards.
- Mt. View Sanitary District: "*All biosolids will continue to go to the landfill in 2021. It is anticipated that biosolids will begin going to Lystek in 2022*."
- San Francisco Public Utilities Commission: "*We have phased out the use of landfill ADC entirely as of fall 2020*."

Additionally, the Silicon Valley Clean Water response noted that the agenda hopes to divert more biosolids to Bioforce Tech in late 2021.

The survey also specifically asked about agency's responses to SB 1383, which mandates diversion of organics from landfills in order to reduce short-lived climate pollutants (i.e., methane). SB 1383 will require a 75% reduction in organics from landfills compared to 2014 levels. This new legislation is expected to have two main impacts on biosolids disposal:

- Biosolids used as landfill ADC will be considered disposal instead of beneficial reuse, which will sharply limit ADC use of biosolids;
- Municipalities will need to divert organic materials (green waste, food waste, etc.) from landfills. If wastewater agencies provide opportunities for co-digestion of these diverted materials, there will be an increase in the production of digested biosolids and of biogas at POTWs.

Responses to the survey question about the status of implementation readiness for SB 1383 are summarized below in **Figure 10**, with additional details reported in **Table 6**. As summarized in **Figure 9**, agencies reported the following strategies for responding to the mandates in SB 1383.

- 11 agencies (Central Marin Sanitation Agency, East Bay Municipal Utility District, Millbrae, Oro Loma Sanitary District, Petaluma, San Francisco Public Utilities Commission, San Jose, Santa Rosa, Sewerage Agency of Southern Marin, Sunnyvale, and Union Sanitary District) plan an increased reliance on **land application**.
- 9 agencies (Delta Diablo, East Bay Municipal Utility District, Fairfield-Suisun Sewer District , Mt. View Sanitary District, Petaluma, San Francisco Public Utilities Commission, San Jose, Santa Rosa, and Union Sanitary District) will **increase the volume of biosolids sent to another facility or third party for additional treatment** (i.e., Lystek or composting).
- 4 agencies (Hayward, Silicon Valley Clean Water, South San Francisco - San Bruno, and West County Wastewater District) will **improve treatment technology at the plant** to expand use and disposal options.

- 4 agencies (Petaluma, South San Francisco - San Bruno, Union Sanitary District, and West County Wastewater District) will **add digester capacity for organics co-digestion** at the plant.

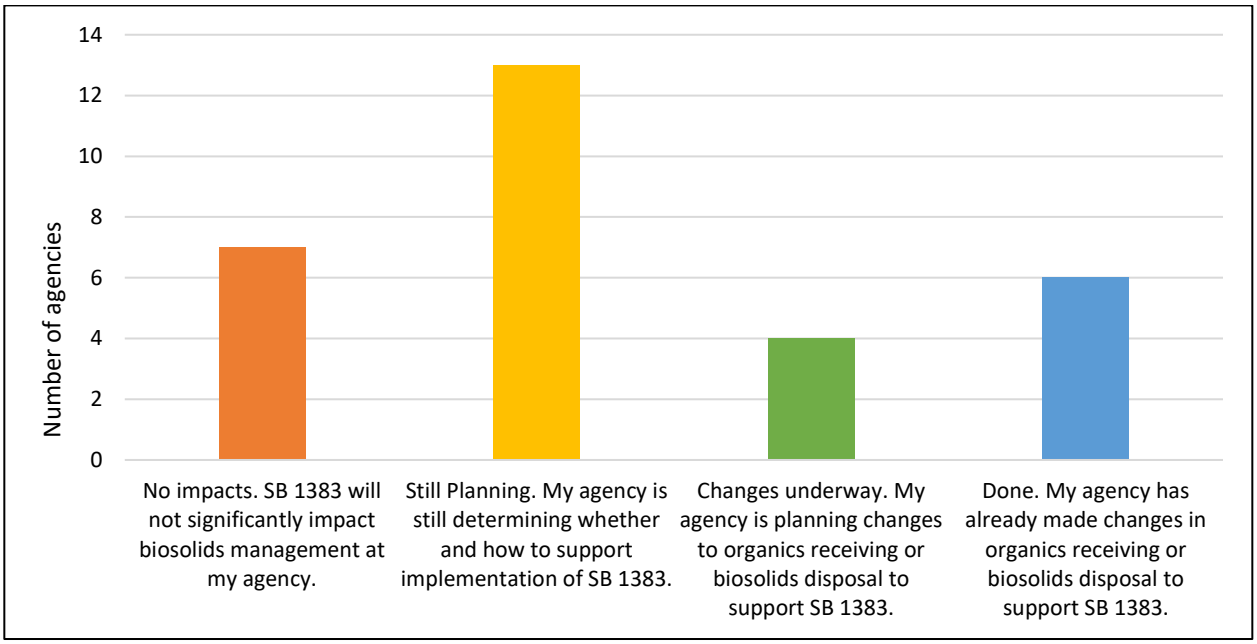


**Figure 10. Survey Responses regarding Status of Implementation Readiness for SB1383.**

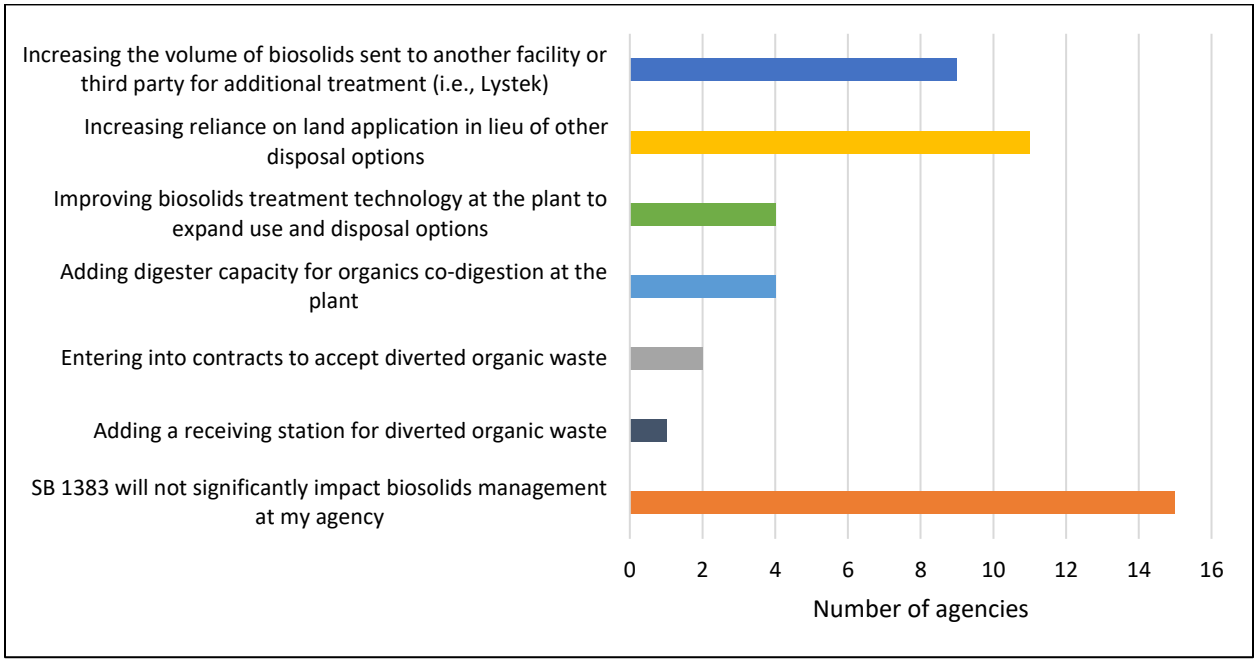


**Figure 11. Agency Plans for Responding to SB 1383's Limits on Landfill Use and Disposal**

**Table 6. Agency Plans to Respond to SB 1383 as of 2018**

| Agency | Status of Implementation Readiness for SB1383 | | | | Details |
|---|---|---|---|---|---|
| | No SB1383 Impacts | Still Planning | Changes Underway | Complete | |
| **American Canyon, City of** | | x | | | |
| **Benicia, City of** | | | x | | Present hauler (Republic Services) to compost at their facility. |
| **Central Contra Costa Sanitary District** | x | | | | Evaluating how classification of sewage sludge incineration as "landfilling" will affect our site |
| **Central Marin Sanitation Agency** | | x | | | |
| **Delta Diablo** | | x | | | |
| **Dublin San Ramon Services District** | | x | | | SB1383 does not immediately impact our agency since we dispose of biosolids at our own Dedicated Land Disposal facility. |
| **East Bay Municipal Utility District** | | | x | | |
| **Fairfield-Suisun Sewer District** | | | | x | |
| **Hayward, City of** | | x | | | |
| **Las Gallinas Valley Sanitary District** | x | | | | |
| **Livermore, City of** | x | | | | |
| **Millbrae, City of** | x | | | | |
| **Mt. View Sanitary District** | | | | | |
| **Napa Sanitation District** | x | | | | |
| **Novato Sanitary District** | | x | | | |
| **Oro Loma Sanitary District** | | | | x | |
| **Palo Alto, City of** | | x | | | |
| **Petaluma, City of** | | | | x | |
| **San Francisco Public Utilities Comm.** | | | | x | |

| Agency | Status of Implementation Readiness for SB1383 | | | | Details |
|---|---|---|---|---|---|
| | No SB1383 Impacts | Still Planning | Changes Underway | Complete | |
| **San Jose, City of** | | | x | | Dewatered biosolids will be directly land applied, composted, and/or further treated before being beneficially used. |
| **San Leandro, City of** | x | | | | |
| **San Mateo, City of** | | x | | | |
| **Santa Rosa, City of** | | | | x | |
| **Sewer Authority Mid-Coastside** | | x | | | |
| **Sewerage Agency of Southern Marin** | | x | | | |
| **Silicon Valley Clean Water** | | | | x | Divert 50% of biosolids to Bioforce Tech for biochar production. Currently receiving diverted organic waste |
| **South San Francisco - San Bruno WQCP, City of** | | x | | | We are in the planning stages of trying to set up agreements with local trash company to receive organic waste to produce more methane onsite. We would add a receiving station and larger cogen to harvest the increase methane gas and go PG&E neutral. Would rehab our dewatering facility. |
| **Sunnyvale, City of** | | x | | | The City is still evaluating a response and timeline to implement strategies in response to SB1383. In the near term, the City will be prioritizing an increased reliance on land application. Future considerations include a 5th digester (for thickened WAZ, anticipated increases in solids, and co-digestion), pursuing contracts with a third party for additional treatment (i.e., Lystek), and potentially adding a receiving station for the diversion of organic wastes. |
| **Union Sanitary District** | | x | | | |
| **Vallejo Flood & Wastewater District** | x | | | | |
| **West County Wastewater District** | | | x | | |

## 6. Public Outreach

**Marketing**

The survey asked whether agencies directly market their biosolids products, or whether another entity markets biosolids products on their behalf.

- No agencies reported directly marketing or branding their own biosolids products.
- 11 agencies (Benicia, Central Marin Sanitation Agency, Delta Diablo, Fairfield-Suisun Sewer District, Palo Alto, San Francisco Public Utilities Commission, Santa Rosa, Silicon Valley Clean Water, Sunnyvale, Union Sanitary District, and West County Wastewater District) report that a third party such as Lystek or Synagro markets biosolids products on their behalf.

**Outreach and Education**

Agencies were asked whether they conduct any outreach or publicity pertaining to their biosolids programs, and via what venue. Six agencies replied that they conduct outreach pertaining to biosolids, mainly through agency websites and/or bill inserts, as illustrated in **Figure 12**. 14 agencies in this survey replied that they conduct outreach, but not for biosolids in particular. Seven agencies replied that they do not conduct outreach at all. Overall, the responses were similar to the 2016 and 2018 responses, except that in 2018 survey agency (Napa Sanitation District) reported using print media. Napa Sanitation District continues an active outreach program through educational programs, tours, and open house events. Silicon Valley Clean Water noted that biosolids are included in the 1-week Sewer Science program at high schools in their service area.

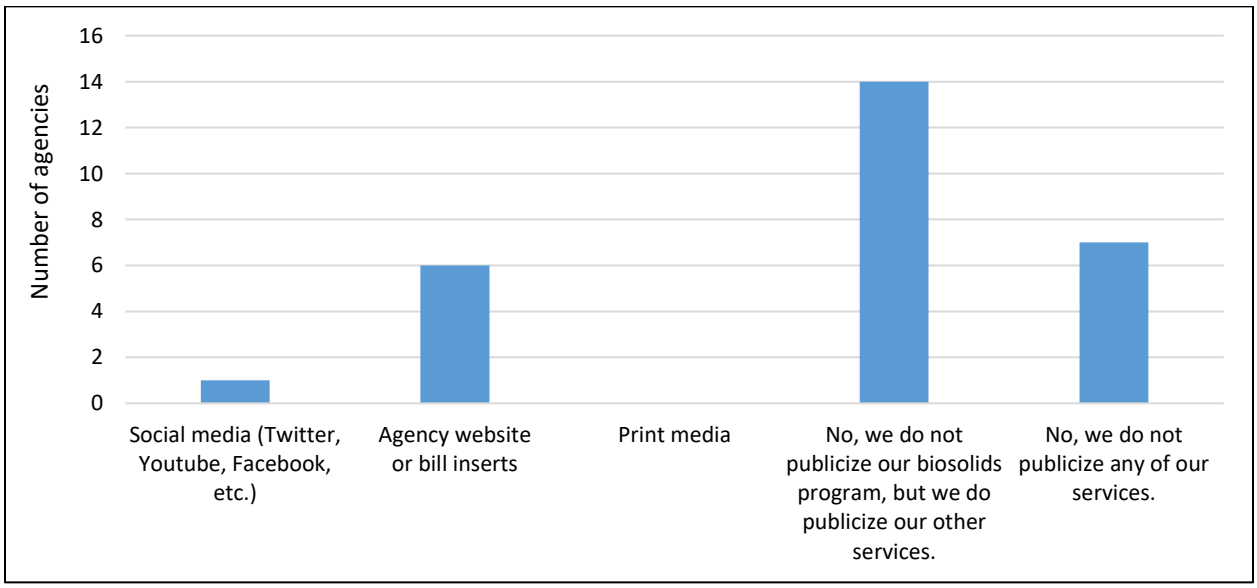


**Figure 12. Number of agencies doing biosolids outreach via traditional and social media.**

## 7. Biosolids Staffing

The survey asked respondents to describe how their agency manages biosolids staffing, including the number of Full Time Equivalent (FTE) positions. Two out of 31 agencies (Sunnyvale and West County Wastewater District) noted use of contractors to manage biosolids-related operations. Complete responses are shown below in **Table 7.** The two agencies reporting the largest dedicated staff are the City of San Jose (12 FTEs) and Central Contra Costa Sanitation District (3.5 FTEs). Adding up the 25 agencies that provided estimated staffing levels, the total is more than 50 Full Time Equivalent positions.

**Table 7. Agency Staffing for Biosolids**

| Agency | How many Full Time Equivalent (FTE) staff are required for biosolids management? | Please describe the roles of staff assisting with biosolids management. |
|---|---|---|
| **American Canyon, City of** | 0.33 | Turning on the press, checking the press, sampling and reporting |
| **Benicia, City of** | 0.2 | Operator to dewatering solids. Hauling is performed by contract operator. |
| **Central Contra Costa Sanitary District** | 3.5 | operating incinerator and solids handling equipment, hauling coordination, regulatory reporting |
| **Central Marin Sanitation Agency** | 2 | 1 FTE operation staff would set up, operate the centrifuge, which runs approximately 10hrs/day, and unload biosolids to a truck daily; 0.5 FTE engineering staff would manage the chemical procurement, biosolids hauling, and disposal contracts; 0.5 FTE maintenance staff would provide services to all the dewatering equipment. |
| **Delta Diablo** | 2.5 | Operators - produce and process the biosolids; Ops Supervisor - tracks digester data (temp, VSR, detention; Ops Manager - Oversees Syangro and Lystek contracts, performs reporting; Lab staff - samples, analyzes biosolids; Engineering - assists w/RFPs, contracts, regulatory issues |
| **Dublin San Ramon Services District** | 1 | 6 seasonal staff (during harvesting season) operating dredge, tractor, injector, and soil preparation. 1 FTE oversees biosolids harvesting. |
| **East Bay Municipal Utility District** | - | No one FTE is allocated for biosolids, but at least 5 people have biosolids responsibilities: Contract and program management, quality control and reporting, invoicing, day-to-day operations. |

| Agency | How many Full Time Equivalent (FTE) staff are required for biosolids management? | Please describe the roles of staff assisting with biosolids management. |
|---|---|---|
| **Fairfield-Suisun Sewer District** | 1 | We do not have dedicated biosolids staff. Roles shared between engineering, operations, and regulatory |
| **Hayward, City of** | 2 | Operations manages polymer dosing and Maintenance manages the sludge drying bed process |
| **Las Gallinas Valley Sanitary District** | - | Contracted to a third party |
| **Livermore, City of** | 2 | They are Belt Press Operators - Contractor hauls Biosolids to land apply or ADC |
| **Millbrae, City of** | - | 4 Operators. Operator is assigned to dewatering daily or as needed |
| **Mt. View Sanitary District** | 1 | 1 Lab Analyst performs weekly process control monitoring. 5 Operators and 1 Supervisor maintain and operate sludge pumps, grit removal, sludge thickening, sludge digestion, scum handling, sludge dewatering and disposal. |
| **Napa Sanitation District** | 3 | (1) Manager - oversees the biosolids program, coordinates with growers, procure agronomists, record keeping, reporting (2) Reclamation Workers - prepare fields, apply solids, incorporate solids, irrigate if needed. |
| **Novato Sanitary District** | 2.5 | Sludge transfer and return, lab analysis of solids and health of digester(s), reporting (EPA 503), infrastructure (piping and pumps) repair and maintenance |
| **Oro Loma Sanitary District** | 0.1 | Pretreatment inspector manages annual off haul, billing, and required sampling. GM does annual EPA reporting and manages RFP prep/bidding. Our lab chemist, pretreatment inspector, plant manager, and General Manager all contribute. |
| **Palo Alto, City of** | 1 | Plant Manager, Senior Engineer, Associate Engineer and Admin. Assistants |
| **Petaluma, City of** | 3 | 2 FTE Operations Staff, 0.5 FTE maintenance staff, 0.5 FTE analytical/regulatory staff |
| **San Francisco Public Utilities Commission** | 1 | Biosolids FTE staff oversees contracts related to biosolids use, manages biosolids reporting, special projects, and improvement of current program |
| **San Jose, City of** | 12 | Program Manager establishing contract to manage future dewatered biosolids; other/O&M staff manage current lagoons and drying bed process. 12 positions: 5 Heavy Equipment Operators, 2 Senior HEOs, 3 Wastewater Attendants, 1 Superintendent, & 1 Program Manager |
| **San Leandro, City of** | 1 | a maintenance staff tills and moves material part time. Operations staff press and place in beds, Lab staff sample and analyze material. Approx. 1 FTE equivalent |

| Agency | How many Full Time Equivalent (FTE) staff are required for biosolids management? | Please describe the roles of staff assisting with biosolids management. |
|---|---|---|
| **San Mateo, City of** | - | In typical fashion we have a liquids operator and solids operator and the solids operator manages the biosolids / dewatering process every shift. We do not have any FTE staff dedicated to biosolids. Operations manages it. |
| **Santa Rosa, City of** | 3 | Manager, senior maintenance worker, admin support. |
| **Sewer Authority Mid-Coastside** | - | Responsibilities shared by 5 staff members in operations |
| **Sewerage Agency of Southern Marin** | 1.5 | 1 operator and 0.5 supervisor |
| **Silicon Valley Clean Water** | 3 | (1) Operator operating the Fournier Rotary Fan Press units, (1) Operator to operate equipment using in the concrete drying beds, (1) Operations Supervisor |
| **South San Francisco - San Bruno WQCP, City of** | - | Responsibilities shared by 14 Wastewater Operators: Running the belt presses, scheduling truck/hauling pick ups. |
| **Sunnyvale, City of** | 1.5 | Biosolids dewatering and hauling operations are managed by a contractor. There are no dedicated employees for biosolids management. Operations and Laboratory staff assist part time in the collection and analysis of biosolids samples. The Regulatory Division supports regulatory oversight and reporting of biosolids related data. |
| **Union Sanitary District** | 1.5 | Operations, field inspections and maintenance, engineering analysis, sampling, testing, invoice tracking, reporting and regulatory oversight |
| **Vallejo Flood & Wastewater District** | 2 | 2 truck drivers (also function as general help when not driving), 1 program management (oversee other programs in addition to biosolids) |
| **West County Wastewater District** | 1 | Sample collection |

## 8. Future Surveys

BACWA intends to repeat this survey in 2023 (covering biosolids activities in 2021 and 2022), and every two years thereafter. This will give the region the ability to track changes in biosolids trends over time.

BACWA member agencies are all permitted by the San Francisco Regional Water Quality Control Board. The Regional Water Board's jurisdiction includes oversight over impacts to groundwater and surface water from biosolids land application and land disposal. In 2021, Regional Water Board staff expressed renewed interest in local review of these biosolids uses to ensure water quality protection, especially in lowland areas adjacent to San Francisco Bay. The Regional Water Board's jurisdiction also includes regulatory requirements within NPDES permits, which indirectly affect biosolids management. Within the next few years, however, new regulations from the California Air Resources Board and the Bay Area Air Quality Management District regarding air toxics (e.g., from the combustion of biogas) and climate pollutants (e.g., methane) are expected to impact biosolids management to a greater extent than water quality-related requirements.

As SB 1383 Regulations are implemented, and the next two years bring clarity to approaches for biosolids reuse and disposal in California, future survey questions may be refined to better understand how agencies are responding to this shifting landscape.

## APPENDIX A – AGENCY DATA: 2020 Biosolids Management

| American Canyon, City of | |
|---|---|
| **type** | Landfill disposal |
| **location** | Hay Road Landfill, Vacaville |
| **wet tons** | 131 |
| **cost ($/ton)** | Hauling included in City's waste disposal contract |
| **one-way distance (miles)** | 32 |

| Benicia, City of | |
|---|---|
| **type** | Lystek |
| **location** | Lystek Organic Materials Recovery Center (OMRC) |
| **wet tons** | 2488 |
| **cost ($/ton)** | Hauling $512/load 6 days/week, Treatment $75/wet ton |
| **one-way distance (miles)** | 20 |

| Central Contra Costa Sanitary District | | |
|---|---|---|
| **type** | Incineration | Lystek |
| **location** | Onsite | Lystek. Only for emergency use and routine testing of facility; may be used exclusively during capital improvements to the incinerators. |
| **wet tons** | 66,310 | 206 |
| **cost ($/ton)** | $0 | $93 |
| **one-way distance (miles)** | 0 | 23 |

| Central Marin Sanitation Agency | | | |
|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** |
| **type** | ADC | Land Application | Lystek |
| **location** | Redwood Landfill, Novato | Synagro Solano County land application sites | Lystek |
| **wet tons** | 2,415 | 1,540 | 1,775 |
| **cost ($/ton)** | $50 | $55 | $99 |
| **one-way distance (miles)** | 18 | 55 | 42 |

| Delta Diablo | | |
|---|---|---|
| | **Destination 1** | **Destination 2** |
| **type** | Land Application | Compost |
| **location** | Various fields in Solano, Sacramento, and Merced Counties | Synagro Central Valley Compost Facility |
| **wet tons** | 13,615 | 23 |
| **cost ($/ton)** | $50 | $80 |
| **one-way distance (miles)** | 150 | 240 |

| Dublin San Ramon Services District | |
|---|---|
| **type** | Onsite disposal |
| **location** | DSRSD Dedicated Land Disposal (DLD) site |
| **wet tons** | 174,329 |
| **cost ($/ton)** | Not reported |
| **one-way distance (miles)** | 0 |

| East Bay Municipal Utility District | | | | | |
|---|---|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** | **Destination 4** | **Destination 5** |
| **type** | Land Application | ADC | Land Application | Compost | Land Application |
| **location** | Merced County | Potrero Hills Landfill | Sacramento County | Central Valley Compost Facility | Solano County |
| **wet tons** | 30,291 | 19,463 | 13,911 | 5,738 | 209 |
| **cost ($/ton)** | $35 | $68 | $68 | $68 | $68 |
| **one-way distance (miles)** | 135 | 45 | 89 | 130 | 40 |

| Fairfield-Suisun Sewer District | |
|---|---|
| **type** | Lystek |
| **location** | Lystek Organic Materials Recovery Center (OMRC) |
| **wet tons** | 22,668 |
| **cost ($/ton)** | Not reported |
| **one-way distance (miles)** | 0 |

| Hayward, City of | |
|---|---|
| **type** | ADC |
| **location** | Altamont Landfill |
| **wet tons** | 4,222 |
| **cost ($/ton)** | Hauling included in City's waste disposal contract |
| **one-way distance (miles)** | 32 |

| Las Gallinas Valley Sanitary District | |
|---|---|
| **type** | Onsite Disposal |
| **location** | Onsite surface disposal |
| **wet tons** | 6,255 |
| **cost ($/ton)** | $14 |
| **one-way distance (miles)** | 0 |

| Livermore, City of | |
|---|---|
| **Type** | Land Application |
| **Location** | Silva Ranch in Galt, Sacramento County (Synagro) |
| **wet tons** | 9,164 |
| **cost ($/ton)** | $41 |
| **one-way distance (miles)** | 75 |

| Millbrae, City of | |
|---|---|
| **Type** | Land Application |
| **Location** | Sacramento County |
| **wet tons** | 1,464 |
| **cost ($/ton)** | $76 |
| **one-way distance (miles)** | 120 |

| Mt. View Sanitary District | |
|---|---|
| **Type** | ADC |
| **Location** | Potrero Hills Landfill |
| **wet tons** | 937 |
| **cost ($/ton)** | $54 |
| **one-way distance (miles)** | 29 |

| Napa Sanitation District | | | |
|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** |
| **type** | Land Application | Land Application | Land Application |
| **location** | Jameson Ranch (owned by NapaSan) | Somky Ranch (owned by NapaSan). Oxidation Pond solids were land applied. | Fagundes Ranch (owned by NapaSan). Oxidation Pond solids were land applied. |
| **wet tons** | 7,816 | 11,660 | 245 |
| **cost ($/ton)** | Not reported | Not reported | Not reported |
| **one-way distance (miles)** | 3 | 0.1 | 0.1 |

| Novato Sanitary District | |
|---|---|
| **type** | onsite |
| **location** | Designated Land Disposal site |
| **wet tons** | 12,865 |
| **cost ($/ton)** | $220,000 flat fee contract for transfer from sludge lagoons to DLD |
| **one-way distance (miles)** | 0 |

| Oro Loma Sanitary District | |
|---|---|
| **Type** | Land Application |
| **Location** | Denali Water Solutions - Land Application Sites |
| **wet tons** | 5,229 |
| **cost ($/ton)** | $40 |
| **one-way distance (miles)** | 60 |

| Palo Alto, City of | | |
|---|---|---|
| | **Destination 1** | **Destination 2** |
| **type** | Lystek | Compost |
| **location** | Lystek | Synagro Central Valley Composting Facility |
| **wet tons** | 6,218 | 11,321 |
| **cost ($/ton)** | $98 | $67 |
| **one-way distance (miles)** | 74 | 114 |

| Petaluma, City of | | | | |
|---|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** | **Destination 4** |
| **type** | ADC | Land Application | Lystek | Land Application |
| **location** | Potrero Hills Landfill | Solano County | Lystek | Sacramento County |
| **wet tons** | 2,935 | 2,756 | 1,286 | 317 |
| **cost ($/ton)** | $286 hauling fee/load, $112 loading/unloading fee/load | $316 hauling fee/load, $112 loading/unloading fee/load | $242 hauling fee/load, $112 loading/unloading fee/load | $561 hauling fee/load, $112 loading/unloading fee/load |
| **one-way distance (miles)** | 45 | 49 | 38 | 109 |

| San Francisco Public Utilities Commission | | | | | |
|---|---|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** | **Destination 4** | **Destination 5** |
| **type** | Land Application | Land Application | Storage | Lystek | ADC |
| **location** | Solano County | Sacramento County | Alameda County | Lystek | Solano County |
| **wet tons** | 18100 | 3622 | 11,168 | 11,458 | 7,259 |
| **cost ($/ton)** | $65 | $101 | $91 | $101 | $87 |
| **one-way distance (miles)** | 65 | 121 | 26 | 47 | 54 |

| San Jose, City of | |
|---|---|
| **type** | ADC |
| **location** | Newby Island Landfill |
| **wet tons** | 59,972 |
| **cost ($/ton)** | $26 |
| **one-way distance (miles)** | 2 |

| San Leandro, City of | |
|---|---|
| **type** | Land Application |
| **location** | Solano and Sacramento counties |
| **wet tons** | 3,167 |
| **cost ($/ton)** | $53 |
| **one-way distance (miles)** | 80-90 |

| San Mateo, City of | | | | |
|---|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** | **Destination 4** |
| **type** | ADC | ADC | Land Application | Land Application |
| **location** | Billy Wright Landfill | Potrero Landfill | Merced County California | Dos Palos Landfill |
| **wet tons** | 2326 | 1488 | 3256 | 651 |
| **cost ($/ton)** | $47 | $47 | $30 | $30 |
| **one-way distance (miles)** | 103 | 70 | 126 | 126 |

| Santa Rosa, City of | | | |
|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** |
| **type** | Land application | Composting | Storage |
| **location** | 9 City-managed Land application sites | Laguna Subregional Compost Facility | City-managed sites |
| **wet tons** | 21,235 | 2,297 | 1,,418 |
| **cost ($/ton)** | $12 | $4 | $5 |
| **one-way distance (miles)** | 24.2 | 0.5 | 3 |
| | **Destination 4** | **Destination 5** | **Destination 6** |
| **type** | Lystek | Landfill | ADC |
| **location** | Lystek | Redwood Landfill | Redwood Landfill |
| **wet tons** | 5,214 | 1,255 | 1,255 |
| **cost ($/ton)** | $115 | $54 | $54 |
| **one-way distance (miles)** | 48 | 20 | 20 |

| Sewer Authority Mid-Coastside | |
|---|---|
| **type** | ADC |
| **location** | Ox Mountain Landfill |
| **wet tons** | 2,171 |
| **cost ($/ton)** | $68 |
| **one-way distance (miles)** | 5 |

| Sewerage Agency of Southern Marin | |
|---|---|
| **type** | ADC |
| **location** | Redwood Landfill |
| **wet tons** | 1,479 |
| **cost ($/ton)** | $324 including fuel surcharge, regulatory cost recovery, and other fees. |
| **one-way distance (miles)** | 23 |

| Silicon Valley Clean Water | | | |
|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** |
| **type** | Biochar | ADC | Compost |
| **location** | BioForce Tech | Billy Wright Land Fill Merced County | CVC Merced |
| **wet tons** | 260 | 63 | 66 |
| **cost ($/ton)** | $49 | $78 | $80 |
| **one-way distance (miles)** | 0 | 117 | 141 |
| | **Destination 4** | **Destination 5** | **Destination 6** |
| **type** | Land Application | Land Application | Land Application |
| **location** | Merced County | Sacramento County | Sacramento County |
| **wet tons** | 1165 | 3548 | 7546 |
| **cost ($/ton)** | $ 62 (winter rate) and $46 (summer rate) | | |
| **one-way distance (miles)** | 110 | 115 | 115 |

| South San Francisco/San Bruno | |
|---|---|
| **type** | ADC |
| **location** | Potrero Hills Landfill |
| **wet tons** | 9,730 |
| **cost ($/ton)** | $62 |
| **one-way distance (miles)** | 53 |

| Sunnyvale, City of | | | |
|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** |
| **type** | Land Application | Land Application | ADC |
| **location** | Silva Ranch, Sacramento County | Baker Ranch, Merced County | Potrero Hills, Solano County |
| **wet tons** | 5,550 | 24 | 207 |
| **cost ($/ton)** | $730 (per dry ton) is a flat rate per dry ton regardless of end use destination. Includes dewatering in addition to hauling fees | | |
| **one-way distance (miles)** | 110 | 120 | 88 |

| Union Sanitary District | | | | |
|---|---|---|---|---|
| | **Destination 1** | **Destination 2** | **Destination 3** | **Destination 4** |
| **type** | Land Application | Land Application | Land Application | Compost |
| **location** | | | | |
| **wet tons** | 1,296 | 12,609 | 547 | 6,42 |
| **cost ($/ton)** | $35 | $35 | $35 | $61 |
| **one-way distance (miles)** | 120 | 101 | 79 | 121 |

| Vallejo Flood and Wastewater District | | |
|---|---|---|
| | **Destination 1** | **Destination 2** |
| **type** | Land Application | Lystek |
| **location** | Tubbs Island | Lystek |
| **wet tons** | 10,910 | 1,099 |
| **cost ($/ton)** | $25 (estimate) | $75 (wet ton tipping fee) |
| **one-way distance (miles)** | 13 | 17 |

| West County Wastewater District | | |
|---|---|---|
| | **Destination 1** | **Destination 2** |
| **type** | Landfill Disposal | Landfill Disposal |
| **location** | Vasco Landfill | Potrero Hills Landfill |
| **wet tons** | 13,991 | 8,009 |
| **cost ($/ton)** | Not provided | $1.3 million (flat fee) |
| **one-way distance (miles)** | Not provided | Not provided |