



## VIRGINIA

### BIOSOLIDS MANAGEMENT 2018 - STATE SUMMARY

This summary, a dashboard of state statistics, & further data are at [www.biosolidsdata.org](http://www.biosolidsdata.org)

#### ***In Virginia...***

- *Virginia wastewater solids (sewage sludge) are managed via each of the three options (in 2018): 52% by recycling to soils, 43% by incineration, and 5% by landfill and surface disposal.*
- *Virginia farms and forests also receive almost as much land-applied biosolids from out of state as from in-state sources, mostly from the DC Water Blue Plains AWWTF (with about 15% of its wastewater flow coming from Virginia) and several water resource recovery facilities (WRRFs) owned by the WSSC (Washington Suburban Sanitary Commission).*
- *Virginia's Department of Environmental Quality (VA DEQ) administers state law and regulation pertaining to land application of all biosolids, applying regulations that are more stringent than the federal biosolids regulations at 40 CFR Part 503.*
- *In the decades prior to this report there was considerable activity in Virginia's General Assembly (legislature) associated with biosolids, resulting from public concern in some rural localities. Public complaints received during biosolids land application from 2013-2018 declined by approximately 75% from the complaints received from 2008-2012. Several changes occurred in this time frame: application of stricter regulations that included broader notification to adjacent landowners prior to permitting, a more robust procedure for extending setbacks, increased DEQ oversight during land application, and the use of higher quality biosolids. Fewer regulatory and legislative changes related to biosolids have been initiated in recent years.*
- *Virginia's biosolids land appliers and WRRFs are supported by associations such as the Virginia Biosolids Council (VBC) and the Virginia Association of Municipal Wastewater Agencies (VAMWA), with ongoing expertise, research, and extension outreach from Virginia Tech, helping to develop and design best management practices.*

#### **Biosolids Management in Virginia**

Virginia wastewater solids (sewage sludges) are managed via each of the three options: 52% by recycling to soils, 43% by incineration, and 5% by landfill and surface disposal in 2018. These data were compiled by NBDP for this report and included three sources, one for each of the three different management options (see below). Note that in 2020, the associations in Virginia and Maryland of Municipal Wastewater Agencies (VAMWA and MAMWA) conducted a biosolids survey of VA water resource recovery facilities (WRRFs), compiling 5-year average data on biosolids generation, use, and disposal in VA. The survey included responses from WRRFs representing more than 90% of VA

wastewater flow. NBDP relied on those data to corroborate and support the 2018 data reported here. Discrepancies between NBDP data and the VAMWA/MAMWA survey may be due to NBDP data focusing on just 2018 versus the VAMWA/MAMWA reporting of 5-year averages.

- *Land application:* The Virginia Department of Environmental Quality (VA DEQ) tracks land application of in-state and out-of-state biosolids comprehensively and compiles data from monthly biosolids reports submitted by land appliers and WRRFs. Data from the U.S. EPA electronic reporting system, as compiled in the online ECHO database, was an additional source for Virginia data on land application.
- *Incineration:* The ECHO database appears to include data on all of the solids from Virginia WRRFs that were incinerated in Virginia in 2018. That total (60,155 dry U.S. tons), which is included in this NBDP report, is significantly higher than the percentage of incineration found in the VAMWA/MAMWA Biosolids Survey (~34,500 dry U.S. tons); the difference may be due to more solids being incinerated in 2018 than the 5-year average in the VAMWA/MAMWA survey. NBDP checked the ECHO data and confirmed that the reporting WRRFs had wastewater flows that support the incinerated tonnages they reported.
- *Landfill disposal:* The solid waste branch of VA DEQ reported total “sludge” disposal at landfills for 2018, but there is no way to know what percentage of that total was municipal wastewater solids versus industrial and other sludges. So NBDP relied on the VAMWA/MAMWA survey, which reported only 4% of municipal wastewater solids were landfilled over their 5-year average period. They noted that it is a common practice for small WRRFs to use landfills for solids disposal, and most of these small WRRFs were not captured in the VAMWA/MAMWA survey. Therefore, NBDP added a few hundred dry tons to the VAMWA/MAMWA estimate of 5,100 dry U.S. tons going to landfill, resulting in the 5,500 dt included here.

The use of these different sources of data was required because the reporting requirements of Virginia Pollutant Discharge Elimination System (VPDES) permits have focused on biosolids land application and not on wastewater solids (sewage sludge) that are incinerated or landfilled.

The current VA DEQ biosolids staff has been working on program enhancements for more than 15 years and has been involved in the regulation updates and the technical advisory committee work that informed those updates. VA DEQ staff and other state experts provided helpful input and review of the data and report presented here by the NBDP, but NBDP is solely responsible for the final data and this report.

Land application of bulk Class A and bulk Class B biosolids is common, and it includes biosolids from many VA WRRFs as well as biosolids from out-of-state facilities. This NBDP report on Virginia biosolids includes only data on biosolids generated in Virginia; see other NBDP reports regarding District of Columbia and Maryland for details on biosolids generated at those locations, much of which was land applied in Virginia.

Of the estimated 165,000 dry U.S. tons (dt) of biosolids produced in Virginia and used or disposed of in 2018, 44% was applied to soil, mostly as bulk Class A or B material applied to farmland. Some went to forestland. Some was generally distributed as EQ products – compost and heat-dried pellet fertilizer.

A 2017 report for the VA General Assembly discussed 2016 data, which is still representative of 2018: “Biosolids and industrial residuals are applied to land throughout the state. In 2016, land application occurred in at least 53 different localities.... Most land application occurred in rural counties. In 2016, Amelia, Buckingham, Caroline, Culpeper, and Madison counties had the most material applied” (JLARC, 2017, p. 3).

“In 2016, the majority of materials applied to land were biosolids (69 percent). Thirty percent of land-applied materials were Class A biosolids and 31 percent were Class B biosolids (Figure 1-3). Eight percent of land-applied materials were composite biosolids from storage facilities, a mix of Class A and B materials. The most common land-applied industrial residuals were paper mill sludge, wood ash, and synthetic gypsum. About two-thirds of biosolids applied under DEQ site restrictions are applied to crops that are not consumed by humans. The majority of land application is to hay and pasture fields (55 percent) and pine tree farms (14 percent). The remainder is applied to fields that grow corn (27 percent) or other row crops, such as soybeans or wheat (four percent). Corn and other row crops are used for animal feed or as ingredients in processed food products that may be consumed by humans. Biosolids applied under DEQ site restrictions, including all Class B and most Class A biosolids, are not used on fresh produce crops” (JLARC, 2017, p. 3).

Out-of-state biosolids are also widely land applied in Virginia, the majority coming from the DC Water Blue Plains AWWTF, a regional facility that treats wastewater from the District of Columbia (Washington) and the Maryland suburbs and northern Virginia, and WSSC Water, whose four WRRFs treat about 65 MGD of wastewater from the Maryland suburbs of DC. Historically, smaller amounts of out-of-state biosolids have come from as far away as New York City and as close as the Tuscawilla Hills WRRF just over the border in West Virginia (but these WRRFs sent no biosolids to VA in 2018). In 2018, the many Maryland facilities that relied on land application outlets in Virginia included Annapolis, Broadneck, Broadwater, Dorsey Run, Freedom District, Mattawoman, Patuxent and Little Patuxent, Piscataway (WSSC Water), and Seneca (WSSC Water). Altogether, in 2018, 47,888 dry U.S. tons (dt) of biosolids from 19 out-of-state facilities were applied to 19,932 acres of Virginia farmland and 6,441 dt to forest land. Of this, about 38,000 dt were from just two agencies: DC Water and WSSC Water. For comparison, VA-generated biosolids applied to land in VA totaled 72,661 dt, of which 53,499 dt were applied to farmland and 1,489 dt to forest land (with the rest likely being marketed and distributed for various uses as EQ products).

Notably, before DC installed thermal hydrolysis and anaerobic digestion for its biosolids treatment in the mid-2010s, which dramatically reduced the tonnage of biosolids produced, more than 50% of the biosolids land applied in Virginia was from DC Water. In the 2000s, this influx of DC Water biosolids, which were sometimes malodorous, along with some malodorous biosolids from other WRRFs, contributed to public upset amongst neighbors to land application sites. That upset, and expansion of land application into new areas because of agronomic issues and population incursions at older land application sites, led to Virginia's decade-long review of biosolids safety and best management, involving diverse stakeholders, which led to the robust regulatory and enforcement systems in place today at VA DEQ, the VA Department of Conservation and Recreation (VA DCR), and the VA Department of Agriculture and Consumer Services (VDACS).

Today's DC Water thermal-hydrolysis, anaerobically-digested, EQ biosolids are more stable and low-odor. The thermal hydrolysis and anaerobic digestion process was such a success that WSSC Water and Arlington County are installing similar biosolids treatment systems, and the Hampton Roads Sanitation District's (HRSD's) Atlantic WRRF began startup of a thermal hydrolysis process in 2020. These improvements to make high-quality biosolids have helped advance the sustainability of biosolids land application in Virginia and have expanded the markets for biosolids. DC Water is no longer strictly reliant on application to farm and forest land. Its EQ "Bloom" biosolids are now used in nurseries, soil blends, and retail bagging sales. The results of this transition are apparent in the distribution of Blue Plains biosolids by state. Whereas in the period 2010-2015, when it was making lime-stabilized biosolids, about 90 percent was used in VA, currently more than half of Bloom use is in Maryland and the District of Columbia, driven in part by new Class A EQ uses.

Several biosolids management companies conduct almost all of the land application operations for Virginia WRRFs. Some of these contractors have storage facilities that serve as logistical hubs for managing biosolids. These hubs are located in the major agricultural counties, including Appomattox, Cumberland, Fauquier, Goochland, King George, and King and Queen. Active contractors include (more information on their websites; see references, below):

- Nutri-Blend, a local company that began operations in 1973, when it had a contract with the Richmond WWTP to land apply their biosolids; the company still land applies through storage and distribution hubs in Goochland and Cumberland Counties;
- Synagro Central LLC, part of a nationwide company, which land applies biosolids from large and small Virginia WRRFs around the Commonwealth and maintains a storage facility in the state;
- Houff Corporation, whose Gardner and McPherson storage facilities serve as distribution hubs – but only for industrial residuals, not municipal biosolids;
- Recyc Systems, a family-owned agribusiness that began connecting WRRFs with farmers in 1983 and currently provides broad services for a number of Virginia WRRFs and manages its own storage and distribution facilities;
- Crops, Inc., a relatively small local land application contractor;

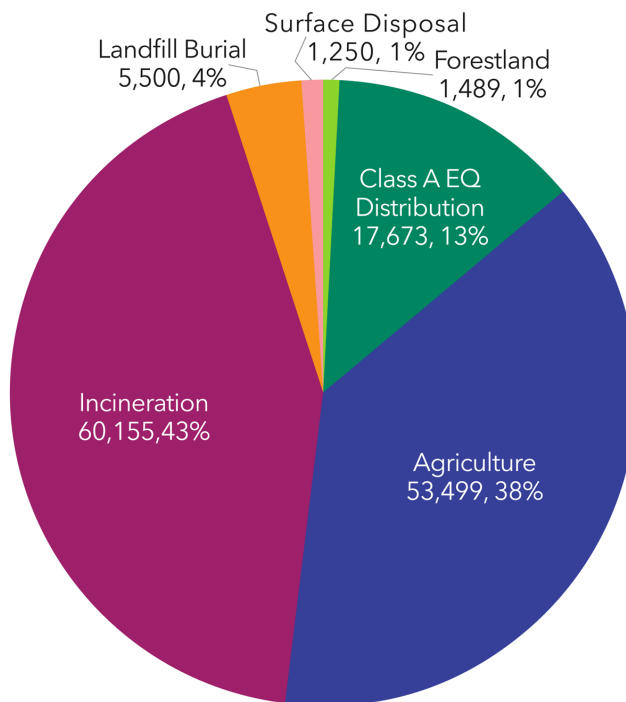
- Agri-Services Corp., based in King George County, which manages biosolids from several WRRFs and brings them to growers in VA, MD, PA, and DC (according to their website);
- AgNutrients, which has provided land application and logistical services for many years in the Hampton Roads area of Virginia.

As mentioned above, Virginia also has active land application of other residuals, which is also regulated and tracked in similar ways at the state level. These “industrial” residuals are not included in the data presented here by the NBDP, which are focused solely on municipal wastewater solids. For example, in Virginia, major food processors treat wastewater solids by aerobic or anaerobic digestion and either land apply or compost throughout the year. One was the yogurt and food company White Wave – now part of Danone – which land applied 1,328 dt of treated solids in 2018.

Fairfax Water and other water treatment facilities also land apply residuals - drinking water treatment residuals (WTR), also sometimes called hydrosolids. These solids, while having little nutrient and organic matter, are useful for bulking soil amendment products and reducing the leaching of phosphorus from the soils or residuals in which they are mixed.

The JLARC report (2017) says there were six sewage sludge incinerators (SSIs) operating in Virginia in 2016. ECHO data for 2018, which NBDP relied on here, show the following WRRFs sent solids to on-site incineration in 2018: Prince William County Service Authority, Lower Potomac WRRF, Hopewell WRRF, and WRRFs operated by HRSD: Army Base, Atlantic, Boat Harbor, Chesapeake/Elizabeth, VA Initiative, Nansemond, and Williamsburg. In total, HRSD incinerated 26,900 dt. The small Henrico Regional WRRF sent 162 dt of its solids to another facility for incineration, likely the Hopewell incinerator, not far away. By the end of 2030, HRSD will have closed three of its five incinerators. The first closure happened in 2021. At the same time, HRSD will increase solids flows to its Atlantic WRRF, where solids will be treated by thermal hydrolysis. Thus, in the future, incineration will be the least common method of wastewater solids management in Virginia.

**Virginia Biosolids Use & Disposal 2018**  
(dry US tons, %)  
Total: 140,000



### Agency/Department Oversight, Regulations, and Permitting

Biosolids are thoroughly and actively regulated at the state level in Virginia, as described by [Alvarez-Campos and Evanylo, 2019](#):

“The Virginia Biosolids Use Regulations (12 VAC 5-585, 32.1-164.5 of the Code of Virginia) were developed by the Virginia Department of Health (VDH), but the Virginia General Assembly transferred oversight of the regulations and permits to the Virginia Department of Environmental Quality (DEQ) in 2008 ([§ 62.1-44.19:3. of the Code of Virginia](#)). Thus, compliance with land application regulations of biosolids in Virginia is now regulated by the DEQ via the Virginia Pollution Abatement (VPA) permit regulation ([9 VAC 25-32](#)) and the Virginia Pollutant Discharge Elimination System (VPDES) permit regulation ([9 VAC 25-31](#)). State regulations require biosolids to meet pathogen reduction, metal concentration limits, and vector attraction reduction as established by the Part 503 rule. However, some of the additional specific requirements for Virginia include:

- “Permits that must be obtained by [land appliers and/or] owners of wastewater treatment facilities for the land application of biosolids, which

comprise both VPA and VPDES Permit Regulations. It's important to highlight that the DEQ permit process provides the opportunity for public involvement by holding public meetings to provide information to residents, by allowing residents to submit written comments to DEQ, and by holding public hearings if more than 25 qualifying requests for hearings are received ([§ 62.1-44.15:02 of the Code of Virginia](#)). Public input can help modify permits (JLARC, 2018).

- "Specific procedures and nutrient management plans for biosolids land application.
- "Soil monitoring, site management, sampling, analysis, record keeping, and reporting in connection with land application and distribution of biosolids.
- "Determining the suitability of a site for land application.
- "[Multiple notices to] local government prior to biosolids application, [at least 100 days prior, at least 14 days prior, and again in the 24-hour period prior to land application].
- "Ensuring quality of biosolids before land application.
- "Investigating the activities and operation of WWTP [permit holders] following complaints.
- "Enforcement actions if regulations are not followed." (VA DEQ sends warning letters and/or compliance notices, using a point system to elevate issues from informal compliance action to civil enforcement.)

"While Virginia DEQ largely focuses on compliance of appropriate biosolids land application through permitting and inspections, the Virginia Department of Agriculture and Consumer Service (VDACS) regulates biosolids as fertilizer, soil amendments, horticultural growing media or liming materials through product registration and manufacturing licensing." The VDACS-regulated biosolids are all Class A EQ. All biosolids distributed and marketed in VA for public use must be EQ, meaning that they must meet Table 3 in the federal biosolids regulation at 40 CFR Part 503 as well as pathogen and vector attraction reduction requirements.

VA DEQ also requires that biosolids be land applied in accordance with nutrient management plans, over which the VA DCR provides oversight. Plans must be site-specific and developed by a certified nutrient management planner. In accordance with Virginia law, VA DEQ administers a program to train people that land apply biosolids, with assistance from other Virginia agencies such as DCR, VDH, and VDACS, along with Virginia Tech.

There are a couple of notable features associated with Virginia's biosolids land application programs:

- **Fees:** VA DEQ charges a fee to help fund VA DEQ regulation. The agency assesses a fee when



biosolids are applied to land under site restrictions. The fee is \$7.50 per dry ton of Class B material, and \$3.75 per dry ton of Class A EQ cake material. These fees are paid by WRRFs (passed through as a component of contracts with land applicers), paid to VA DEQ by the party conducting land application, and are used to fund DEQ's regulatory program. These fees do not apply to heat-dried or composted Class A EQ materials that are distributed and marketed as fertilizers and registered with VDACS.

- *Transparency:* As biosolids management and land application permits are discussed, promulgated, and decided in Virginia, there are ample opportunities for involvement by the agency doing the regulating and any interested public. The regulations for biosolids in Virginia contain very detailed notification requirements. The permitting of biosolids also requires significant "regulated" communication, meaning the public and local government representatives are provided an opportunity to participate in the permitting of biosolids.

## **Supporting Organizations**

The strength and resilience of biosolids management programs in Virginia is demonstrated by the ongoing involvement of many organizations other than state agencies. These other organizations help encourage additional best management practices, acknowledge the value of regulations and oversight, and provide helpful communications and engagement with the General Assembly, county governments, agricultural advisors, and other key stakeholders. These organizations include the following:

### *Virginia Tech*

The state's land grant university has long had expertise in biosolids land application and has conducted leading local research that informs proper regulations and best management practices while building legislative and public confidence in biosolids land application programs statewide.

<https://ext.vt.edu/natural-resources/biosolids.html>

### *Virginia Biosolids Council*

The Virginia Biosolids Council (VBC) is the country's only state-level biosolids non-profit organization dedicated to communications regarding the generation and beneficial use of biosolids. VBC's membership includes those who generate and manage more than 95% of the biosolids land applied in the state, including out-of-state generators that have a vested interest in the use and regulation of biosolids in Virginia, such as DC Water and WSSC.

One unique, proactive aspect of VBC is the Code of Good Practice that members sign on to. It was initiated by VBC members in 2010 to provide guidance for responsibly generating and beneficially recycling biosolids in Virginia. The Code is voluntary; it focuses on the following objectives:

- Protecting the environment by using best management practices,
- Minimizing adverse social impacts by using best practices, and



- Promoting education and awareness among the diverse public.

VBC is also unique in its direct outwardly-facing social media presence, providing information on biosolids recycling through its active website and Facebook and Instagram accounts.

<https://www.virginiabiosolids.com/>

*Virginia Association of Municipal Wastewater Agencies (VAMWA)*

VAMWA members include most of the major WRRFs in Virginia. The association works “for clean water in Virginia based on sound science and good public policy,” and has an active Biosolids Committee. <http://www.vamwa.org/>

## **Pressures on Biosolids Management and Land Application**

The VA DEQ biosolids coordinator chose the following pressures on biosolids management from a list provided in the NBDP survey:

1. ENVIRONMENTAL ISSUES – impacts to soils, organisms, public health, contaminants (pathogens, metals, organic chemicals, etc.)
2. COST – rising costs generally
3. TRADITION – recycling biosolids is not a priority or part of WWTP's core mission
4. AGRICULTURAL ISSUES – appropriate nutrient management, soil compaction, difficulty with timing, stockpiling, etc.
5. PUBLIC INVOLVEMENT – concerns of neighbors, environmental groups, and others

VA DEQ also noted these additional pressures:

- Costs – trucking & logistics are always a concern.
- Some opponents of biosolids cite Chesapeake Bay protection efforts as reason to not use biosolids, but Virginia regulations make nutrient management plans mandatory with biosolids use. In contrast, nutrient management plans are voluntary in Virginia for commercial fertilizer sources.
- Hauling distances are challenging for some WRRFs, but not for others.
- Odors/nuisances – complaints have gone down since DEQ took over regulation of biosolids in 2008. The complaints that are still received are most commonly related to odors. The percentage of land application events that get complaints is small and follows no particular pattern. While causing less pressure than in the past, public upset continues to be a concern that can impact local land application programs. (See table below for land application-related complaints in 2008-2018.)
- Biosolids generators (WRRFs) are concerned that VA DEQ rules are too restrictive around EQ; EQ bulk cake is regulated similarly to Class B bulk biosolids. There are a few other states, such as Texas, which have similar requirements around EQ bulk land application.

- As has happened in other states, in 2020 – 2021, the Covid-19 pandemic impacted work at regulatory agencies and other organizations. VA DEQ held public meetings virtually during the state of emergency, declared by Virginia’s governor, which allowed a waiver of the requirement to hold meetings in the locality where land application is proposed. After the state of emergency was lifted, some citizens have requested virtual meetings continue, but Virginia law precludes the option.
- Finally, PFAS is another issue putting pressure on biosolids land application in VA, just as it is in some other states. PFAS – per- and polyfluorinated alkyl substances – began to gain interest in Virginia in 2018. All biosolids contain PFAS in trace levels, but the science on acceptable levels is still developing. As of 2021, VA DEQ is not proceeding with biosolids regulation updates until it becomes clearer how PFAS in biosolids should be addressed.

A significant issue in Virginia in and around 2018 was a lack of adequate biosolids storage capacity caused by excessive rains that precluded land application for relatively long periods of time. WRRFs and land appliers had to find alternative options for biosolids storage. This resulted in VA DEQ enforcement discretion in some cases and civil penalties in others. There are a few localities that had imposed ordinances on storage facilities prior to 2018, such as limiting hours of operations, and those local ordinances remain in effect in those few jurisdictions. But the new pressures experienced by many more biosolids programs in 2018 created heightened concerns. In 2021, measures to help avoid a similar crisis in the future are being considered by generators and appliers in discussion with VA DEQ.

About the future, VA DEQ notes that upcoming additions of more thermal hydrolysis systems, such as at WSSC, will result in some corresponding reduction in volumes of biosolids for land application. But the agency anticipates that this shift will lead to more requests to land apply more EQ bulk cake material with fewer site restrictions and notifications. It is clear that Class A EQ is becoming more prevalent, with a corresponding decrease in Class B biosolids. However, WRRFs that opt for landfill disposal are not changing over to beneficial use.

<b>Calendar Year</b>	<b>Complaints during/after biosolids land application</b>	<b>Dry U. S. tons spread</b>	<b>Acres spread</b>
2008	203	260,655	70,800
2009	106	204,879	60,100
2010	143	230,142	66,800
2011	180	220,534	66,000
2012	84	225,314	62,300
2013	36	184,590	52,100

2014	29	190,065	45,141
2015	38	130,219	35,396
2016	39	145,920	49,835
2017	23	139,686	45,121
2018	27	54,988	45,511

(Zahradka, 2019)

## Septage Management

As in many other states, the regulation of septic systems and, to some extent, septage, falls under the jurisdiction of the Department of Health (VDH). According to a 2010 report (VA Chesapeake Bay TMDL, 2010), “Virginia has approximately 1,015,000 onsite sewage systems statewide.” VDH issues some permits for management of septage, including for pumping and hauling, for storage, and/or for treatment without land application. Land application of septage is managed under the biosolids program, and VA DEQ has permitted one facility, allowing land application of septage. VA DEQ provides guidance for septage land application, including that it must be treated to Class B standards and be applied in accordance with the federal Part 503 rule. Virginia law prohibits the land application of lime-stabilized septage.

**Table 1. Virginia Septage Management**

Quality of state septage data	None
Septage haulers based in state:	no data
In-state separate preparers (not WRRFs) taking septage:	some
WRRFs required to take septage?	no
WRRFs that accept septage:	many
Septage received at WRRFs in 2018 (gallons):	no data
Other outside wastes accepted at WRRFs:	no data
Is fats/oil/grease (FOG) a significant issue?	no data
Is it regulated?	no data
How?	no data
	no data
Is there a proactive program to collect FOG?	no data
Can septage be land applied in state?	yes
If yes, what treatment is required?	must follow Part 503 & state biosolids regulations
Most recent septage regulations update:	VA has no separate septage regulations; septage oversight is looped in with biosolids.

Full-time equivalent (FTE) at state agency for septage:	0
<b>Notes:</b> NBDP estimates that VA households with septic systems generate ~52.8 million gallons of septage each year, based on ~34% of the state's households relying on septic systems and assuming that tanks are 1000 gallons and 5% of them are pumped out each year. Most septage is hauled to and disposed of at WRRFs. A small amount is land applied, and some is treated in lagoons and later land applied.	

## Major WRRFs, Separate Preparers, and Notable Projects

**Arlington County's WRRF** is the state's largest single WRRF biosolids producer and created 10,741 dry U. S. tons (dt) in 2018. The WRRF, located next to Reagan National Airport near Washington, DC, used to incinerate solids. Neighbors objected, and the facility is upgrading to production of a Class A EQ product, using a similar thermal hydrolysis and anaerobic digestion process as at DC Water and WSSC Water. <https://www.virginiabiosolids.com/arlington-plan-focuses-resource-recovery/>

**Richmond**, the state capital, has the largest average daily flow of any WRRF in Virginia. In 2018, it land applied about 5,700 dt of anaerobically-digested Class B biosolids to farmland. Some (~1,500 dt) was managed and land applied by a private contractor who either hauls biosolids directly to farm fields or stores them at their storage and distribution hub (e.g., in this case, the Goochland facility).

**Henrico County Water Reclamation Facility** treats an average flow of 40 MGD, and recycles biosolids to county-owned lands that are leased to farmers. <https://www.virginiabiosolids.com/biosolids-public-property-reflects-countys-commitment/>

**Hopewell's** WRRF treats about 27 MGD. Its solids go in the facility's multiple hearth incinerator, and the resulting ash is landfilled.

**Alexandria Renew Enterprises** biosolids are managed through land application by private contractors who either haul biosolids directly to farm fields or store them at storage and distribution hubs (e.g., in this case, at the Fauquier County hub).

**Hampton Roads Sanitation District** as a whole produces more biosolids than any other agency (more than Arlington) – but from 17 total WRRFs treating 249 MGD combined. HRSD has had the most diverse biosolids treatment and management operations in the state, including incineration and land application of Class A and Class B products from its nine major plants and eight smaller plants in eastern Virginia and the Eastern Shore.

**Leesburg** has a solids drying facility that was shut down in mid-November 2018 for refurbishment. That year, most of the town's solids were dried, distributed and marketed (742 dt), but ~170 dt (773 wet tons) of cake solids were removed through a shorter-term arrangement with a private contractor – an example of how the solids management marketplace is complex and fluid because of practical needs.

**Loudoun Water's Broad Run Water Reclamation Facility** (8 MGD average flow, in construction to soon be 15 MGD capacity) in 2018 produced 1,636 dry tons of aerobically-digested Class B biosolids that were land applied.

**Spotsylvania County Utilities** produced about 2,500 dt of dewatered (~15%) solids in 2018. The solids were composted in a dedicated facility on the property of the county landfill, producing "Livingston's Blend" compost, which sells for \$16 - \$30 per cubic yard.

**Western Virginia Water Authority (WVWA)** treats solids with anaerobic digestion and land applies them in liquid form (about 8% solids).

**The Upper Occoquan Service Authority** WRRF northeast of Manassas is designed to treat up to 54 MGD to very high quality: the effluent is returned to the Occoquan Reservoir, an example of indirect potable reuse. Exceptional steps are taken to remove excess nutrients, including a rare high-lime tertiary treatment process and subsequent additional clarification. The resulting chemical solids are dewatered and landfilled. The primary and secondary solids are anaerobically digested and the resulting biogas drives an internal combustion engine that, in 2016, met one quarter of the plant's electricity needs. The digested solids are dewatered in centrifuges and dried and pelletized for bulk EQ land application on area farms by a private biosolids management contractor.

## References

- JLARC (Joint Legislative Audit and Review Commission), 2017. Land Application of Biosolids and Industrial Residuals, Report to the Governor and the General Assembly of Virginia. October 10, 2017.
- Virginia Department of Environmental Quality (VA DEQ), 2019. 2019 Annual Solid Waste Report for CY2018. June 2019.
- Zahradka, Neil (VA DEQ). 2019. Biosolids regulatory program. Slide presentation to the VASWCD Area III Meeting, March 21, 2019.

## Regulatory:

Alvarez-Campos, O. and G. Evanylo. 2019. How and who regulates the use of biosolids. Virginia Tech and Virginia Biosolids Council. [https://www.viriniabiosolids.com/wp-content/uploads/2018/10/VBC\\_WhoRegulates.pdf](https://www.viriniabiosolids.com/wp-content/uploads/2018/10/VBC_WhoRegulates.pdf)

**Virginia Nutrient Management Standards and Criteria, July 2014:**

<https://www.dcr.virginia.gov/document/standardsandcriteria.pdf>

**Virginia Tech:**

<https://ext.vt.edu/natural-resources/biosolids.html>

**VAMWA:**

<http://www.vamwa.org/>

**VA Landfills:**

<http://www.viriniaplaces.org/waste/landfill.html>

Virginia, Commonwealth of, Chesapeake Bay TMDL Phase I Watershed Implementation Plan, Nov. 29,, 2010

**Selected WRRFs / biosolids programs:**

Fairfax Water:

<https://www.fairfaxwater.org/>

Hampton Roads Sanitation District:

<https://www.tpomag.com/editorial/2021/07/cambi-reactor-breaks-down-and-sterilizes-biolids-at-this-virginia-utility>

Houff Corporation:

<https://houffcorp.com/biosolids/>

Loudon Water:

<https://www.loudounwater.org/about/loudoun-water-facilities>

Nutriblend:

<http://www.nutri-blend.com/>

Spotsylvania County Composting:

<https://www.spotsylvania.va.us/1686/Composting-Facility>

<http://gwregion.org/wp-content/uploads/2018/09/Doug-Crooks.-Livingston-Landfill.pdf>

Western Virginia Water Authority:

<https://www.westernvawater.org/wastewater-service>

<https://www.westernvawater.org/wastewater-service/wastewater-treatment/biosolids-land-application>

Recyc Systems:

<https://recycsystems.com/>

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