
Chapter 6

Biosolids Policies

RWSP biosolids policies focus on the beneficial use of wastewater solids. The policies provide guidance on continuing to produce and market Class B biosolids while evaluating alternative technologies that have the potential to produce the highest quality marketable biosolids, including Class A biosolids.^{1,2}

The RWSP biosolids policies require King County to produce biosolids in accordance with federal, state, and local regulations. The policies provide direction on working cooperatively with statewide organizations on biosolids issues. They also provide guidance on minimizing noise and odor impacts and on using digester gas for energy generation.

This chapter provides an overview on the efforts associated with implementation of the RWSP biosolids policies from 2004 through 2006. In accordance with the RWSP reporting policies, this chapter also includes a summary of the biosolids activities carried out in 2006. There were no amendments made to the RWSP biosolids policies in 2004–2006.

The complete text of all the biosolids policies, including a brief summary of how each policy was implemented in 2004–2006, is provided in Appendix E.

6.1 Implementation of Biosolids Policies from 2004 through 2006

Biosolids are the nutrient-rich organic material produced by treating wastewater solids. After processing and treatment, they can be beneficially recycled as a fertilizer and soil amendment. When added into the soil, biosolids help to retain soil moisture, reduce erosion, improve soil tilth, and slowly release essential plant nutrients like nitrogen, phosphorous, potassium, and zinc. King County has been recycling biosolids for more than 30 years. In addition, the digester gas that is a byproduct of the solids treatment process can be used as fuel and converted to electricity and heat for treatment plant use.

The Wastewater Treatment Division's (WTD) vision of creating resources from wastewater aligns closely with the RWSP biosolids and reclaimed water policies. (Chapter 7 provides

¹ Class B biosolids refer to biosolids that have been treated to significantly reduce pathogens to levels that are safe for beneficial use in land application. Federal and state regulations require site management and access restrictions when biosolids of this quality are land applied.

² Class A biosolids refer to biosolids that have been treated to reduce pathogens to below detectable levels. Federal and state regulations require this level of quality for biosolids that are sold or given away in a bag or other container, or applied to lawns or home gardens.

information on implementation of water reuse policies.) As part of this vision, WTD also recycles grit—the sand, pebbles, and debris that are removed from incoming wastewater.

WTD’s biosolids recycling, energy recovery, and reclaimed water efforts are also consistent with the 2006 King County Executive orders to reduce global warming.³ The orders include innovative actions to turn waste into resources to help buffer global warming impacts.

This section provides information on implementation of the biosolids policies in regard to biosolids recycling, quality of biosolids, maximizing program reliability, exploring technologies to generate Class A biosolids, and working cooperatively with statewide organizations on biosolids issues. In addition, this section includes information that corresponds to the policies that relate to energy recovery.

6.1.1 Biosolids Recycling

The RWSP biosolids policies call for King County to achieve beneficial use of wastewater solids. The county’s biosolids are used in agriculture and forestry, and as an ingredient in compost. One hundred percent of King County’s biosolids were recycled in 2004–2006 and continue to be used in the following programs and projects.

- **Boulder Park Soil Improvement Project.** About 60 percent of the county’s biosolids are used to fertilize and amend the soils for dryland wheat crops in Douglas County. Boulder Park, Inc., under contract to King County, manages the largest multi-farmer biosolids recycling project in the United States, with more than 100 participating farmers and 65,000 acres permitted for application. It is one of the most successful long-term, community-supported biosolids operations in the country. Biosolids from other agencies are also used in this project.
- **Green Valley Project.** About 15 percent of the county’s biosolids are used by farmers in the Yakima Valley for a variety of irrigated and dryland crops. Natural Selection Farms (NSF), a farmer-owned company, distributes and applies the biosolids.

WTD participated in research initiated by the University of Washington to evaluate the

History of King County’s Biosolids Program

The formation of a regional wastewater treatment system and overall treatment improvements helped reduce pollution to waterways. However, solids were still considered a waste and typically dumped in landfills or discharged into the ocean.

King County was a pioneer in recycling biosolids. Looking for an environmentally sound alternative, King County’s Biosolids Program began working with local universities in the early 1970s to find safe and beneficial uses for this nutrient-rich soil-like material. Landfills were a costly option with no environmental benefit.

Research projects showed that biosolids enhanced tree and plant growth and could be used safely in the environment. Federal and state governments used results from research and demonstration programs to establish standards for land application of biosolids. These regulations and guidelines protect public health and the environment. King County’s biosolids quality and recycling practices easily meet these stringent requirements for land application.

³ The Executive orders to reduce global warming (PUT 7-5 to 7-8 [AEO]) are available at <http://www.metrokc.gov/recelec/archives/sysindex.htm>

response of canola crops to fertilization with biosolids. The research showed that using biosolids is a suitable fertilizer for canola. Because of this research, canola farmers are using the county's biosolids. NSF is operating the first crushing facility to produce "made in Washington" canola oil for biodiesel production. King County's buses are running on biodiesel made from these biosolids-fertilized canola crops.

- **Mountains to Sound Greenway Biosolids Forestry Program.** This program is a partnership of private and public agencies that uses biosolids to fertilize and preserve working forests in eastern King County. About 20 percent of the county's biosolids are used to fertilize forests owned and managed by the Hancock Forest Management Group (on the former Snoqualmie Tree Farm) and the state Department of Natural Resources (at Marckworth Forest, east of Duvall).
- **GroCo Compost.** About 5 percent of the county's biosolids are mixed with sawdust and composted to make GroCo compost for use in residential and commercial landscaping, home gardens, and soil restoration. GroCo compost meets state and federal Class A standards.

For more information, visit WTD's Biosolids Program Web site at <http://dnr.metrokc.gov/wtd/biosolids/index.htm>

6.1.2 Producing High Quality Biosolids

The RWSP policies require the county to meet federal, state, and local regulations regarding the production of biosolids. In addition, the policies guide the county to produce the highest quality of biosolids economically and practically achievable and provide direction to minimize impacts associated with biosolids recycling.

Meeting state and federal regulations

Biosolids are regulated under both state and federal regulations (WAC 173-308 and 40 CFR, Part 503). WTD's biosolids are routinely monitored for metals, conventional constituents (phosphorous, potassium, and pH), microbes, and organic compounds.⁴ WTD's biosolids consistently meet or exceed all federal and state criteria. For example, King County's biosolids metal concentrations are well below the most restrictive federal and state standards. Industrial source control and pretreatment have reduced the amount of metals in biosolids by 70–90 percent since the 1980s. Implementation of the county's Dental Waste Program has helped to reduce the amount of mercury in biosolids by 50 percent from levels in 2000. Chapter 9 provides more information on the county's source control and pretreatment programs. Table 6-1 provides information on the metal concentrations in the county's biosolids in 2006 as compared to federal and state standards.

⁴ Details on the quality of King County's Biosolids is provided in the *2006 Biosolids Quality Summary*, March 2007 <http://dnr.metrokc.gov/wtd/biosolids/pdf/2006%20Biosolids%20Quality%20Summary.pdf>

**Table 6-1. Trace Metals in King County's Biosolids in 2006
Compared to Federal and State Standards**

2006 Averages (dry weight)	Federal and State Standard mg/kg	West Point Plant mg/kg	South Plant mg/kg
Arsenic	41	6.95	6.16
Cadmium	39	3.03	4.75
Lead	300	111	59.6
Copper	1,500	561	507
Mercury	17	1.43	1.1
Nickel	420	30.4	26.4
Selenium	100	6.86	6.95
Zinc	2,800	940	866

It is anticipated that EPA will limit molybdenum (Mo) in biosolids for land application in future rules revisions. WTD's Industrial Waste Program is evaluating potential sources that contribute Mo to the wastewater system, such as air conditioning cooling towers.⁵

Participating in Studies and Investigations

King County continues to participate in studies and investigations to understand the significance and fate of various chemicals found in its biosolids. WTD is also evaluating information on microconstituents of emerging concern, such as potential endocrine disruptors. In 2005, WTD began participating in a three-year study to evaluate the presence of fire retardant chemicals (PBDEs) in biosolids and their fate after land applications, including degradation and potential risk to public health, relative to other exposures such as house dust. The study is being conducted by the University of Arizona Water Quality Center and includes long-term biosolids field sites in western Washington.

King County's Environmental Lab and the University of Washington collaborated on a laboratory and greenhouse project to study the fate and degradation of nonylphenol from land applied biosolids. Nonylphenol is a surfactant found in many household cleaning products and therefore is commonly found in wastewater and biosolids. Results indicated that nonylphenol is not absorbed by plants and degrades quickly after application to soil.

Implementing Best Management Practices

In 2004, the county's biosolids program passed an independent audit and was certified into a national program of Environmental Management Systems (EMS).⁶ King County was the third wastewater agency in the nation to earn this prestigious certification. The EMS is a program

⁵ Mo is a metallic element that resembles chromium and tungsten; it is used in strengthening and hardening steel and is also a trace element in plant and animal metabolism.

⁶ For more information on the National Biosolid's Partnership EMS Program, visit the program's Web site at http://www.biosolids.org/ems_main.asp?sectionid=48

developed by the National Biosolids Partnership to document, monitor and optimize the management of wastewater solids and improve biosolids management programs nationwide. In order to be admitted and certified by this program, WTD's biosolids program had to meet the following five requirements.

- The agency has documented its responsibility for the Biosolids Value Chain (pretreatment, treatment and final use)
- The agency has committed to the 10 principles in the National Biosolids Partnership's Code of Good Practice
- The agency operates a Biosolids Environment Management System that meets all the National Biosolids Partnership's requirements
- The agency has committed to make continual improvements in their Environmental Management System for environmental performance, regulatory compliance, public participation, and quality biosolids management practices
- The agency has successfully completed a fully independent audit of its Environmental Management System and has been verified by a National Biosolids Partnership's accredited company

The EMS is used to document the county's biosolids program's performance and management practices that go beyond minimum regulatory requirements, ensure protection of public health and the environment, and foster relationships with the community. A commitment to sustainable management practices and operations is a key component in maintaining EMS certification. Annual third-party audits are being used to confirm that the county's EMS is addressing its biosolids management goals of environmental protection, cost-effectiveness, and public acceptability.

Highlights of WTD's EMS achievements in 2004–2006 are as follows:

- Trained staff and contractors on EMS tools and performance goals
- Worked with member agencies of the Northwest Biosolids Management Association to develop a method to provide interagency assistance on EMS internal audits to reduce costs
- Converted biosolids truck fleet to seasonal use of B20 (20 percent blend) biodiesel to reduce greenhouse gas emissions
- Developed policy guidelines for permitting discharges from the biotechnology industry sector to King County's sewers (<http://dnr.metrokc.gov/wlr/indwaste/biotech.htm>)

The National Biosolids Partnership has a tiered recognition program to track agency progress in developing and implementing an environmental management system that has been audited by an independent third-party auditor. In 2007, the partnership awarded the Platinum Level designation to WTD's Biosolids Program. The Platinum Level designation represents the highest achievement of biosolids management and environmental stewardship.

Minimizing Impacts Related to Biosolids Recycling

The RWSP biosolids policies call for the county to seek ways to minimize impacts related to biosolids recycling. One of the county's stated goals is to reduce biosolids truck trips to an average of five per day. In the period from 2004 through 2006, biosolids truck trips at West Point have averaged about four trips per day. At South plant, the trips went from an average of 6.6 trips per day in 2003 to fewer than five trips per day in 2006. The reduction in truck trips at both plants is attributed to the installation of high solids centrifuges.⁷ However, odors at application sites have increased due to the use of the centrifuges. WTD is evaluating the options available to reduce these odors. National studies are also under way as other treatment plants are facing similar results from the use of high-solids centrifuges.

The West Point Digestion System Improvements project is being planned to increase the stability of the digestion system and decrease the potential for digester upsets. In addition to affecting the quality of the biosolids, these upsets increase odor at the plant. The project will also include modifications to the blending storage tank (Digester 6) to enable its use as an emergency active digester if needed. Predesign will be completed in 2007; final design is expected to be complete in 2008.

6.1.3 Maximizing Program Reliability

RWSP Biosolids Policy (BP)-4 directs the county to maximize program reliability and minimize risk using one or more of several options. One option is to consider diverse technologies, end products, and beneficial uses. WTD accomplishes this by supplying Class B biosolids to two agricultural projects, two forestry projects, and a composter. The composter then creates and markets a Class A compost product made with King County's biosolids. WTD also continues to evaluate new markets that would provide additional site capacity, environmental benefits, or lower costs. The canola research mentioned earlier in this chapter is an example of evaluating and creating new markets for the county's biosolids.

Another option for maximizing program reliability is maintaining reserve capacity to manage 150 percent of the projected annual volume of biosolids. This additional capacity (primarily in Douglas County) has allowed King County to recycle 100 percent of its biosolids even when one or more of its projects has temporarily reduced capacity.

In accordance with RWSP BP-6, which provides guidance on exploring technologies that may enable the county to generate Class A biosolids cost-effectively or because they have better marketability, WTD conducted investigations into the most appropriate technologies and resultant costs of producing Class A biosolids at the regional treatment plants in 2004–2006. These technologies, which produce Class A “exceptional quality” biosolids, could open up opportunities to market the product in King County and Western Washington, thereby reducing hauling and site management costs. The investigation concluded that, at this time, temperature-phased anaerobic digestion would be the most viable alternative for converting each plant to Class A biosolids production. Further assessment of costs, benefits, and markets will continue.

⁷ Centrifuges are equipment that removes water from biosolids.

6.1.4 Working Cooperatively with Statewide Organizations

RWSP BP-8 directs the county to work cooperatively with statewide organizations on biosolids issues. King County's biosolids program is built on partnerships with public agencies, private companies, landowners, university researchers, and environmental organizations. These partners help manage field sites, provide information, and conduct credible research. The partnerships have been instrumental in achieving and maintaining public acceptance and markets for biosolids in the Northwest. In addition, the county participates in local organizations and is a founding member of the Northwest Biosolids Management Association (NBMA), whose purpose is to share technical knowledge about biosolids management between members, provide opportunities to work with university scientists; local, state, and federal regulators; and the general public.

Through the NBMA, WTD works cooperatively with regulatory officials, scientists, and other biosolids managers on regulatory issues, education and training, public information, and research and demonstration. WTD is participating in the Washington State Department of Ecology's biosolids rule revision advisory group and in the NBMA's regulations committee review and comment process.

In addition, the county and the University of Washington are evaluating the amount of carbon storage created by each of WTD's current biosolids end users.⁸ These include using biosolids to enhance forest growth, to increase soil carbon reserves in agriculture or restoration projects, and to grow energy crops such as oil seed crops for biodiesel. The study will include details on how to account for carbon storage in soils and in different ecosystems.

6.1.5 Energy Recovery

During solids treatment, naturally occurring microorganisms degrade the solid organic matter and produce digester gas, which consists mostly of energy-rich methane gas. Both the West Point and South plants recover this gas to generate electricity and heat for treatment plant processes; it is used to power engines, boilers, turbines, and a fuel cell to produce heat and power. Some of the gas produced at South plant is sold to Puget Sound Energy for distribution in its natural gas system.

In 2004–2006, in cooperation with the U.S. Environmental Protection Agency and FuelCell Energy, Inc., King County sponsored the world's largest fuel cell demonstration project using digester gas at South plant.⁹ The project had two main objectives—to demonstrate that molten carbonate fuel cell technology can be adapted to use anaerobic digester gas as a fuel source and to achieve a nominal power output target of one megawatt using either digester gas or natural gas. Both of these objectives were met and the demonstration project confirmed that fuel cell technology is a viable, clean, sustainable power generation alternative.

⁸ Carbon storage is the process through which agricultural and forestry practices remove carbon dioxide (CO₂) from the atmosphere and store it in soil or above ground biomass. CO₂ is a major contributor to global warming.

⁹ A fuel cell is a device that chemically combines hydrogen and oxygen to make electrical energy without combustion. Fuel cells can operate on a variety of fuels including natural gas, methanol, ethanol, landfill methane, coal gas, digester gas, propane, gasoline, and pure hydrogen.

King County will own the fuel cell power plant beginning in 2007 and will evaluate negotiating a new service agreement with FuelCell Energy, Inc., for operations and maintenance if it is determined that the plant meets the county's energy objectives. For more information on the fuel cell demonstration project, visit the project's Web site at

<http://dnr.metrokc.gov/wtd/fuelcell/library.htm#supplemental>

Plans are under way to replace an existing cogeneration facility at the West Point plant that was commissioned in 1984 to burn digester gas as fuel and to generate heat and electricity for the plant. The existing system has been operating with increasing unreliability and because of this will be removed in 2008. WTD staff is evaluating other options to continue to beneficially use digester at the West Point plant; the evaluation process is expected to be complete in fall 2007.

A feasibility study will be prepared in 2007 to identify potential technologies for using digester gas to generate alternative forms of energy at Brightwater. The study has been funded by a state grant.

The Executive orders to reduce global warming include direction to maximize the conversion and use of waste for energy and to minimize existing energy use through increased efficiency, optimized operation and maintenance, and conservation efforts. In addition, a goal of the *King County Energy Plan* (February 2007) is for the county to achieve a 10 percent per square foot reduction in county energy use by 2012.¹⁰ WTD is developing a division-wide energy plan to meet these goals.

For more information on WTD's energy recovery efforts, visit the program's Web site at <http://dnr.metrokc.gov/wtd/energy/index.htm#2>

6.2 2006 Annual Report Activities

In accordance with RWSP reporting policies to include elements of the RWSP annual report in the RWSP comprehensive review, this section describes accomplishments of WTD's Biosolids and Energy Recovery programs in 2006.

Approximately 110,000 wet tons of biosolids were produced and recycled beneficially in 2006. The county met all the conditions of its Statewide General Permit for Biosolids.¹¹

In 2006, King County's biosolids were used as a soil amendment for a variety of applications:

- 5,600 acres of wheat in Douglas County
- 128 acres of hops in the Yakima Valley

¹⁰ The *King County Energy Plan*, February 2007, is available on the Web at <http://www.metrokc.gov/exec/news/2007/pdf/EnergyPlan.pdf>

¹¹ The Statewide General Permit for Biosolids is issued by the Washington State Department of Ecology and establishes the conditions that must be met for land application of biosolids and other related processes and aspects of operations related to biosolids.

- 320 acres of state forestlands and 1,207 acres of Douglas-fir plantations in Hancock's Snoqualmie Forest
- 3 percent of the biosolids for GroCo compost

Other highlights in 2006 are as follows:

- Generated more than \$100,000 in fertilizer revenue from customers
- Completed the *2006 Biosolids Quality Summary* report; this report provides information on the results of monitoring and data analysis of King County's biosolids
- Worked with the University of Washington to estimate carbon sequestration for biosolids end uses. In addition, the University evaluated the potential for biosolids applications to qualify for carbon credits that could be traded on the Chicago Climate Exchange.¹²
- Converted entire biosolids truck fleet to seasonal use of B20 biodiesel to reduce greenhouse gas emissions
- Issued a Notice to Proceed on the West Point Digestion Improvement Project in June 2006; predesign is expected to be complete by the end of 2007
- Worked with WTD's Industrial Waste Program to develop policy guidelines for permitting discharges from the biotechnology industry sector to King County's sewers
- Completed demonstration testing on the fuel cell project at South plant

¹² In July 2006, the King County Council approved membership in the Chicago Climate Exchange, which works to reduce greenhouse gas emissions through binding goals and the trading of "carbon credits." The trading of carbon credits is similar to pollution credit programs that allow industries and jurisdictions to sell, trade, or purchase emissions that contribute to air pollution, with the goal of reducing the overall amount of emissions.