Knoxville Utilities Board

KUB BIOSOLIDS
Partnering for Greener Pastures

2018 Biosolids Performance Report

July 2019

KUB's Biosolids Program Maintains Platinum Level Certification

For over 25 years, KUB has produced high-quality Class B biosolids, the nutrient-rich product of the wastewater treatment process. KUB's wastewater treatment plant separates solid materials from liquid waste and sends the solids to digesters, which add heat, pressure, and helpful bacteria to destroy harmful pathogens and reduce odor. After treatment and dewatering, the biosolids can be applied to soil like fertilizer, recycling essential nutrients like phosphorus and nitrogen. KUB's biosolids are rergistered as a fertilizer with the Tennessee Department of Agriculture and are 100 percent land applied to area farms.

"KUB's biosolids program is one of the best customer service programs KUB offers," KUB Plants Analyst David Obenschain said. "The farmers who use the free biosolids benefit greatly from the program by doubling or tripling their yield, and KUB saves money from not having to take our product to a landfill."

KUB's Biosolids Beneficial Reuse Program has been Platinum Certified with the National Biosolids Partnership (NBP) since 2011. The NBP helps advance biosolids management practices and programs across the United States so that they are effective and environmentally sound.

As part of KUB's NBP certification, the biosolids program undergoes annual third-party and internal audits. In December 2018, KUB passed a two-day biosolids external audit to recertify its Platinum status through the NBP. The auditor determined that "use of a management system approach is generating positive outcomes for KUB's biosolids program in the areas of regulatory compliance, environmental performance, quality practices, and relations with interested parties." One strength observed was the excellent relationship between Synagro (KUB's residuals management contractor) and farmers. No major or minor nonconformances were identified during the audit. KUB's Biosolids Program is the only NBP Platinum Certified program in the state of Tennessee.

KUB Biosolids Benefit the Environment

While KUB's biosolids directly assist local farmers and promote agricultural growth, the Biosolids Beneficial Reuse Program also benefits the environment. By land applying 100 percent of its biosolids, KUB avoids using landfills or otherwise unsustainable disposal methods for wastewater treatment byproducts. When farmers use KUB's biosolids as a state-certified agricultural fertilizer, they are also reducing use of commercial fertilizer products. According to a study published by the US National Library of Medicine, nitrogen fertilizer production uses large amounts of fossil fuels and can account for more than 50 percent of total energy use in commercial agriculture. KUB's biosolids contain similar nutrients to commercial fertilizers such as nitrogen and phosphorus and eliminate fossil fuel use in fertilizer production.

Additionally, KUB captures and reuses methane generated in the wastewater treatment process. To create biosolids, sludge from the process must be digested. The process of digestion creates gaseous methane, which can be used in green energy generation. As KUB's Kuwahee Wastewater Treatment Plant's digesters produce methane, the gas is then used to help operate the digestion process efficiently. The methane powers sludge heaters to keep the right bacteria alive, and it is used to mix sludge inside digesters to keep a healthy balance of sludge throughout the tank. Excess methane produced by digesters is flared off to prevent it from being released into the atmosphere as a greenhouse gas.

KUB

KUB Committed to Community Outreach

KUB uses the following methods to inform customers, the community, and interested groups about the KUB Biosolids Beneficial Reuse Program and Environmental Management System:

Community Events
Biosolids staff and/or materials are available at various community events. Staff members are also available to speak at schools, special events, or meetings.

Customer Communications
KUB shares biosolids information with the public primarily through its website. The site provides an overview of the program, a whitepaper, and audit reports. Other means of public communication include a biosolids brochure, newsletters, KUB's annual Environmental Stewardship Report, and training for employees about the program so they can help answer customer questions.

Interested Farmer Relations
KUB's website (www.kub.org) offers a wealth of information about the biosolids program for farmers or other interested parties, including links to more information from the National Biosolids Partnership, the National Association of Clean Water Agencies, the Water Environment Federation, and the Environmental Protection Agency (EPA).

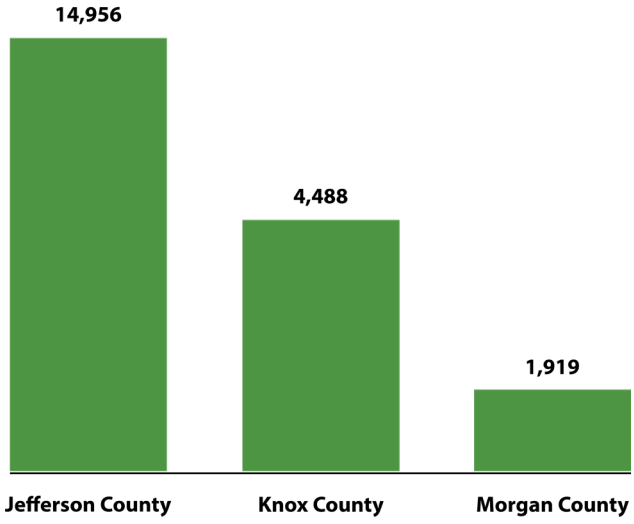
Farmers may call KUB's Customer Information Center (865-524-2911) or e-mail the KUB Biosolids Mailbox at biosolids@kub.org if they have specific questions or are interested in scheduling a farm visit to determine eligibility for biosolids application.

East Tennessee Farmers Benefit from KUB Biosolids

KUB beneficially reuses 100 percent of its biosolids. KUB contracts with Synagro Technologies for dewatering, transportation, and land application. Synagro's highly trained staff ensures that the company's work maintains compliance with applicable federal, state, and local regulatory requirements. In addition, Synagro works with the Environmental Protection Agency, National Biosolids Partnership, and applicable regulatory agencies to be proactive in meeting changing rules and regulations.

In 2018, 17 farms received over 21,000 wet tons of biosolids, spread over 1,324 acres of land. As shown in the below figure, Jefferson County received the largest amount of biosolids. There are currently 57 farms that are permitted for KUB biosolids by the Tennessee Department of Environment and Conservation.

2018 Land Applied Biosolids
[In Tons Spread]



Farmers who use KUB biosolids say...

"I saved money on fertilizer, and I like the way the grass grows better, especially in the dry season."

"Other farmers have noticed how well the grass is growing, as it is visible from the roads."

"Biosolids enrich the soil of my pastures that once was a reclaimed strip mine."

2018 Goals Achieved, Continuous Improvement in 2019

The KUB Biosolids Environmental Management System (EMS) goals and objectives were developed to seek continual process improvement and enhance biosolids quality. Each year, KUB develops these goals and objectives as part of the National Biosolids Partnership requirements. These goals are recorded and assessed throughout each year and at an annual third party audit of KUB's Biosolids Beneficial Reuse Program. The program goals reinforce KUB's commitment to being environmentally responsible and supporting the sustainability of our communities' natural resources.

In 2018, KUB achieved the following:

- Maintained average fecal coliform levels under 200,000 colony forming unit (CFU) in all reporting periods but one.
- Improved sampling procedures and methods in four areas including pH, chlorine, dissolved oxygen, and mixed liquor volatile suspended solids (MLVSS).
- Implemented the Biosolids Feasibility Study (identified scope, gained approval, identified consultant, etc.). This study will be completed in 2019.
- Provided five opportunities for internal biosolids education and two external opportunities.

Some of KUB'S 2019 goals and objectives include:

- Evaluate nutrient loss from biosolids stockpiles.
- Participate in TVA's Demand Response Program to reduce pressure on the region's electric grid during periods of peak demand.
- Complete three public presentations related to biosolids management.
- Continue to improve our asset management program through training and program development.
- Maintain fecal coliform under 200,000 CFU and volatile solids reduction about 50 percent for the two-month reporting period.

KUB Verifies Quality

The table below shows the maximum concentration of each parameter allowed by the EPA 503 regulations in land application. In addition, the table shows how KUB's 2018 results are well below established EPA ceiling limits.

Parameter	EPA Ceiling Limits	2018 KUB Data
Arsenic (ppm**)	75	6.7
Cadmium (ppm)	85	2.07
Copper (ppm)	4,300	266
Lead (ppm)	840	19.7
Mercury (ppm)	57	0.4
Molybdenum (ppm)	75	7
Nickel (ppm)	420	27
Selenium (ppm)	100	6.9
Zinc (ppm)	7,500	764

**ppm: parts per million. One part per million is equivalent to a single penny in $10,000 of pennies.

KUB Promoting Sustainability with Biosolids

The federal Clean Water Act Part 503 regulations identify two classes of pathogen reduction, Class A and Class B. KUB currently produces Class B biosolids, which are certified as fertilizer with the Tennessee Department of Agriculture. While pathogens in Class B products are significantly reduced to levels that are often below those found in animal manures, additional best management practices are required at the site where they are used. Class B biosolids are used in bulk as fertilizers in agriculture and forestry and to reclaim barren land. In Class A biosolids, pathogens are reduced to a level similar to the native soil and environment. Class A products can be used on home lawns and gardens, parks and golf courses, and other places where public contact is likely.

KUB is currently conducting a Biosolids Feasibility Study to assist in future decision-making related to the program and our product classification. This study is expected to be completed in 2019.

In evaluating future options for the Biosolids Beneficial Reuse Program, KUB will consider sustainability alternatives related to:

- Renewable energy
- Energy efficiency
- Water quality conservation
- Air quality
- Waste management recycling
- Chemical minimization
- Environmentally preferred chemicals
- Fuel efficiency

KUB's Class B biosolids are land applied in several counties in East Tennessee. The findings of this study will help KUB determine the sustainability and associated cost impact of producing Class A biosolids. Additionally, Kuwahee's digesters and dewatering system equipment are key components for biosolids production, and they are approaching the end of their life expectancy. The study will help determine the best approach for replacement of the aging equipment. It will also help assess the need for and value of waste disposal alternatives and general process upgrades for the Biosolids Beneficial Reuse Program, as well as establish projected biosolids quantities.

KUB Ensures Excellence

Biosolids produced in Tennessee are monitored for compliance based on the EPA Part 503 Biosolids Rule (40 CFR Part 503). KUB produces Class B biosolids. Pathogen requirements are met by anaerobic digestion and monitoring the density of indicator organisms. Vector attraction reduction requirements are met by meeting a reduction of at least 38 percent volatile solids reduction.

As illustrated in the table below, KUB monitors its biosolids much more frequently than industry regulators require.

Monitoring Category	EPA Part 503 Monitoring Frequency	KUB Monitoring Frequency
Pathogen Requirements	Once every 60 days	Monthly
Vector Attraction Requirements	Once every 60 days	Monthly
Regulated Pollutant Limits (metals)	Once every 60 days	Monthly
Total Solids, pH	N/A	Monthly
Nutrients	N/A	Monthly

Note: Based on biosolids production of equal to or greater than 1,500 dry metric tons but less than 15,000 dry metric tons.

Fast Facts

- KUB has operated a Biosolids Beneficial Reuse Program for over 25 years.
- 100 percent of KUB's biosolids produced in 2018, and in the last 25 years, have been land applied.
- KUB provides approximately 27,000 wet tons of Class B biosolids to local farmers as a fertilizer annually.
- KUB's biosolids are certified as fertilizer by the Tennessee Department of Agriculture.

For more information on KUB biosolids, visit www.kub.org or email biosolids@kub.org.

P.O. Box 59017
Knoxville, TN 37950-9017
524-2911 • www.kub.org

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