



Report
National Biosolids Partnership
Biosolids Management Program
Interim Audit

Knoxville Utilities Board
Kuwahee Wastewater Treatment Plant
Knoxville, Tennessee

Audit Dates: December 8 & 9, 2020

Audit Conducted By: DEKRA Certification, Inc.

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Report Date: December 22, 2020

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1. EXECUTIVE SUMMARY

DEKRA Certification, Inc. (DEKRA) conducted an independent third-party audit of the Biosolids Environmental Management System (BEMS) being used by the Knoxville Utilities Board (KUB) in managing its biosolids program. The audit was conducted onsite at KUB's request December 8 and 9, 2020 covering requirements of the National Biosolids Partnership (NBP) BMP Elements. The audit was an Interim Audit (#2-4) for continuing DEKRA Verification and NBP Certification.

Audit Purposes

This Interim Audit was conducted to:

- Verify that the Biosolids Environmental Management System (BEMS) being used by KUB meets National Biosolids Partnership (NBP) expectations and conforms with requirements of the NBP BMP Elements.
- Confirm that the KUB BEMS is functioning effectively, with practices and procedures being performed as documented.
- Examine outcomes KUB is achieving by using a systematic approach for managing its biosolids program.
- Verify the effectiveness of corrective action taken in response to open nonconformances from previous DEKRA third party audits.

Summary of Audit Activities and Results

DEKRA reviewed KUB's biosolids program and audited that program for conformance with expectations and requirements of the NBP Biosolids Management Program Elements and the KUB BEMS (audit criteria). The audit scope was consistent with NBP requirements, as stated in the NBP Auditor Guidance (2011).

No major nonconformances and one minor nonconformance with respect to the audit criteria were found during this audit.

Conclusions

Based on the results of this audit, DEKRA has 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.
- KUB biosolids practices are consistent with NBP expectations and meet requirements of the NBP BMP Elements, with one minor exception.
- No nonconformances from prior DEKRA audits remain open.

This audit has verified that the KUB biosolids management program meets NBP expectations and requirements and we recommend continuing certification within the NBP Biosolids Management Program.

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2. AUDIT DETAILS

2A. Agency Details

Agency Name: Knoxville Utilities Board, Knoxville TN (referred to as KUB in this report)

Number of Employees = 42

Biosolids Production Sites: Kuwahee Wastewater Treatment Plant, Knoxville, TN

Volume of Wastewater Treated = 25 MGD (average); design 44MGD, capacity 120 MGD

Biosolids Produced = approx. 28,000 wet tons per year (all Class B). Solids content ranges from 24% to 26%

Biosolids Use Options: 100% agriculture land application

KUB Biosolids Program

KUB manages their biosolids program using a “Biosolids Environmental Management System (BEMS) that is based on the NBP BMP Elements. The scope of the KUB BEMS includes activities within the full biosolids value chain, including Pretreatment, Wastewater Treatment and Solids Generation, Solids Stabilization, Dewatering, Biosolids Storage and Transportation and Biosolids Use (land application). A contractor (Synagro) is employed for managing biosolids dewatering, storage, transportation and use options.

Contractors Participating in Audit

Synagro

Interested Parties Interviewed

The following interested parties were interviewed to verify the effectiveness of the Communications, Public Participation and Compliance processes.

Garland Heidel – Farmer (biosolids user) Morgan County

Luke Greene – Farmer (biosolids user) Jefferson & Knox Counties

2B. Audit Criteria

The KUB biosolids program activities were assessed against requirement of the NBP BMP Elements (July 2011) and the KUB BEMS.

2C. Audit Team

KUB authorized DEKRA Certification Inc. to conduct this third-party audit of their biosolids program. DEKRA is an accredited Third-Party Audit Company within the NBP Biosolids Management Program. Mr. Jon Shaver was the Biosolids EMS Lead Auditor and Technical Expert on behalf of DEKRA. DEKRA and the auditor have an independent and impartial relationship with KUB that meets NBP criteria for third-party audits.

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2D. Audit Scope and Locations

The audit was consistent with NBP requirements for Interim Audits and the Scope of Work agreed by KUB and DEKRA. It was conducted to cover requirements of the NBP BMP Elements (July 2011), with special attention to practices and management activities that directly support biosolids-related operations, processes and activities.

The following processes were audited:

- 1) Biosolids Management System Dynamics Review:
 - Significant changes affecting biosolids program
 - BEMS changes (incl documentation)
 - Biosolids Policy (demonstrated commitment, including CoGP)
 - Effectiveness Reviews
 - Communications Program
 - Corrective & Preventive Action
 - Goals & Objectives
 - Internal Audits
 - Management Reviews
- 2) Process Audits:
 - Biosolids Dewatering (incl contractor control)
 - Biosolids Storage & Transportation (incl contractor control)
 - Biosolids Land Use (incl contractor control)
 - Critical Control Points & Operational Controls
 - Competence, Awareness & Training
 - Compliance (with legal & other requirements)
 - Engineering (incl process design)
 - Management Involvement (direction, BMP planning, responsibilities)
- 3) Examination of outcomes being achieved in the areas of regulatory compliance, interested party relations, environmental performance and quality practices

Notes:

- Transactions were tested to verify the continuing health of the BEMS
- Interested party interviews were conducted to verify the effectiveness of the Communications Program, and included interviews with two users of KUB biosolids.

2E. Audit Methodology

The audit was conducted by qualified auditors following guidelines stated in the NBP Auditor Guidance (August 2011). The auditor observed practices in place, interviewed key persons and reviewed pertinent documents and records using sampling techniques to assess the systematic performance of the process being audited and the consistency of biosolids management practices with written procedures. This audit is not a verification of compliance with any legal requirements applicable to biosolids practices performed by the agency or its contractors.

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2F. Reference Materials

The following documents were used as references during this audit:

KUB EMS Manual (November 2017)

National Biosolids Partnership "BMP Elements" (July 2011)

National Biosolids Partnership Biosolids EMS Third Party Auditor Guidance (August 2011)

National Biosolids Partnership Code of Good Practice

National Biosolids Partnership Manual of Good Practice

2G. Definitions of Audit Findings & Required Corrective Action

Major Nonconformance – a serious omission from requirements and/or other departure that represents, or could cause, a systemic failure, or the existence of multiple related minor nonconformances, or failure to effectively correct a nonconformance in a timely manner. For verification to continue, major nonconformances must be corrected and verified by third party audit within 90 days.

Minor Nonconformance – an isolated departure from requirements that does not represent a systemic failure. Minor nonconformances require timely and effective correction by the agency and verification by the third-party auditor during the next third-party audit.

Opportunity (for improvement) – a possible improvement in the management system based on audit observations. There is no obligation for action in response to these observations.

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3. SUMMARY OF AUDIT RESULTS

3A. Verification Conclusion

The Knoxville Utilities Board has been independently verified by DEKRA Certification, Inc. as having an effective biosolids environmental management system that supports continual improvement in environmental performance, meeting regulatory compliance obligations, utilizing good management practices and creating meaningful opportunities for public participation and is in conformance with requirements of the National Biosolids Partnership Biosolids Management Program.”

We recommend continued Certification within the NBP Biosolids Management Program.

3B. Audit Findings – Nonconformance

Minor Nonconformance JS/20-01/14 NBP BMP Element 14 requires the organization to Identify the cause (of nonconformances), take actions to correct the problem and document corrective actions taken to prevent a recurrence.

CAPA 8/17/20 (high rain SSO) does not fully identify cause or related corrective action(s).

3C. Status of Nonconformances from Previous DEKRA Audits

Minor Nonconformance JS/19-01/15 NBP BMP Element 15 requires the organization to complete a written BMP performance report summarizing the performance of its BMP. The report shall provide summaries of internal BMP audit results. The 2018 Biosolids Program Performance Report does not include a summary of internal audit results.

Corrective Action – KUB took action to correct this nonconformance by issuing a Performance Report for 2019 that included results of prior internal audits. They determined this nonconformance was caused by an incomplete process for preparing Biosolids Program Performance Reports. This cause was corrected by adding requirements for preparing Performance Reports in the BEMS Manual

3D. Interested Party Interviews

Two biosolids users were interviewed as part of this audit. Both were complimentary about communications and service provided by KUB and Synagro and expressed a desire to continue to use KUB biosolids on their land that is used to produce grass and hay. The process for interested party input and communications was found to be functioning effectively.

3E. Appeals

The NBP provides an appeal process for biosolids organizations and interested parties that disagree with the Verification conclusion of a third-party audit. The appeals process involves an Appeals Board; representing a balance of biosolids management interested parties, including an environmental advocacy group and wastewater industry professionals. An appeal must be submitted within 30 days of the Audit Company’s verification decision or interim audit decision. Information about the appeals process is available from the National Biosolids Partnership. Contact Mr. Patrick Dube at pdube@wef.org

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3F. Agreements

KUB and DEKRA have agreed that the next audit, a Reverification Audit, will occur by December 2021 (exact timing to be agreed in advance). That audit will be conducted by DEKRA as a Third-Party Audit. The scope will be consistent with NBP requirements. KUB will make arrangements for this audit with Dekra.

3G. Additional Information

Further information about this audit and/or the National Biosolids Partnership BMP can be obtained from Knoxville Utilities Board by contacting Ms. Drew Iles at drew.iles@kub.org.

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4. BIOSOLIDS MANAGEMENT PROGRAM DYNAMICS

Review of the biosolids management program dynamics and outcomes is conducted to verify that the biosolids management program is functioning effectively and generating positive outcomes (results) and that changes are being incorporated consistent with requirements. The following summarizes DEKRA's review of the dynamics of the KUB Biosolids EMS.

4A Significant Changes

Significant changes affecting the KUB biosolids program since the previous Dekra audit include:

- Addition of new boilers (energy efficiency improved)
- Cleanout of digester for biosolids stabilization efficiency. Waste material sent to landfill.
- Drew Iles became Biosolids Coordinator (previous Coordinator transferred to new position)

4B Revisions to the Management System

Minor changes were made in the KUB Biosolids EMS that did not significantly affect the management system.

4C Biosolids Policy Commitments

The KUB Biosolids Management Policy remains as previously approved. The Policy includes a commitment to meet NBP requirements, which by inference includes following the principles of the Code of Good Practice. Review of performance in meeting commitments made in that Policy demonstrated it has been incorporated into the Biosolids Management Program and that continual improvements are occurring.

4D Examination of Outcomes

The KUB Biosolids EMS is improving through the use of a systematic approach to managing biosolids activities. The following improvement outcomes within the past two years were confirmed.

Relations with Interested Parties

- Formation of a KUB internal team is leading to better understanding of emerging technologies.
- Use of social media methods (e.g. Facebook) is receiving positive response from the public (>1000 views) and farmers.
- The KUB website was redone to modernize / update information about the plant and its operation.

Regulatory Compliance

- Increased focus on plant operations, particularly in management reviews, has resulted in improved efficiency and thicker solids (VSR consistently above 50%) and less heat loss.

Environmental Performance

- Tracking COD and BOD is leading to better understanding of how specific influent impacts plant processes.
- New equipment (boilers, RAS pumps, bar screens) has allowed tighter temperature control in digesters (range now within +/- 2/10 degree)

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Quality Practices

- The Project Close Out procedure is generating more internal understanding and allowing projects to finish with better planning and completion
- A pretreatment study for industrial users has started to allow better understanding of incoming waste streams.

4E Use of NBP Certification and DEKRA Verification

Use of and references to NBP Certificate and DEKRA Verifications were reviewed. There were no concerns.

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5. BEMS EFFECTIVENESS REVIEWS AND PROCESS AUDITS

5a. Effectiveness Reviews

Communications Program

The KUB Communications Program includes proactive methods for communicating with interested parties, including the public and regulators. Communications occurs through public presentations and an interactive website. Interested parties interviewed during this audit noted that effective and useful channels of communication are in place..

Biosolids Goals and Objectives Process

Long term goals are set by management team addressing regulatory compliance, environmental performance, quality, relations with interested parties. Five objectives for 2019 and four objectives for 2018 have been completed. Two objectives are in progress and 2 have been deferred. These results demonstrate that the Goals and Objectives process is working effectively.

Internal Audits

Internal audits were conducted as planned in 2019 and 2020. The most recent audits conducted 9/2/20 and 10/1/19 covered most of the system. A finding and several "recommendations" from this audit are being addressed. The Internal Audit process is functioning effectively.

Corrective and Preventive Action Process

The Corrective and Preventive Action process was used to address nonconformances from previous Third-party Audits and internal audits. The process is working effectively, except as noted in Minor Nonconformance 20-01. See Opportunities for Improvement below.

Management Review

Management involvement has been demonstrated through actions taken regarding issues raised in management reviews and programs for measurement and improvement. The actions taken are consistent with defined objectives. Follow-up actions are recorded. The Management Review process is functioning effectively. See Opportunities for Improvement below.

5b. Process Audits

As part of this audit DEKRA audited the following processes that KUB uses within its biosolids management program and determined the level of conformance of each process with NBP expectations and requirements of the audit criteria.

Management Involvement (direction, BMP planning, responsibilities)

Plant Operations Manager interviewed. Plant management directs biosolids program. Intended outcomes include remaining above and beyond regulatory compliance, focus on biosolids improvement, environmental performance (including energy reduction) , being as transparent as possible with interested parties and continual improvement. Management reviews conducted semi-annually to review performance and identify opportunities for improvement. Process is effective. See Opportunities for Improvement below.

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Critical Control Points & Operational Controls

Process control points identified in table ("Process Control Points") that includes risk for environmental impacts, compliance obligations, biosolids quality, interested party relations. Operational controls identified. Process is effective. See Opportunities for Improvement below.

Competence, Awareness & Training

Operator qualification program in place, including certification and training. Annual EMS training for all employees involved in biosolids, including Synagro. Process is effective.

Engineering (incl process design)

Team Lead Plant Engineering interviewed. KUB Project Managers design and supervise capital projects. Consultants and contractors qualified by Project Manager. Project Closeout procedure used to plan capital projects (e.g. new boilers). Planning includes ensuring regulatory compliance, control points understood, written operating procedures, training for operators qualification. Process is effective.

Biosolids Dewatering (incl contractor control)

Biosolids dewatering (centrifuge) done by contractor (Synagro) under contract with KUB. KPIs in place (e.g. tons per hour processed). Operational controls are in place, including SOPs/WIDs (Operating Procedures). Operator competence & skills up to date, including annual BEMS training and Synagro internal training. Good communications with KUB operations personnel. Process is effective.

Evidence – Interview - , documents – Synagro contract 4/27/20

Biosolids Storage & Transportation (incl contractor control)

Biosolids storage and transportation done by contractor (Synagro) under contract with KUB. No storage at KUB plant – product can be temporarily stored at farm sites where it will be used. Farmers aware and complimentary. Transportation SOP, Spill Response SOP, Truck Loading SOP in place (all approved by KUB). Synagro maintains trucks using preventive maintenance. Process is effective.

Biosolids Land Use (incl contractor control)

Biosolids use done by contractor (Synagro) under contract with KUB. All biosolids land applied on permitted sites (General Operating Permit) with agreement from farmer. Buffers in place. Agronomic calculations by Synagro. Land applications inspected for conformance by KUB. Internal audits include contracted operations. Process is effective.

Compliance (with legal & other requirements)

Legal requirements for biosolids program identified on list. Identification and application through discussions with TDEC. NPDES permit renewed in 2019. Internal audits include verification of compliance. Process is effective. See Opportunities for Improvement below.

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5c. Summary of Conformance Results

Process	Applicable BMP Elements	Conformance
Biosolids Dewatering (incl contractor control)	3,10,13	Conforms with requirements
Biosolids Land Use (incl contractor control)	3,10,13	Conforms with requirements
Biosolids Storage & Transportation (incl contractor control)	3,10,13	Conforms with requirements
Biosolids Policy	2	Conforms with requirements
Communications	6, 9, 15	Process is effective
Competence, Awareness & Training	7,8	Conforms with requirements
Compliance (with legal & other requirements)	4,14	Conforms with requirements
Corrective Action	14	Process is effective, except as noted in Minor Nonconformance 20-01
Critical Control Points & Operational Controls	3, 10	Conforms with requirements
Engineering (incl process design)	3,10	Conforms with requirements
Goals and Objectives status	5	Conforms
Internal Audits	16	Process is effective
Management Involvement (direction, BMP planning, responsibilities)	7, 17	Conforms with requirements
Management Review	17	Process is effective

5d. Opportunities for Improvement

The following “opportunities” for improving the KUB BEMS were noted during the audit. Opportunities do not represent nonconformances and KUB has no obligation to take any action in response to them.

Compliance Obligations

- Compliance with “other requirements” could be considered as much of an obligation as compliance with “legal requirements”

Objectives

- Consider noting how objectives demonstrate and measure improvement

Critical Control Points & Operational Controls

- Simplify the “process control point table” by doing risk assessment first & then focusing on high / medium risks and mitigation methods

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- Consider adding potential environmental impacts to SOPs

Corrective Action Process

- The Corrective Action process could be simplified to include “containment” (fix the problem), cause analysis (what caused the problem) and corrective action (to remedy cause) & prevent the problem from re-occurring.
- Consider recording corrective actions on a spreadsheet to enable trend analysis

Management Review

- Use management reviews as a way of looking at changes (forward) for continual improvement

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APPENDICES

List of Participants

The following persons participated in this audit. Other persons provided additional explanations, as necessary.

KUB Personnel

Steve Clettenburg	Wastewater Operations Supervisor
Whitney Durfee	Lab Supervisor
Leslie Glover	Pretreatment Coordinator
John Gresham	VP Operations
Drew Iles	Biosolids Coordinator
Josh Johnson	Manager, Plant Operations
Amy Mann	Business Management Analyst
David Obenschain	Business Management Analyst
Alex Owen	Business Management Analyst - Communications
Thomas Pucci	Wastewater Team Lead
John Urbano	Business Management Analyst

Contractor Personnel

Bill Bailey	Operations Manager (Synagro)
Alvin Bendle	Operator (Synagro)
Daniel Dodson	Technical Specialist (Synagro)

Interested parties

Garland Heidel – Farmer (biosolids user) Morgan County
Luke Greene – Farmer (biosolids user) Jefferson & Knox Counties

List of Documents & Records Reviewed

BEMS Manual 11/17/17
Beneficial reuse program brochure
Biosolids Management Policy (2.2 in Manual)
Biosolids objectives 2020
Biosolids Performance Report 2019
Biosolids Policy
Biosolids training for Synagro 9/4/20
Biosolids training records
CAPA for odor complaint 10/3/19
CAPA records (various)
Centrifuge operation SOP 10/30/20
Compliance evaluation (legal requirements) in internal audit
Customer newsletter Nov 2020
e-coli sampling evaluation
EMS training record – A Bundle 9/4/20

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Facebook site KUB
General operating permit for land application of biosolids 8/16/19
Goals & objectives 2020, 2029
Internal audit progress
Internal audit report 9/2/20, 10/1/19
Internal audit schedule 2019-2020
KUB contractor inspection 9/9/20
KUB contractor inspection biosolids 2020
KUB website
List of legal requirements 11/16/20
Management reviews 7/23/20, 11/12/20
Notice & necessary info 10/31/20
Operations organization chart 11/18/20
Process control points & operational controls 11/12/19
Project Closeout Form – Heater Improvement 8/23/19
Public input record
Refresher training Biosolids 2020
Synagro contract 4/27/20
Synagro Pre-op (permitted) checklist 5/18/20
Synagro spill response plan 10/30/20
Synagro truck maintenance vehicle 5R83520810
Transportation SOP
Truck loading SOP
WID – starting restarting boilers 1/15/20

END OF REPORT