



National Biosolids Partnership
Biosolids Management Program Interim Audit Report

Knoxville Utilities Board
Kuwahee Wastewater Treatment Plant
Knoxville, Tennessee

Audit Dates: December 1 to 3, 2014

Audit Conducted By: DEKRA Certification, Inc. (North Wales, PA)

Audit Team: Jon Shaver, Biosolids EMS Lead Auditor / Biosolids Auditor

Report Written By: Jon Shaver, Biosolids EMS Lead Auditor

Report Date: January 12, 2015

Reviewed By: Adonia Phillips, Knoxville Utilities Board

Approved By: Michelle Hunn, DEKRA Certification, Inc.

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1. SUMMARY

DEKRA Certification, Inc. (DEKRA) conducted an independent Third Party Audit of the biosolids management program being used by Knoxville Utilities Board, Knoxville TN (KUB). The audit was conducted December 1 to 3, 2014 at KUB's request. It was Interim Audit #1-3 following DEKRA's Verification of the KUB Biosolids Environmental Management System (BEMS) in December 2011.

Audit Purposes

This interim audit was conducted to:

- Verify that the KUB BEMS continues to meet NBP expectations and conforms with all requirements of the NBP Biosolids Management Program (BMP) Elements.
- Confirm that the KUB Biosolids Environmental Management System (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 that effective corrective action has been taken in response to open nonconformances from previous third party audits.

Summary of Audit Activities and Results

Consistent with NBP requirements for interim audits, DEKRA reviewed the dynamics of KUB's BEMS and audited parts of that program for conformance with expectations and requirements of the NBP BMP Elements (audit criteria). The audit scope was consistent with NBP requirements and the interim audit program agreed by KUB and DEKRA.

One major nonconformance and two minor nonconformances with respect to the audit criteria were found during this audit. KUB has developed corrective action plans to address the nonconformances and those plans have been approved by DEKRA's Lead Auditor.

Audit Conclusions

The audit determined that:

- All nonconformances from prior DEKRA third party audits have been effectively corrected.
- The KUB BEMS is functioning effectively, generating positive outcomes, and meets NBP expectations and requirements of the NBP BMP Elements, except as noted in the stated nonconformances.
- The major nonconformance must be corrected effectively for DEKRA verification to continue.

Based on results of this audit, DEKRA will defer our Verification of the KUB biosolids management program until:

- Corrective action plans for each nonconformance are in place and approved by DEKRA's Lead Auditor
- Effective corrective action has been verified to eliminate the cause of the major nonconformance.

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2. AUDIT DETAILS

2A. Local Agency Details

Agency Detail

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

Number of Employees = 55

Biosolids Production Sites: Kuwahee Wastewater Plant, Knoxville, TN

Volume of Wastewater Treated = 33 MGD (average); design 44MGD, capacity 120 MGD

Biosolids Produced = 8,000 dry tons per year (28,000 wet tpy); 100% Class B

Biosolids Use Sites Audited

None

Contractors Participating in Audit

Synagro, Inc.

KUB Biosolids Program

KUB's Biosolids Program includes defined processes for Pretreatment, Wastewater Treatment and Solids Generation, Solids Stabilization, Dewatering, Biosolids Storage and Transportation and Biosolids Disposition (agricultural land application). A contractor (Synagro) is employed to manage and operate centrifuge dewatering and biosolids storage and transportation and for controlling biosolids use options. KUB manages their biosolids program using a Biosolids Environmental Management System (BEMS) based on the NBP BMP Elements.

2B. Audit Team

KUB requested DEKRA Certification Inc. to conduct this independent Third Party Audit of their biosolids program. Mr. Jon Shaver led the audit on behalf of DEKRA. Mr. Shaver is certified by the National Biosolids Partnership as a Biosolids EMS Lead Auditor and Biosolids Auditor. DEKRA asserts that our firm and auditor each have an independent and impartial relationship with KUB that meets NBP criteria for Third Party Audit Companies and Auditors.

2C. Audit Criteria, Scope and Methodology

Audit Criteria

Requirements stipulated in the NBP BMP Elements (July, 2011) and the KUB "Biosolids Environmental Management System" were used as criteria for this audit.

Audit Scope

The scope of this audit covered parts of the KUB biosolids program, with special attention to practices and management activities that directly support biosolids-related operations, processes and activities. The audit covered the following topics, consistent with NBP requirements for interim audits, the interim

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audits program previously agreed to by DEKRA and KUB and the Scope of Work for this audit agreed by KUB and DEKRA.

1. Management System Dynamics Review:
 - Significant changes affecting the biosolids management program
 - Commitment to Biosolids Policy
 - Internal Audits
 - Effectiveness:
 - Corrective & Preventive Action Process
 - Goals & Objectives Process
 - Management Review Process
2. Process Audits:
 - Pretreatment (incl incoming material from other plants & locations)
 - Wastewater Treatment & Solids Generation
 - Corrective and Preventive Action
 - Document Control
 - Records Management
 - Emergency Preparedness
 - Engineering (incl process design)
 - Maintenance
3. Verification of effective correction of open nonconformances from previous Third Party audits (i.e. Interim Audit, December, 2013)
4. Examination of outcomes being achieved through KUB's Biosolids Management Program

Audit Methodology

Each audit was conducted as a process audit covering all requirements of the audit criteria that apply to the process. The audits were performed by interviewing key personnel with biosolids responsibilities, observing practices in place and reviewing pertinent documents and records. Interested parties were interviewed and transaction tests were performed to verify management system effectiveness. Standard audit sampling techniques were used.

2D. 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 proceed, correction of major nonconformances must be verified by a 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 a Third Party Auditor during the next third party audit.

Opportunity (for improvement) – possible improvement in the EMS based on auditor observations. There is no obligation for action in response to these observations.

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2E. Reference Materials

The following documents were used as references during this audit:

- KUB BEMS Manual (current version)
- NBP "BMP Elements" (July 2011)
- NBP Biosolids Management Program Third Party Auditor Guidance (August 2011)
- NBP Code of Good Practice
- NBP Manual of Good Practice

2F. Additional Information

Further information about this audit and/or the National Biosolids Partnership Biosolids Management Program can be obtained from the Knoxville Utilities Board. Contact Ms. Adonia Phillips (e-mail: adonia.phillips@kub.org).

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3. SUMMARY OF AUDIT RESULTS

3A. Strengths

During this audit, DEKRA noted the following strengths in the KUB biosolids management program.

- KUB understands the need to go beyond regulatory compliance limits in applying biosolids to meet interested party needs.
- The relationship between KUB and Synagro continues to be strong, cooperative and mutually beneficial.

3B. Nonconformances Found This Audit

Three minor nonconformances were found with respect to the audit criteria. KUB has submitted Corrective Action Plans for each nonconformance and DEKRA's Lead Auditor has approved those plans. KUB will complete the corrective action plans in a timely manner and DEKRA's Lead Auditor will verify the effective correction of each nonconformance during the next Third Party Audit (see Agreements). The nonconformances are listed below, with reference to the applicable EMS Element.

Minor Nonconformance JS/14-01/5 NBP BMP Element 5 requires the organization to develop biosolids program goals and objectives using SMART criteria (i.e., be Specific, Measurable, Achievable, Relevant, and Time-bounded). Some biosolids objectives are not measurable and do not have an expected completion time.

Minor Nonconformance JS/14-02/12 NBP BMP Element 12 requires the organization to establish and maintain records of its biosolids management activities. The table identifying documents and records requiring control does not distinguish between documents and records and some documents and/or records are not clearly identified (e.g. compliance documentation, training, safety program).

Minor Nonconformance JS/14-03/16 NBP BMP Element 16 requires the organization to establish and maintain an internal audit program to periodically analyze its BMP and KUB's internal audit process requires internal audits at least every 6 months. The most recent internal audit was conducted over 6 months ago, although an audit is planned for early 2015. Actual internal audits are, therefore, not being conducted exactly as planned to analyze the BMP for system problems and improvement opportunities.

3C. Nonconformances from Previous DEKRA Audits

All nonconformances found during previous DEKRA audits are closed as discussed in Section 4 of this report.

3D. Verification Conclusion

Based on the results of this audit, DEKRA has verified that the KUB Biosolids Management Program continues to meet the expectations and requirements of the National Biosolids Partnership BMP. Continuing NBP Platinum Certification is recommended.

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3E. Appeals

The NBP provides an appeals 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 Ms. Lisa McFadden at lmcfadden@wef.org.

3F. Agreements

KUB and DEKRA have agreed that the next Interim Audit will occur in December 2015. Since a major nonconformance was found during the current audit, DEKRA suggests that the next interim audit be conducted as a Third Party Audit. KUB auditors may participate if desired. A scope of work for that audit will be prepared by DEKRA and KUB that is consistent with NBP requirements and the Interim Audits Program previously agreed by DEKRA and KUB.

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4. BIOSOLIDS MANAGEMENT PROGRAM DYNAMICS

Review of the management system dynamics and outcomes is intended to verify that the biosolids management system is functioning effectively and generating positive outcomes (results) and that changes are being incorporated into the system. The following summarizes DEKRA's review of the dynamics of KUB's biosolids management program.

4A Significant Changes Since the Previous DEKRA Audit

Five new operators have been hired to replace retiring operators. DEKRA's review determined that the new Operators are being introduced to their responsibilities and to the KUB BEMS effectively.

The KUB Biosolids Environmental System (BEMS) and related documentation (BEMS Manual) have not changed significantly.

4B Management Involvement

Biosolids Policy Commitments

The KUB Biosolids Management Policy approved April 2011 remains in place and was reviewed by management during the recent management review meeting. The Policy commits to follow the principles of the NBP Code of Good Practice. Review of performance in meeting commitments made in that Policy demonstrated the Policy has been effectively incorporated into the biosolids program and that continual improvements are occurring.

Management Reviews

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. The review process includes discussion of BEMS performance and any need for changes at bi-annual BEMS Management Review led by the BEMS Coordinator. The review and follow-up actions are recorded.

4C Effectiveness Reviews

Communications Program

Regular communications with biosolids regulators occurs through meetings and e-mails. The Tennessee Department of Environment and Conservation Regulator was positive and complimentary about KUB's proactive external communications. Brochures are used to provide information to the public about biosolids. The KUB website includes information about the Biosolids Management System. A Biosolids Performance Report for 2013 was prepared and issued publicly. Internal communication occurs through training and regular staff meetings.

Biosolids Goals and Objectives Process

Two of twelve objectives set for 2013 were achieved, two were not achieved and adequate progress is occurring for the others. New objectives were set for 2014. The Goals and Objectives process is working effectively, except as noted in Minor Nonconformance JS/14-01.

Corrective and Preventive Action Process

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The Corrective and Preventive Action process was used to address nonconformances from previous Third Party Audits and internal audits. The process used includes a dynamic database that monitors progress in completing corrective / preventive actions. The process is functioning effectively.

4D Internal Audits

An internal audit of parts of the KUB BEMS was conducted in April 2013 (reported in June 2013). Corrective actions from that audit were recorded and implemented. KUB performs quarterly inspections of biosolids use sites to monitor compliance and general conditions. The internal audit process could be more effective, as noted in Nonconformance JS/14-03.

4E Review of Nonconformances from Previous DEKRA Audits

Corrective action taken in response to nonconformances from DEKRA's Interim Audit of the KUB Biosolids Management Program in December 2013 were reviewed for effectiveness. The status of those nonconformances is summarized below.

Minor Nonconformance JS/13-01/3 NBP Element 3 requires the organization to identify critical control points of biosolids management activities throughout the biosolids value chain consistent with authoritative sources. The table identifying operational controls and process control points incorrectly labels "operational controls" and includes several items that are not useful for controlling operations.

Corrective Action - KUB determined that this nonconformance was caused by lack of understanding of NBP requirements. In response, KUB modified their identification of process control points and operational controls to correctly identify controls and developed better understanding of the need to effectively identify necessary operational controls. Review by DEKRA's Lead Auditor verified that this action was effectively completed to prevent recurrence of the nonconformance. This nonconformance is now closed.

Minor Nonconformance JS/13-02/4 NBP Element 4 requires the organization to establish a procedure for identifying and tracking other requirements to which it voluntarily subscribes and to maintain records of those other requirements. KUB has not identified requirements to which it voluntarily subscribes beyond applicable legal requirements.

Corrective Action - KUB determined that this nonconformance was caused by lack of understanding of the term "other requirements". In response, KUB determined that internal standards for biosolids application (i.e. extended setbacks) are other requirements and will be treated as such. Review by DEKRA's Lead Auditor verified that this action was effectively completed to prevent recurrence of the nonconformance. This nonconformance is now closed.

4F Interested Party Interviews

During this audit, DEKRA interviewed a local farmer who uses biosolids and a representative of the Tennessee Department of Environment and Conservation. All were positive about the KUB biosolids program and their communication with KUB and with Synagro.

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4G Examination of Outcomes

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

Relations with Interested Parties

The newly developed website information on biosolids has nearly 400 “hits” in past year.

Surveys of biosolids users were returned 100% positive about the product and about KUB / Synagro performance.

KUB received the Tennessee “Beneficial Use of Biosolids” Award from WEF.

NBP Certification is recognized by TDEC to allow biosolids application on land before a “Notice of Coverage” is issued (30 days).

Quality Practices

Cleaning digesters resulted in much improved product quality (less trash).

Removal of DAF and replacing with Gravity Belt Thickener has led to more consistent product (% solids), eliminated need for compressed air (lower energy requirements).

Environmental Performance

SSOs have been reduced by 77 % from an aggressive FOG program and the PACE10 program to replace old sewer pipe.

Replacing the aeration blowers with efficient turbo style blowers has reduced energy costs by 17%.

Regulatory Compliance

KUB voluntarily increased setbacks for land application (e.g. 200 ft buffer for houses, 25 ft buffer for roads) to continually improve public perception about biosolids use.

Several characteristics of biosolids are tested monthly instead of every 60 days as required by 503 for better biosolids quality awareness.

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5. AUDIT RESULTS

5a. Summary

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.

BMP Element	Conformance with Applicable NBP BMP Elements
1. Biosolids Management Program Manual	Conforms
2. Biosolids Management Policy	Conforms
3. Critical Control Points	Conforms
4. Legal and Other Requirements	Conforms
5. Goals and Objectives	Conforms, with minor exception as noted in Section 3
6. Public Participation in Planning	Conforms
7. Roles and Responsibilities	Conforms
8. Training	Conforms
9. Communication	Conforms
10. Operational Control of Critical Control Points	Conforms
11. Emergency Preparedness and Response	Conforms
12. Documentation, Document Control and Recordkeeping	Conforms, with minor exception as noted in Section 3
13. Monitoring and Measurement	Conforms
14. Nonconformances: Preventive and Corrective Action	Conforms
15. Biosolids Management Program Report	Conforms
16. Internal BMP Audit	Conforms, with minor exception as noted in Section 3
17. Management Review	Conforms

5b. Opportunities for Improvement

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

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- The Critical Control Points / Operational Controls table could be reviewed more frequently, especially when significant changes occur, such as introducing a Gravity Belt Thickener to replace the DAF.
- A formal “management of change” procedure could be added to the Biosolids EMS. That procedure could have been used when planning the addition of the Gravity Belt Thickener.
- A process could be developed for managing emergency preparations such as what emergency procedures apply to various situations and to direct training and improvements.
- The KPI for Maintenance that notes priorities 1 to 4 could be evaluated to determine why reactive maintenance targets are not being met.
- The CAPA procedure notification option could be activated to ensure targeted actions are completed as intended.

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APPENDICES

List of Participants

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

KUB & Synagro Personnel

Debbie Ailey	Manager LRC
Jennifer Bivens	Business Processes
Steve Campbell	Supervisor EMSP
Chris Castellaw	Team Lead Maintenance
Davis Combs	Project Engineer
Daniel Dodson	Technical Service Manager (Synagro)
Jimmy England	Plant Supervisor
Jill Fairbanks	Scheduler
Terry Fultz	Operator (in training)
Leslie Glover	Lab Analyst
John Gresham	Plant Manager
William Honea	Safety & Tech Services
Ann Marie Johnson	Training / Human Resources
Josh Johnson	Plant Engineer
Kelly Lane	Communications Team Lead
Billy Joe McCarley	Engineer
David Obenschain	Program Technician
James Ownby	Plant Tech III
Leanne Parker	LRC
Wayne Pearson	Field Manager (Synagro)
Adonia Phillips	BEMS Coordinator, Plant Supervisor
Stephanie Pickens	Operations Manager (Synagro)
Diane Rauch	Operations
Kimberly Stringfield	Scheduler

Interested parties

Joe Jaynes (farmer, biosolids user)
John West (Biosolids Regulator, Tennessee Department of Environment and Conservation)

List of Documents & Records Reviewed

After action report 7/21/14	Critical control point & operational controls table
BEMS Manual Rev 1/2014	Documentation requiring control (table)
Biosolids Performance Report 2013	Emergency Plan reference guide
Biosolids Spill Response Plan 11/18/14	Emergency Response for Wastewater 7/1/11
BM Policy 4/2011	General State Operation Permit
Corrective and Preventive Action records (various)	Goals & objectives 2014, 2013
Corrective Action Plans (12/19/14)	Grease Control Guide

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Grease Waste Hauler List
Internal audit 11/25/14, 6/21/13
Internal audit process description 12/19/14
Internal audit program 2015 - 2019
Key performance indicators
KUB EMS Audit Scope & Schedule 2009 – 2014
Legal & other requirements (list)
Management Review 11/18/14
Memo re “other requirements” 1/15/14

Operational controls 9/5/14
Operations report October 2014
Plant flow – SCADAVIEW
Plant trends screens (various)_
Records retention schedule
SOPs (various)
Training records (various)

END OF REPORT