National Biosolids Partnership
Biosolids EMS Interim Audit Report

City of Raleigh Public Utilities Department
Raleigh, North Carolina

Audit Report Date: December 21, 2010

Audit Conducted By:
KEMA-Registered Quality, Inc. (Chalfont, PA)
Auditors: Mr. Jon Shaver, Biosolids EMS Lead Auditor

Audit Dates: December 9 & 10, 2010

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Interim Audit #4, December 9 & 10, 2010

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1. SUMMARY

KEMA-Registered Quality Inc. (KEMA) conducted an independent audit of the environmental management system (EMS) being used by the City of Raleigh Public Utilities Department (CORPUD) in managing its biosolids program. The audit was performed December 9 and 10, 2010 at the request of the City of Raleigh and was interim audit #4 following verification of the CORPUD biosolids program in December 2006.

The purposes of this audit were to:

- Verify that the biosolids EMS being used by CORPUD conforms to expectations and requirements of the National Biosolids Partnership (NBP) *Environmental Management System for Biosolids*, comprised of 17 EMS Elements
- Confirm that the CORPUD biosolids management program is functioning as intended, with practices and procedures being performed as documented.
- Examine outcomes that CORPUD is achieving through the use of a systematic approach to managing their biosolids program.

During the audit KEMA reviewed several processes and activities used by CORPUD in managing its biosolids program and assessed the conformance of these processes with expectations and requirements of the NBP EMS Elements. This scope of the audit was consistent with the interim audit program agreed upon by CORPUD and KEMA.

The audit determined that:

- The management system is generating positive outcomes, particularly in the areas of public acceptance.
- The CORPUD biosolids management system meets requirements of NBP's EMS Elements with two minor exceptions (minor nonconformances), as described in this report.
- All nonconformances from prior third party audits have been effectively corrected.
- Some "opportunities for improvement" were noted.

Based on results of this audit, KEMA verifies that the biosolids management system being used by the City of Raleigh Public Utilities Department meets the expectations and requirements of the NBP EMS Elements and we recommend continuing certification of that management system within the National Biosolids Partnership Biosolids Management (EMS) Program.

2. AUDIT DETAILS

2A. Local Agency Details

Agency Name: City of Raleigh Public Utilities Department (referred to as CORPUD in this report)

Facility: Neuse River Wastewater Treatment Plant, Raleigh, North Carolina

Volume of Wastewater Treated = 60 MGPD capacity

Biosolids Produced = 16,000 dry tons per year Class A & B

Number of Employees = 105 (includes 25 employees in collection activities)

2B. Audit Team

KEMA-Registered Quality Inc. performed this audit on behalf of the National Biosolids Partnership. Mr. Jon Shaver conducted the audit for KEMA. Mr. Shaver is certified by the NBP as a Biosolids EMS Lead Auditor and Biosolids Auditor. KEMA asserts that our firm and auditors have an independent relationship with the City of Raleigh that meets criteria established by the NBP for Third Party Audit Companies and Auditors.

2C. Audit Scope and Methodology

The CORPUD biosolids program encompasses pretreatment, biosolids stabilization, storage and transportation and end use / disposition, with special attention to practices and management activities that directly support biosolids-related operations, processes, and activities.

The scope of this audit included the following, consistent with NBP requirements for biosolids EMS interim audits and the overall audit program agreed to by KEMA and CORPUD.

1. Review of significant changes affecting the biosolids program.
2. Management System Dynamics Review, including effectiveness reviews of::
   - Communications Program
   - Corrective and Preventive Action Process
   - Goals & Objectives Process
   - Management Involvement & Review Process
3. Verification of effective correction of open nonconformances
4. Examination of outcomes being achieved
5. Process Audits
   - Biosolids Stabilization, Conditioning & Handling
   - Control of Contractors
   - Critical Control Points & Operational Controls
   - EMS Documentation
   - Maintenance

The audit was conducted by qualified auditors following NBP Auditor Guidance (August 2007). Using sampling techniques, the auditor observed practices in place, interviewed key persons and reviewed pertinent documents and records to assess the systematic performance of the process being audited and the consistency of biosolids management practices with CORPUD written procedures.

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 any nonconformance in a timely manner. For verification to proceed, effective correction of major nonconformances must be verified by KEMA 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.

2E. Reference Materials

The following documents were used as references during this audit:

CORPUD EMS Manual (current version)
National Biosolids Partnership "EMS for Biosolids" standard (May 2002)
National Biosolids Partnership Biosolids EMS Third Party Auditor Guidance (August 2007)
National Biosolids Partnership Code of Good Practice
National Biosolids Partnership Manual of Good Practice

3. SUMMARY OF AUDIT RESULTS

3A. EMS Strengths

During this audit KEMA noted the following strengths in the CORPUD biosolids program.

- A robust "management of change" procedure is in use (best practice)
- Having Operators involved in generating operating procedures will allow more ownership and more meaningful procedures.
- A very proactive and effective approach is in place for improving relations with interested parties.

3B. Nonconformances

During this audit, KEMA found two (2) minor nonconformances with respect to the audit criteria, as described below. Review of these nonconformances determined that they are not related and do not represent a systemic deficiency. CORPUD has prepared Corrective Action Plans for each nonconformance that were reviewed by KEMA's Lead Auditor and found acceptable. Verification of the effectiveness of corrective actions taken will occur during the next scheduled third party audit.

Minor Nonconformance JS/10-01/Element 11 EMS Element 11 requires emergency response equipment to be readily available. A truck being loaded on Dec 9 with intention of transporting biosolids to the McGill composting site did not have any spill control equipment and the required spill response plan was not available.

Minor Nonconformance JS/10-02/Element 12 EMS Element 12 requires the organization to establish document control and records requirements for biosolids management activities conducted by contractors. Although required records are inspected, specific requirements for recordkeeping are not included in "special conditions" for contractors.

3C. Nonconformances from Previous Audits

All nonconformances from previous KEMA audits have been closed (see Section 4 of this report). No nonconformances remain open.

3D. Plans for Closure of Open Nonconformances

CORPUD will submit a Corrective Action Plan for each nonconformance found during this audit for approval by KEMA's Lead Auditor and will correct the nonconformances in a timely manner.

Verification of effective correction of the minor nonconformances found during this audit will occur during the next Third Party Audit, a Reverification Audit, currently planned to occur in December 2011.

3E. Opportunities for Improvement

The following "opportunities" for improving the CORPUD biosolids program were noted during the audit. Opportunities do not represent nonconformances and there is no obligation to take any action in response to them.

- Consider measuring performance of processes (key performance indicators) as a way of identifying improvement opportunities.
- .A link to biosolids quality risks / requirements could be included in operational controls.
- Review of contractor performance could be performed as a way of continually improving the relationship with biosolids contractors.
- Internal audit reports could include reference to corrective action needed for audit findings.
- Management review could be a process rather than a meeting.

3F. Previous Nonconformances

All open nonconformances from previous third party audits were closed during this audit (see Section 4 of this report).

3G. Audit Conclusion and Verification Statement

Based on the results of this audit, KEMA has verified that CORPUD's biosolids management system continues to meet the expectations and requirements of the National Biosolids Partnership Biosolids Management (EMS) Program. Continuing certification within that Program is recommended.

3H. Agreements

CORPUD will implement their approved corrective action plans for each nonconformance identified in this audit in a timely manner. The effectiveness of actions taken will be verified during the Third Party Verification Audit in 2011... CORPUD has asked KEMA to submit a proposal, to cover the Reverification Audit in 2011 and interim audits in 2012, 2013, 2014 and 2015.

3I. Appeals

The NBP provides an appeals process for biosolids organizations and interested parties that disagree with the findings of a third party EMS audit. The verification 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 official verification decision or interim audit decision by the Audit Company. Anyone who may need help in understanding the appeals process should contact the National Biosolids Partnership staff, Mr. Jim Cox by e-mail: jcox@wef.org.

An appeal process is available to persons concerned about the methods and/or scope of this audit. Further information about this appeal process can be obtained directly from KEMA (contact Pierre Salle, pierre.salle@kema.com or Jon Shaver jon.shaver@kema.com) or from NBP (contact Jim Cox, jcox@wef.org).

4. MANAGEMENT SYSTEM 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 KEMA's review of the dynamics of the CORPUD biosolids management system.

4A. EMS Outcomes

Quality Practices

- Addition of centrifuge has increased dewatering capacity (+50%) and led to higher cake solids content (+5%) resulting in lower energy use.

Environmental Performance

- Three constructed wetlands are in place for reducing nitrate runoff from the facility. $70M saving in remediation cost + $6M/year cap & trade benefit. Demonstrated commitment to environmental improvement. Neusse River keeper indicated this is best practice.
- Addition of Denitrification filters and upgraded reuse water distribution system has reduced demand for potable water and deferred need for additional water plant by 10 years (cost $7/gal vs. $20/gal new plant.

Interested Party Relations

- Neighbors have noted that plant management is more receptive to their input / concerns. Result= fewer complaints, better relations.
- Reduced noise & odor resulting from air priming system planned for digester jet mixers and improved sound reduction on blowers.

4A Significant Changes

The following significant changes affecting the CORPUD biosolids program were completed in 2010:

The former Director of Public Utilities retired and was replaced by a new Director. A constructed wetlands has been installed for use in filtering nitrates from wastewater effluent. An additional dewatering centrifuge has been installed. Denitrification filters have been installed. Compacting dumpsters have been installed.
Review of these changes during the audit determined that they were planned and implemented in a systematic manner that is consistent with applicable requirements of the NBP EMS Elements.

4B Management System and Documentation Revisions

No changes have been made in the biosolids management system or documentation describing that system since the previous KEMA audit.

4C Correction of Nonconformances From Previous Third Party Audits

Corrective action taken in response to nonconformances from previous Third Party Audits of the CORPUD Biosolids Management System and the status of those nonconformances are sumarized below.

Minor Nonconformance JS/09-01/Element 12 EMS Element 12 requires that biosolids program documents be controlled. There is no evidence that wastewater treatment DOPs are being reviewed and some DOPs (e.g. barscreen) are out of date.

> Corrective Action - The City of Raleigh determined that the cause of this nonconformance was a "documentation" issue. In response provided operations employees with access to most current DOPs on the intranet and provided personnel with training in controlling documents... This nonconformance is now closed.

Minor Nonconformance JS/09-02/Element 7 EMS Element 7 requires that sufficient resources be provided to execute biosolids program and EMS responsibilities. Lack of resources is limiting ability to do internal audits to the extent desired and having an effect on other biosolids program activities, such as contractor inspections and management reviews.

> Corrective Action - The City of Raleigh determined that the cause of this nonconformance was a "management error" issue, primarily associated with budgeting. In response they reallocated resources to high priority programs and revised resource needs for internal audits and contractor inspections. Resource needs are discussed regularly as part of management reviews. This nonconformance is now closed.

Minor Nonconformance JS/09-03/Element 17 EMS Element 17 requires that management reviews include consideration of changing circumstances and commitment to continually improve. The Management Review meeting in August 2009 did not address follow-ups from previous reviews or changing circumstances and did not record changes and improvements in the management system.

> Corrective Action - The City of Raleigh determined that the cause of this nonconformance was a "management" issue. In response they revised management reviews to include assigned system reviews, with discussion of improvement recommendations at EMS Management meetings. This nonconformance is now closed.

4D Management System Effectiveness Reviews

The auditor reviewed the use and effectiveness of each of the following processes.

Management Review Process

An Operations EMS Team meets regularly to discuss ongoing performance and a Department EMS Team meets bi-weekly to discuss and plan broader matters. Ina addition, the EMS Team conducts a formal management review of the biosolids management system semi-annually. As a result of these planning meetings the biosolids program is working effectively to maximize quality, reduce environmental impacts, respond to interested parties and comply with regulations. Several

improvements in equipment and processing have been implemented. The management review process is functioning effectively.

Goals and Objectives Process

Seven of ten objectives for 2010 have been achieved. Three objectives are ongoing and one objective was not completed as planned. New objective are in place for 2011 fiscal year. The goals and objectives process is functioning effectively.

Corrective and Preventive Action Process

All findings from prior Third Party Audits and from internal audits have been corrected using a formalized "Corrective and Preventive Action" process. The EMS Team reviews causes of findings to determine if trends exist that can lead to further preventive action. The Corrective and Preventive Action process is functioning effectively.

5. RESULTS - PROCESS AUDITS

The following describes the results of KEMA's audit of processes The City of Raleigh uses in managing biosolids activities and the level of conformance of each process with applicable requirements of the EMS Elements.

5A Biosolids Stabilization, Conditioning & Handling

Some solids from the primary clarifier are sent directly to McGill for composting and some are dewaterd (belt filter press + centrfuge). Solids from the secondary clarifier are digested, thickened (gravity belt thickener) and conveyed for laoding onto trucks for land application. Operators qualified through State Certification are well aware of operational controls in place, including a SCADA automated control system and written operating procedures (DOPs). Operators participate in writing DOPs.

Audit Results
The process described above is functioning effectively and meets NBP expectations and requirements of the EMS Elements.

5B Control of Contractors

Contractors involved in the CORPUD biosolids program include McGill Composting (transportation and compost), Granville Farms Inc. (transportation and land application) and Always Trucking (transportation). Contractual agreements are in place with each contractor that define roles and responsibilities. In additon, a "Speciaal Conditions for Contractors" document defines responsibilities and expectations related to the CORPUD biosolids management system consistent with requirements of the EMS Elements. Contractor operations are inspected regularly by CORPUD personnel.

Audit Results
The process described above is functioning effectively and meets NBP expectations and requirements of the EMS Elements, except as noted below:

> Minor Nonconformance JS/10-01/Element 11 EMS Element 11 requires emergency response equipment to be readily available. The truck being loaded on Dec 9 with intention of transporting biosolids to the McGill composting site did not have any spill control equipment and the required spill response plan was not available.
>
> Minor Nonconformance JS/10-02/Element 12 EMS Element 12 requires the organization to establish document control and records requirements for biosolids management activities conducted by contractors. Specific requirements for recordkeeping are not included in "special conditions" for contractors.

5C Critical Control Points & Operational Controls

Critical control points (aka process control points) within the biosolids program and related operational controls are determined by Operations personnel and the EMS Team using a risk

analyisis method. Identified controls and control points are listed in a table. This identification is used for planning control of significant environmnetal impacts, biosolids quality, regulatory compliance and relations with interested parties. Identified process control points and methods for controlling operations are consistent with NBP requirements.

Audit Results
The process described above is functioning effectively and meets NBP expectations and requirements of the EMS Elements.

5D EMS Documentation

The CORPUD EMS Manual is written to describe the biosolids manageen system and its requireemnts corresponding to the NBP EMS Elements. Review of the Manual found it meets the fundamental requirements of the EMS Elements.

Audit Results
The process described above is functioning effectively and meets NBP expectations and requirements of the EMS Elements.

5E Maintenance

The Maintenance Group at the Neusse River Plant performas maintenance on equipment at the plant, two other remote facilities and pump stations feeding the plants

Audit Results
The process described above is functioning effectively and meets NBP expectations and requirements of the EMS Elements.

APPENDICES

List of Participants

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

NRWWTP Personnel	Position
Burrell Brock	Industrial Pretreatment Coordinator
Darrell Crews	Laboratory Supervisor
Marla Dalton	Environmental Coordinator - Reuse
Winslow Davis	Operations Supervisor
Glenn Evans	Plant Maintenance Supervisor
Marti Gibson	Environmental Coordinator / EMS Coordinator
Nate Howell	Operator (in training)
Jeremy Jernigan	Residuals Distribution Coordinator
Jesse Luper	Assistant Reuse Superintendent
Ken Waldroup	Asst Public Utilities Director
Jason Waters	Land Mgmt Supervisor
T.J. Lynch	WWTP Superintendent
Tim Woody	Reuse Superintendent

Interested Parties	
Ed Hardee	NCDENR Biosolids Regulator
D.R. Wells	Citizen, biosolids user (land application)

List of Documents & Records Reviewed

CAPA (various)
City of Raleigh Biosolids Goals & Objectives 2009, 2010
DOPs (various)
EMS Meeting minutes (12/10/09)
Process charts (various)
SCADA screens (various)
CAPA Tracking log
Management review meeting minutes 9/1/10
Internal audit Sept 7 – 10, 2010
Contractor inspection reports (various)
Inspection report – McGill 10/14/10
Critical control points & operational controls table
Special Conditions for Contractors
Centrifuge startup procedure
Centrifuge training manual
Control systems training
City of Raleigh biosolids newsletter
City of Raleigh Reuse Newsletter Dec 2010
Wastewater Treatment Plant performance measures

END OF REPORT