DAVIDSON COUNTY
INTEGRATED SOLID WASTE MANAGEMENT
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Din 9044, Permit No. 29-06, JM.

April 21, 2009

Mr. John Murray, P.E.
NC DENR Solid Waste Section
610 E. Center Ave.
Mooresville, NC 28115

**RE: LANDFILL GAS RENEWABLE ENERGY PROJECT**
**CONSTRUCTION NOTIFICATION**
**DAVIDSON COUNTY LANDFILL**
**LEXINGTON, NORTH CAROLINA**

Dear Mr. Murray:

Davidson County has contracted with Davidson Gas Producers, LLC, and a subsidiary of DTE Biomass Energy, to design, install, operate, and maintain a landfill gas (LFG) collection system at the County's landfill facility. The purpose of the project is to recover landfill gas from the landfill units for early action carbon collection and future electric power generation. This project has been motivated by North Carolina Senate Bill #3, Renewable Energy and Energy Efficiency Bill, signed into law on August 20, 2007. This bill's objective is to promote the development of renewable energy and energy efficiency through implementation of a renewable energy and energy efficiency portfolio standard (REPS). Landfill methane (such as that being produced by the Davidson County Landfill) meets the definition of a "renewable energy resource" as defined in the bill. Design and installation of the wellfield is a critical path task necessary to bring the renewable energy project to fruition.

The **attached** brief prepared by BlackRock Engineers, Inc., under contract to Davidson Gas Producers, is submitted in accordance with the NC DENR – Solid Waste Section (SWS) documented *Guidance for Gas Collection Systems*. According to your discussions with BlackRock and DTE Biomass Energy, the purpose of this notification is to document planned compliance for the landfill's Operating Record.

As the landfill is currently under the NSPS threshold for regulated air emissions, this project provides for voluntary early action carbon collection and gas control on the landfill units. Implementation of the wellfield design and Phase 1 temporary system is scheduled to begin with this notification to the SWS. Prior to final cover construction, all gas collection piping will be temporarily installed and secured above ground. The County and our Engineer, Richardson Smith Gardner and Associates, Inc. (RSG), will coordinate Phase 1 closure activities with permanent installation of the gas collection piping. Gas condensate will be managed via the existing leachate system.

Any well drilling will be coordinated with RSG to provide an adequate buffer to the base liner system.

Consistent with established procedures, upon completion of the LFG project a copy of the CQA Report and As-Built drawings for the Gas Collection System will be submitted to the SWS for the facility's record.

Please contact the Design Engineer, Gary W. Ahlberg, and PE with BlackRock Engineers, Inc. (910.232.6696) with any questions regarding this transmittal or additional requirements related to the LFG system. Please contact me with any other questions.

Thank you for your assistance.

Sincerely,
**Davidson County Integrated Solid Waste Management Department**

Charles Brushwood
Director

Attachment

cc: Ed Mussler, P.E., NCDENR-SWS
Al Hetzel, NCDENR-SWS
Pieter Scheer, P.E., RSG
Amanda Gentner, DTEBE
Gary Ahlberg, P.E., BlackRock

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**DAVIDSON COUNTY LANDFILL GAS**
**RENEWABLE ENERGY PROJECT AT THE**
**DAVIDSON COUNTY LANDFILL**
**DAVIDSON GAS PRODUCERS, LLC**
**Lexington, North Carolina**

BlackRock Engineers, Inc. presents the following brief report for Landfill Gas System development in Phase 1 and the Holly Grove landfill units. The project goals include evaluating the existing Phase 1 wells and specific landfill conditions, collecting and flaring gas from a temporary system, and building out a wellfield for commercial power generation as a North Carolina renewable energy project. During the past months, we have met with Davidson County and their landfill Engineer (RSG) to discuss implementation and coordination of the gas project. Based on past implementation strategies for similar gas projects in Wake, Forsyth, and Iredell Counties, this report provides a description of the project for incorporation into the landfill's Operating Record and construction notification to the North Carolina Department of Environment and Natural Resources, Solid Waste Section (NC DENR-SWS). This report is submitted in accordance with the DENR-SWS documented *Guidance for Gas Collection Systems.* Implementation of the LFG system is scheduled to begin with this notification to the NC DENR-SWS, and placement in the landfill's Operating Record.

The power plant project has been motivated by North Carolina Senate Bill #3, Renewable Energy and Energy Efficiency Bill, signed into law by Governor Mike Easley on August 20, 2007. This bill's objective is to promote the development of renewable energy and energy efficiency through implementation of a renewable energy and energy

efficiency portfolio standard (REPS). Landfill methane (such as that being produced by the Davidson County Landfill) meets the definition of a "renewable energy resource" as defined in the bill. The REPS requirements have motivated electric public utility companies and electric membership corporations to enter into contracts to purchase renewable energy. Evaluating existing collectors and building out the wellfield is a critical path task necessary to bring this renewable energy project to fruition.

## PROJECT SUMMARY

The landfill site is divided into three units, Phase 1, Phase 2, and the closed Holly Grove cells. Phases 1 and 2 are lined units. BlackRock Engineers, Inc. is the Design Engineer for the Landfill Gas System, including the wellfield, collection system, and condensate stations. The LFG system will be operated by Davidson Gas Producers, LLC. Construction Quality Assurance (CQA) will be incorporated in the construction plans to monitor contractor activities, protect the integrity of the landfill, and document as-built conditions.

Final Cover is currently in-place over the eastern half of Phase 1, or Phase 1A. The existing series of 15 gas vent wells are targeted for workover and retrofit to active production wells. In addition to the existing vent wells, leachate piping appears to have adequate solid ends for gas recovery at the upstream cleanouts. The project design and implementation strategy utilizes the existing collectors and a series of test wells to evaluate production well spacing for buildout of the Phase 1 LFG system. The complete project scope includes the following tasks or stages of development.

1. Vent conversion to gas production wells
2. Temporary above ground collection piping over Phase 1A
3. Connection of Phase 1 upstream (S) leachate cleanouts
4. Temporary Control Flare Start-up
5. Phase 1A Wellfield Evaluation – First Well Installations
6. Phase 1 Wellfield Buildout
7. Holly Grove Wellfield Evaluation

8. Power Plant Construction
9. Phase 2 Base Gas Collection
10. Phase 2 Gas Pipeline

Implementation of the temporary Phase 1A collection system is scheduled to begin in April 2009. Operation of the temporary flare will commence on or before June 30, 2009. Subsequent development will be based on the performance of the temporary flare system and its collectors. Buildout of the Phase 1 wellfield will be coordinated with the County's Final Cover Project; temporary piping may be installed prior to closure activities. Condensate management will return liquids to the landfill leachate system.

# WELLFIELD

LFG production wells are 36-inch diameter boreholes completed with 6-inch diameter Sch80 PVC casing and perforated well screen. Completion details are specified by the Design Engineer based on drilling logs, total depth and landfill slope variables. Completion includes non-calcareous aggregate, soil, and bentonite seals. Completed wells are capped prior to connection to the collection system. During operation, the well pressure, flow rate, and associated gas quality are controlled using the wellhead valve. Wellfield CQA includes surveyed layout of the locations and verification of liner buffers by the LFG and landfill design engineers. Within 10 feet of planned total depth, the Contractor shall sound the boring depth using a tape measure after each drilling trip (retrieving waste cuttings to the surface) to ensure that the design total depth is not exceeded. Waste cuttings will be hauled to the active landfill area for disposal. As-built records include drilling logs, observations, completion details, and surveyed location. Well abandonment details will also be recorded.

# COLLECTION SYSTEM

A high density polyethylene (HDPE) piping network connects the extraction wells to the blower. The gas collection system (GCS) operates under vacuum conditions ($P_{sys} < P_{atm}$), where gas flow is controlled by the system pressure. Gravity controls gas condensate flow in the collection piping.

The gas collection piping system utilizes flow loops that equalize pressure losses according to gas flow rates. Gas flow can be controlled and isolated using the header valves installed in the system. The header is the main pipeline for gas transmission to the plant. The *header* collects gas from *laterals* that are connected to one well or a series of wells. Header installations shall include aggregate backfill within haul road corridors. Service laterals are 4 or 6 inch lines extending from the header to well locations. Temporary piping will be secured by stakes in the vegetative soil layer, above any cap liner components.

Both landfill units are active and have intermediate soil cover on slopes and completed surfaces. Accordingly, the collection system will be installed in waste, at a nominal depth of 2 feet to the top of pipe. Soil shall be placed and compacted for pipe bedding and backfill. Waste shall be hauled to the active landfill area for disposal. Top of pipe, valves, and header features shall be marked for an as-built survey at completion points.

## CONDENSATE MANAGEMENT

Condensate is “knocked out” at elevation troughs in the collection system. With uniform gas flow toward the blower station, the collection system is graded to permit condensate drainage under *positive* and *reverse* flow conditions. Positive flow means gas and condensate flow in the same direction. Under reverse flow conditions, the pipe grade directs condensate drainage to HDPE condensate stations. Nominal pipe slopes are 4%, and may be reduced to 2% for positive slopes on the older unit(s), where initial settlement has been realized. The condensate stations (KO1), or *“Knock Outs”*, are either equipped with a pump or utilize gravity to transport the condensate for discharge into the landfill leachate system. Condensate discharge locations will be coordinated with the landfill design engineer. Each condensate station utilitizing a pump will be equipped with an automated electrical pumping system, with 3 level indicators. A high level activates the pumping system and condensate is removed from the knock out until the low level is reached. System shut down is triggered by a high-high level switch.

## POWER PLANT AND FLARE

The temporary Phase 1A system includes a blower skid and flare unit, or Fuel Handling Skid (FHS). Automated system controls include a remote telemetry for shutdown and control conditions. The FHS area will be secured with fences and locking gates to limit access to authorized personnel only.

## CONSTRUCTION QUALITY ASSURANCE PLAN

Davidson Gas Producers, LLC employs a trained and experienced staff for project construction and operation. Prior to construction, Contractor Health and Safety Plans will be reviewed for compliance with industry standards and a pre-construction meeting will be conducted by the Construction Quality Assurance (CQA) Engineer. Coordination with the landfill owner and operator is an essential component of project implementation.

In the context of the CQA Plan, Construction Quality Assurance is defined as a planned and systematic program employed by the Owner to assure LFG system construction conforms to the project drawings and the project specifications and protect the existing liner system. With support from the Davidson Gas Producers staff on-site, CQA is directed by the CQA Engineer as a representative of the Owner and is independent from the Contractor. Based on observations and data, the product of this plan is the CQA Engineer's As-Built drawings and certification. BlackRock Engineers, Inc. will perform the duties of the Design Engineer and CQA Engineer. The Contractor is responsible for Construction Quality Control, including surveying. CQC are actions taken by the Contractor to ensure that the materials and the workmanship meet the requirements of the project drawings and the project specifications. The Contractor shall be experienced in LFG project construction.

## PROJECT MEETINGS

To facilitate the specified degree of quality during construction, clear, open channels of communication are essential. To that end, meetings are critical. Prior to proceeding with well drilling a pre-construction meeting will be held to review the responsibilities of

all parties in the CQA Plan and identify milestones and hold points for scheduling, testing, surveying, and progress.

Progress meetings will be held between the Owner, Engineer, the CQA Engineer, and the Contractor and representatives from any other involved parties at a minimum, once every two weeks during construction. These meetings will discuss current progress, planned activities for the next period, and any new business or revisions to the work. The CQA Engineer will log any problems, decisions, or questions arising at this meeting in his daily or periodic reports. Any matter requiring action which is raised in this meeting will be reported to the appropriate parties. These meetings will be documented by the Engineer and summaries will be transmitted to affected parties.

## DOCUMENTATION

An effective CQA plan depends largely on recognition of construction activities that should be monitored and on assigning responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Engineer will document that quality assurance requirements have been addressed and satisfied.

As a party to CQA, the Davidson Gas Producers Facility Manager will provide the CQA Engineer with his daily and weekly progress reports including signed descriptive remarks, data sheets, and logs to verify that required CQA activities have been carried out. These reports will also identify potential quality assurance problems. The Facility Manager and CQA Engineer will also maintain at the job site a complete file of project drawings, reports, project specifications, a CQA Manual, checklists, test procedures, daily logs, and other pertinent documents.

Wellfield CQA includes surveyed layout of the locations and prior verification of liner buffers by the LFG and landfill design engineers. A minimum buffer of 10-ft from the top of protective cover soil to the planned total depth is standard, with a buffer increase to 15-ft based on Engineer's discretion. Drilling Logs will record waste conditions

encountered during drilling. Well completion records will document casing installation and backfill intervals, including wellbore seals. A final survey of the GCS top of pipe, risers and features will be made by the project surveyor. Photographs will be taken by the CQA staff at regular intervals during the construction process and in all areas deemed critical by the CQA Engineer.

## OPERATING RECORD

At completion of construction, the CQA report and drawings will be submitted to Davidson County and the NC SWS for incorporation in the landfill's operating record. Any resulting changes to Closure or Post-Closure Plans may be made according to the CQA documentation for the LFG system.

During the operation of the landfill gas system, it will be necessary to perform maintenance on the system. This may include, but is not limited to, well and collection riser extensions, well replacements, and header and lateral repairs. Relocation and repair of the structures identified in the as built drawings should be documented and maintained on-site by the gas system operator.

Should you have any questions regarding this report, please contact the undersigned at 910.232.6696.

BlackRock Engineers, Inc.
Gary W. Ahlberg, P.E.