



North Carolina Department of Environment and Natural Resources

Dexter Matthews, Director

Division of Waste Management

Beverly Eaves Perdue, Governor
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August 10, 2012

Sent Via Email – YIY1@RJRT.com

Ms. Yongsheng Yi
R.J. Reynolds Tobacco Company
Environment, Health, and Safety
401 North Main St.
Winston-Salem, NC 27101

Re: *Summary Report - Ground Water Modeling for Site Assessment*
R.J. Reynolds Rural Hall Ash Landfill
Forsyth County, Solid Waste Permit #34-05
DIN 17025

Dear Ms. Yongsheng Yi:

The Solid Waste Section has completed a review of the *Summary Report - Ground Water Modeling for Site Assessment* dated May 2, 2012 (DIN 16708) submitted on behalf of R.J. Reynolds Tobacco Company by ERM NC, PC for the closed and unlined R.J. Reynolds Rural Hall Ash Landfill. In lieu of installing and sampling an off-site groundwater monitoring well located to the east/northeast of the facility, the Solid Waste Section, R.J. Reynolds Tobacco Company, and ERM NC, PC agreed during an April 28, 2011 meeting to utilize contaminant transport modeling to determine the potential for groundwater contamination to migrate off-site across Leak Creek in these directions. The plan to utilize groundwater modeling was discussed within the following documents: a Solid Waste Section letter titled *Compliance Order issued by the Division of Waste Management on April 17, 2009* dated June 10, 2011 and sent to R.J. Reynolds Tobacco Company (DIN 14128); a letter titled *Off-Site Access and Groundwater Modeling* document dated July 6, 2011 and sent to the Solid Waste Section by ERM NC, PC on behalf of R.J. Reynolds Tobacco Company (DIN 14344); and a Solid Waste Section letter titled *Off-Site Access and Groundwater Modeling* dated July 28, 2011 and sent to R.J. Reynolds Tobacco Company (DIN 14572). The *Summary Report - Ground Water Modeling for Site Assessment* was submitted as a response to the discussions during the April 28, 2011 meeting and the above mentioned documents.

Groundwater Modeling

R.J. Reynolds Tobacco Company's *Summary Report - Ground Water Modeling for Site Assessment* stated the following: (1) The modeling indicates that groundwater at the facility discharges into Leak Branch and the unnamed tributaries directly downgradient of the perimeter of the landfill; (2) The modeling indicates that the private water supply wells within the surrounding areas are not receiving groundwater from the facility; and (3) The simulated capture zones of the private water supply wells located east of Leak Branch do not extend to the facility which also includes the water supply well used for livestock purposes located approximately 1,100 feet southeast of the facility.

Although the Solid Waste Section requested pursuing off-site access for the installation of an off-site groundwater monitoring well(s) located to the east and northeast of the facility, due to the difficulty in

securing access to the install the off-site groundwater well(s), the Solid Waste Section was amenable to the non-invasive groundwater modeling approach for demonstration purposes as part of the groundwater assessment for determining groundwater flow and the migration of contaminants in the east and northeast directions.

The east and northeast directions are significant because (1) the regional groundwater flow regime within the lower portion of the bedrock aquifer flows to the northeast, (2) the groundwater within the deeper portion of the bedrock aquifer would be expected to eventually enter the deep regional flow regime and flow northeastward toward the Town Creek drainage, and (3) the orientation of the creeks and streams in the study area are primarily controlled by the orientation of the stratigraphy (northeast). These three items of significance were all stated within the *Preliminary Site Assessment* dated October 29, 2009, and the *Phase II Site Assessment Report* dated March 10, 2011, as well as the *Summary Report - Ground Water Modeling for Site Assessment* dated May 2, 2012.

The *Off-Site Access and Groundwater Modeling* document dated July 6, 2011 and approved on July 28, 2011 stated the following:

1. ERM proposes to develop three-dimensional groundwater flow and contaminant transport models to simulate groundwater flow and contaminant transport near the landfill area, including the watershed east and northeast of the landfill.
2. ERM will utilize MODAEM, from which aquifer transmissivities are derived using a regional water balance approach based on USGS' online stream flow data. A localized 3D MODFLOW/MT3D model with finer grid (variable spacing) will be developed around the site, based on the boundary conditions and aquifer properties that are derived from the regional modeling. The model will include aquifer anisotropy to reflect the preferential groundwater flow conditions in fractured rock and saprolite. The model will be calibrated using observed groundwater elevations at the landfill and contaminant concentration data. The model will be applied to evaluate the extent of groundwater impacts east and northeast of the landfill.
3. ERM requests NCDENR's agreement that efforts for obtaining access for the off-site monitoring well is adequate and the proposed modeling approach is acceptable for evaluating the potential for groundwater contamination to migrate off-site across Leak Creek to the east/northeast of the landfill.

Based upon the Solid Waste Section's review, the groundwater modeling demonstration submitted is not complete. The groundwater modeling demonstration does not provide enough information regarding the groundwater flow and provides no information about the current and potential extent of environmental impacts to the east and northeast of the facility on the off-site properties across Leak Branch. The groundwater modeling demonstration submitted appears to only focus on present day on-site conditions. It also appears that the permanent groundwater monitoring wells W-1, W-2, W-3, W-3B, W-8, and W-9 (off-site) and the temporary piezometers PZ-1, PZ-2, and PZ-3 that are located either to the east, north, and southeast of the facility were not utilized within the groundwater modeling demonstration. It is essential to include data from these locations in order to model for contaminant transport off-site to the east and northeast directions.

Analytical data from select facility groundwater monitoring wells and aquifer assumptions were utilized within the groundwater modeling demonstration. Since no aquifer pumping tests were ever performed at the groundwater monitoring wells at the facility, assumptions regarding the aquifer characteristics were utilized during this groundwater modeling demonstration. Aquifer pumping tests are critical because they determine the properties of an aquifer system. These properties include transmissivity, hydraulic conductivity (horizontal and vertical), and storativity. Aquifer pumping tests can also identify and locate recharge and no-flow boundaries that may limit the lateral extent of aquifers. The Solid Waste Section highly recommends that aquifer pumping tests be performed at this facility.

Please submit a complete and comprehensive groundwater modeling demonstration within 60 days of receipt of this letter.

Semiannual Water Quality Monitoring

It appears that water quality monitoring has ceased at the permanent groundwater monitoring wells W-7, W-8, and W-9 (off-site) and the temporary piezometers PZ-1, PZ-2, PZ-3, PZ-4, and PZ-5. These three groundwater monitoring wells and five temporary piezometers, installed as part of the groundwater assessment, were only sampled in January 2011 and April 2011. During the January 2011 monitoring event, iron exceeded the Groundwater Standard within W-8, W-9, PZ-1, PZ-2, PZ-3, PZ-4, and PZ-5, and manganese exceeded the Groundwater Standard within W-7, W-8, PZ-1, PZ-2, PZ-3, PZ-4, and PZ-5. Also, during the April 2011 water quality monitoring event for the facility, these wells and piezometers installed for groundwater assessment were sampled again. During the April 2011 monitoring event, iron exceeded the Groundwater Standard within W-7, W-8, PZ-1, PZ-2, PZ-3, PZ-4, and PZ-5, and manganese exceeded the Groundwater Standard within W-7, PZ-1, PZ-2, PZ-3, and PZ-5.

R.J. Reynolds Tobacco Company's *Summary Report – Phase II Site Assessment* dated March 10, 2011 stated additional sampling of the newly installed groundwater monitoring wells and temporary piezometers is proposed. The additional sample results will be compared to previous results to establish water quality trends at these locations. These additional samples will be collected in conjunction with the routine sampling activities scheduled for April 2011. However, it appears that W-7, W-8, W-9, PZ-1, PZ-2, PZ-3, PZ-4, and PZ-5 were not sampled again and not mentioned within any of the recent water quality monitoring reports or correspondences submitted to the Solid Waste Section.

As a result, the three permanent groundwater monitoring W-7, W-8, and W-9, and the five temporary piezometers PZ-1, PZ-2, PZ-3, PZ-4, and PZ-5 need to be permanently added to the facility's groundwater monitoring network. During the next scheduled semiannual water quality monitoring event (September 2012) at the facility and for all future semiannual water quality monitoring events, please also monitor these locations for the same constituents currently being monitored at the facility.

Groundwater Corrective Action

Finally, since groundwater contamination exists beyond the facility's compliance boundary and as discussed during the April 28, 2011 meeting, during several phone conversations in 2011, and within the March 16, 2012 email, the installation of the synthetic liner cap at the facility may also be included as part of the selected remedy for groundwater corrective action. Please begin the groundwater corrective action process by submitting a completed and signed Groundwater Corrective Action Application (<http://portal.ncdenr.org/web/wm/sw/envmonitoring>) that includes the proposed selected remedy within 90 days. Once the Solid Waste Section issues an approval letter for the proposed selected remedy, then R.J. Reynolds Tobacco Company is required to submit a Groundwater Corrective Action Plan (CAP) within 90 days of receiving the selected remedy approval letter. The implementation of groundwater corrective action at this facility will then take place in accordance with 15A NCAC 2L .0106(d), (h), (i), and (j).

If you have any questions or concerns regarding this letter, please contact me at 919-707-8294 or by email at jaclynne.drummond@ncdenr.gov. Thank you in advance for your anticipated cooperation with these matters.

Sincerely,



Jaclynne Drummond
Compliance Hydrogeologist
Solid Waste Section

cc sent via email:

Mark Poindexter, Field Operations Supervisor
Jason Watkins, Western District Supervisor
Charles Gerstell, Environmental Senior Specialist
John Murray, Permitting Engineer
Max Hopkins, R.J. Reynolds Tobacco Company
Alan Martin, ERM NC, PC