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February 18, 2015

Mr. Ervin Lane
Compliance Hydrogeologist
Division of Waste Management/Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

**RE: Landfill Gas Remediation Plan
Wilkes County, Dan Johnson Landfill, Permit No. 97-02
JOYCE Project No. 356.1501.11, Task No. 01**

Dear Ervin:

On behalf of Wilkes County, Joyce Engineering (JOYCE) is submitting this *Landfill Gas Remediation Plan* (LGRP) for the Wilkes County Dan Johnson Landfill, Permit No. 97-02. This LGRP has been prepared in response to the Notice of Violation (NOV) issued by the North Carolina Department of Environment and Natural Resources (DENR) dated January 20, 2015.

INTRODUCTION

The Dan Johnson Landfill is a closed, unlined municipal solid waste (MSW) landfill maintained by Wilkes County. The landfill property is located near the town of Austin, North Carolina. The area surrounding the landfill is primarily agricultural and contains open fields and woodlands. The landfill is bounded to the south by Little Elkin Creek, and to the east by an unnamed tributary of Little Elkin Creek.

The Dan Johnson Landfill is located in the Blue Ridge Belt in the Alligator Back Formation. It consists of laminated to thin layered mica schist and phyllite interlayered with biotite, muscovite, gneiss and amphibolite.

LANDFILL GAS MONITORING HISTORY

Gas monitoring at the Dan Johnson Landfill has been performed throughout the post-closure care period. Through the third quarter of 2013, quarterly monitoring was conducted on the landfill property with the use of bar-hole probes around the periphery of the landfill. In July 2012, the County submitted a revised Landfill Gas Monitoring Plan (LGMP) proposing the installation of three gas probes, GP-1, GP-2, and GP-3, along the northern boundary of the landfill property. No probes were required along the other sides of the landfill as the landfill property is bounded by creeks which should act as natural barriers to gas migration. The LGMP was approved by the DENR on July 18, 2012.

Gas monitoring probes GP-1, GP-2, and GP-3 were installed on October 9, 2012. The locations of the probes are shown on the attached Drawing 1. The probes were constructed as described below:

Gas Probe ID	Diameter of Boring	Depth of Boring	Diameter of Probe	Top of Screen	Bottom of Screen	Top of Sand Pack	Top of Seal
GP-1	6"	24'	1"	4'	24'	3'	1'
GP-2	6"	27'	1"	4'	27'	3'	1'
GP-3	6"	34'	1"	4'	34'	3'	1'

Depths are in feet below ground surface.

The gas probes were monitored for the first time in October 2012, and quarterly thereafter. Table 1 summarizes the historical gas monitoring results from October 2012 to present. During all but one quarterly event since its installation, gas probe GP-2 has shown concentrations of methane between 33.1% and 58.9% (percent by volume), which is in exceedance of the lower explosive limit (LEL) for methane (5% by volume at standard temperature and pressure). Neither GP-1 nor GP-3 has shown any exceedances of the LEL for methane.

PROPOSED REMEDIAITON STRATEGY

Wilkes County proposes installing a gas intercept trench along the northern edge of waste in the vicinity of GP-2. The trench will be approximately 100 feet long, extending from approximately 60 feet west of GP-2 to approximately 40 feet east of GP-2. The trench will be installed using a backhoe or trackhoe. The trench will be 1-2 feet wide (one bucket width) and approximately 20 feet deep, or as deep as the equipment can reach. The proposed location of the trench is shown on Drawings 2.

A 10-mil plastic vapor barrier will be installed on the northern side of the trench, and three perforated risers will be installed at approximately 40-foot intervals in the trench. The risers will be nominal 4-inch schedule 80 PVC, perforated with $\frac{3}{8}$ -inch holes spaced every 90° and six inches on center along the pipe from the bottom of the trench to approximately 3 feet below the ground surface. The risers will extend to approximately 4-5 feet above grade, and will be topped with a "candy cane" top consisting of two 90° joints, or optionally, with solar-powered turbine caps.

The trench will be backfilled with clean, non-calcareous, 1-2-inch diameter gravel up to approximately 3 feet below grade, and then with compacted native soil to a height of 6-inches above grade. Optionally, a 4-6-inch bentonite seal may be placed between the gravel and native soil. The top of the soil backfill will be sloped to provide runoff of rainwater away from the trench. Drawing 2 shows a schematic of the proposed trench design.

MONITORING AND EVALUATION

Quarterly monitoring of the three gas probes will continue in accordance with the Landfill Gas Monitoring Plan for the facility. In addition, during each quarterly monitoring event the risers in the gas intercept trench will also be monitored for methane.

After one year of monitoring, the data will be evaluated to determine the effectiveness of the gas intercept trench in mitigating methane migration. If, after one year, the methane concentration in gas probe GP-2 has not been substantially reduced, additional remedial action will be considered.

SCHEDULE OF IMPLEMENTATION

- Quarterly gas monitoring will continue on the same schedule as before.
- Within 60 calendar days of DENR approval of this LGRP, the gas intercept trench will be installed.
- Within 60 calendar days of performance of the fourth quarterly monitoring event after the installation of the trench, an evaluation of the effectiveness of the remedy will be submitted to the DENR.
- Within 60 calendar days of determining that the trench is not sufficiently mitigating methane migration in the vicinity of GP-2, a new Landfill Gas Remediation Plan will be submitted to the DENR proposing the next phases of remediation.

Please feel free to contact Alex Everhart or me at (336) 323-0092 if you have any questions regarding this Plan.

Sincerely,
JOYCE ENGINEERING



Van Burbach, Ph.D., P.G.
Senior Technical Consultant

Attachments: Table 1, Drawings 1 & 2

Copy: Kent Brandon - Wilkes County, Solid Waste Director

TABLE 1: Historical Landfill Gas Monitoring Data

Date	Location	Instrument Purged?	Time	Probe Pressure (InWg)	Time Pumped (sec.)	CH ₄ (% Vol)	CH ₄ (%LEL)
15-Oct-12	GP-1	yes	10:58	-	20	0.4	8
15-Oct-12	GP-2	yes	9:50	-	20	56.4	1128
15-Oct-12	GP-3	yes	9:58	-	20	0.0	0
14-Jan-13	GP-1	yes	13:02	0.000	30	0.0	0
14-Jan-13	GP-2	yes	12:48	0.100	30	57.5	1150
14-Jan-13	GP-3	yes	12:51	0.000	30	0.0	0
14-Jan-13	BH-2A	yes	12:51	-	30	0.0	0
15-Apr-13	GP-1	yes	9:10	0.000	30	0.0	0
15-Apr-13	GP-2	yes	9:12	0.011	30	0.0	0
15-Apr-13	GP-3	yes	9:17	-0.070	30	0.0	0
22-Jul-13	GP-1	yes	14:09	0.000	30	0.0	0
22-Jul-13	GP-2	yes	13:43	0.540	30	39.0	780
22-Jul-13	GP-3	yes	13:59	0.000	30	0.0	0
22-Jul-13	BH-2A	yes	13:45	-	30	0.0	0
7-Oct-13	GP-1	yes	10:38	0.000	30	0.0	0
7-Oct-13	GP-2	yes	9:25	0.080	30	51.7	1034
7-Oct-13	GP-3	yes	9:34	-0.010	30	0.0	0
7-Oct-13	BH-2A	yes	9:30	-	30	0.0	0
8-Jan-14	GP-1	yes	10:05	-0.100	30	0.0	0
8-Jan-14	GP-2	yes	10:09	0.100	30	33.1	662
8-Jan-14	GP-3	yes	10:23	-0.040	30	0.0	0
8-Jan-14	BHP-2A	yes	10:18	-	30	0.0	0
28-Apr-14	GP-1	yes	11:10	1.490	45	0.0	0
28-Apr-14	GP-2	yes	10:04	-0.270	45	47.7	954
28-Apr-14	GP-3	yes	10:06	-0.110	45	0.0	0
30-Jul-14	GP-1	yes	9:40	0.000	60	0.0	0
30-Jul-14	GP-2	yes	9:46	-0.010	60	43.1	862
30-Jul-14	GP-3	yes	10:00	0.010	60	0.0	0
30-Jul-14	BH-2A	yes	10:10	-	45	0.0	0
13-Oct-14	GP-1	yes	11:35	0.000	60	0.0	0
13-Oct-14	GP-2	yes	9:40	0.400	60	46.0	920
13-Oct-14	GP-3	yes	9:58	-0.100	60	0.0	0
20-Jan-15	GP-1	yes	10:51	0.000	60	0.0	0
20-Jan-15	GP-2	yes	10:30	0.000	60	58.9	1178
20-Jan-15	GP-3	yes	10:37	-0.002	60	0.0	0
20-Jan-15	BH-2A	yes	10:45	-	60	0.0	0

BH-2A = Barhole probe approximately 50 feet from GP-2 toward the property boundary.

