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RECEIVED

November 20, 2007

NOV 27 2007

Mr. Ed Mussler  
Solid Waste Permitting Branch  
Division of Waste Management  
North Carolina Department of Environment and Natural Resources  
401 Oberlin Road, Suite 150  
Raleigh, North Carolina 27605

SOLID WASTE SECTION  
ASHEVILLE REGIONAL OFFICE

**Reference: Methane Investigation  
Former McDowell County Landfill  
SWS Permit #56-01  
Shield Project No. 1070249-01**

Dear Mr. Mussler:

As per Shield Engineering, Inc.'s (Shield) letter dated October 29, 2007 we have completed the assessment of the potential for the presence of methane at the former McDowell County Landfill. In the approval letter dated October 31, 2007 the Solid Waste Section (SWS) had requested that the work be executed in accordance with our initial letter. Also, the SWS had requested a submission of the results of the methane investigation at the former McDowell County Landfill.

The purpose of this letter is to satisfy both of these requirements as requested in the SWS letter of October 31, 2007 and to request SWS for consent for the installation of three proposed methane extraction wells at the former McDowell Landfill.

The purpose of the proposed work was to complete an assessment of the optimum locations within the landfill for the presence of methane. The assessment of the presence of methane at the former McDowell County Landfill was performed on October 31 and November 1, 2007.

Shield advanced a series of Geoprobe boreholes across the cover of the closed former landfill in a grid pattern. The layout of the actual grid used to direct-push each borehole is shown in Figure 1. Each of these boreholes was pushed through the landfill cover into the underlying waste. Refusal was encountered in several boreholes and a subsequent hole was drilled adjacent to the first borehole. Each borehole was advanced to a depth of about 5 feet. Following the withdrawal of the Geoprobe from the borehole, a LandTec GEM-500 methane probe was used to measure the



methane in air percentage within each borehole. The intake for the methane probe was extended down into each borehole before each reading was collected from the GEM-500 methane probe.

Following the measuring of the methane in air percentages, each borehole was completely sealed with a slurry mix of hydrated bentonite. The waste cumulated from the boreholes was disposed of at the adjacent Transfer Station for subsequent disposal at a permitted landfill.

The percentages of methane in air measured in each borehole are shown at each borehole location on Figure 1. The contour lines for the 30-, 40- and 50-percent of methane in air were interpolated from these borehole data across the former McDowell County Landfill. Based on these methane data and follow-up discussions between our client (Appalachian State University) and Shield, we are proposing to install three methane extraction wells, one each at the three locations identified on Figure 1.

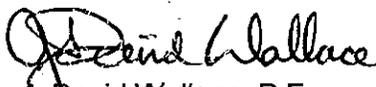
These methane extraction wells will be installed as shown in Figure 2. A 36-inch diameter borehole will be drilled in the waste to the depth of the waste. The depth of the waste is estimated to extend up to about 80 feet below the top of the landfill cover. A perforated 6-inch diameter PVC well screen (SDR-17) will be placed in each borehole. The perforated PVC well screen will extend over a depth of 60 feet. Solid 6-inch diameter PVC well casing (SDR-17) will be used to complete the methane extraction well to above ground surface. The annular space around the perforated PVC well screen will be backfilled with washed #57 stone, up to 5 feet above the top of the perforated PVC well screen.

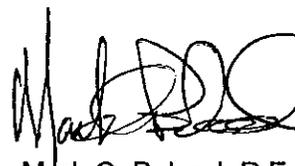
A layer of geotextile fabric Mirafi 140N will be placed across the top of the #57 stone and a 2-foot layer of bentonite pellets will be placed across the top of this fabric. These bentonite pellets will be hydrated in order to seal off the underlying annular space. The annular space will be backfilled with select clean borrow material up to the bottom of the cover of the former landfill. Another 2-foot layer of bentonite pellets will be placed in the remaining annular space. These bentonite pellets will be hydrated. After allowing time for settlement the remaining annular space shall be brought up to ground surface with select clean backfill. The top of the PVC casing shall extend approximately 2 feet above ground surface. The purpose of these three methane extraction wells is to conduct a methane extraction test in order to assess the potential sustainable methane gas production rate from the former McDowell County Landfill.

Based on previous conversations with Mr. Larry Frost the request for approval for these three methane extraction wells is being submitted to your attention. Your willingness to previously accommodate our ambitious schedule per our previous letter dated October 29, 2007 has been greatly appreciated by both ASU and Shield. Both ASU and Shield would sincerely appreciate receipt of your consent for these methane extraction wells within the next three weeks in order to meet our schedule for drilling these three methane extraction wells starting on December 10, 2007. If we could provide any additional information that may assist you in your review, please do not hesitate to contact us by telephone at (704)-971-4149 or by e-mail at [dwallace@sheildengineering.com](mailto:dwallace@sheildengineering.com).

Sincerely,

**SHIELD ENGINEERING, INC.**

  
J. David Wallace, P.E.  
Senior Engineer

  
Mark C. Boland, P.E.  
Principal Engineer

Attachment: Figure 1  
Figure 2

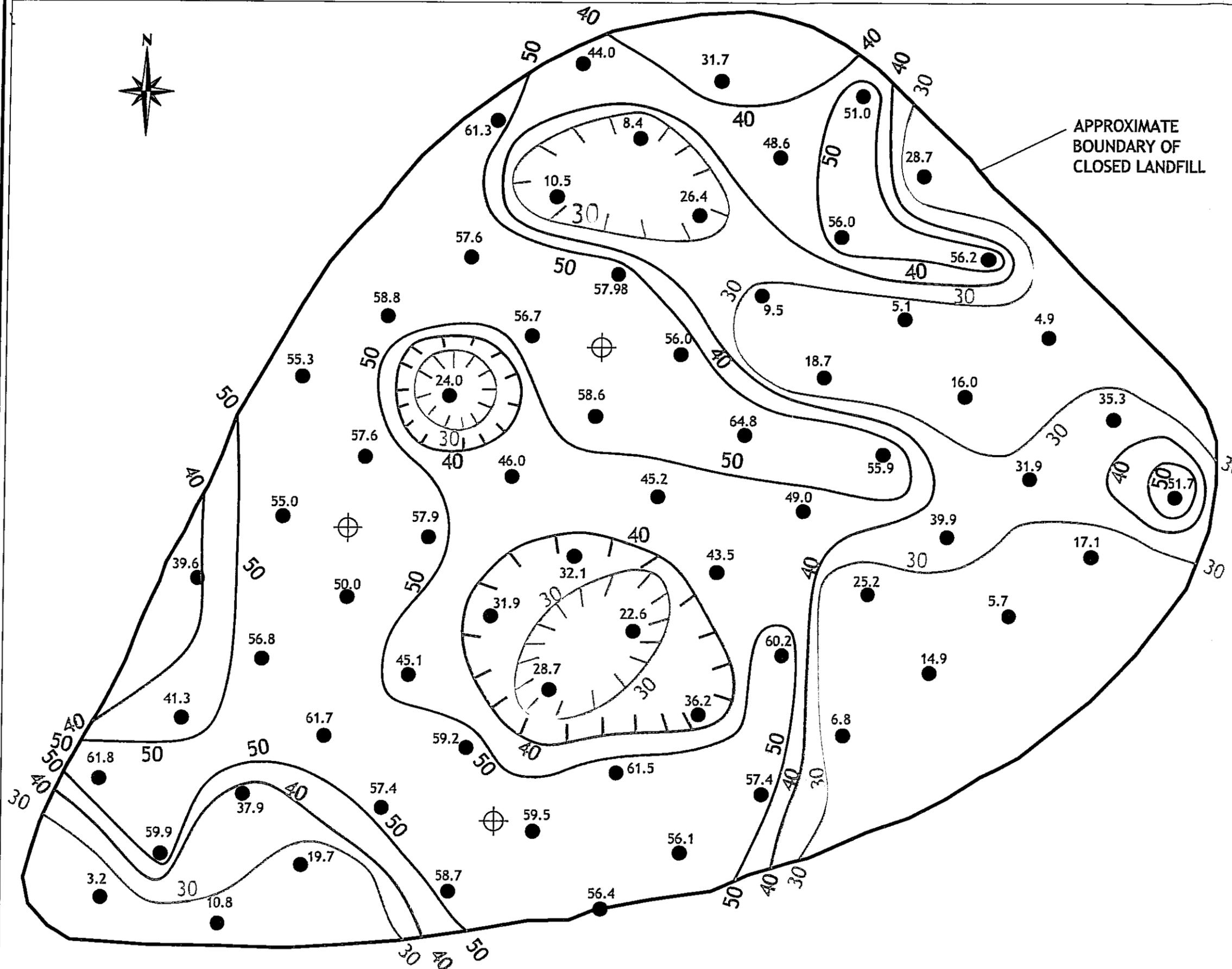
Cc: Mr. Stan Steury (Energy Center – Appalachian State University)  
Mr. Mike Gladden (McDowell County – Public Works Department)  
Mr. Larry Frost (SWS – Swannanoa, NCDENR)



**LEGEND**

- 51.7 ● METHANE GAS CONCENTRATION (% IN AIR)
- 40 — PERCENTAGE OF METHANE GAS IN AIR CONTOUR
- ⊕ POSSIBLE METHANE EXTRACTION WELL LOCATION

APPROXIMATE BOUNDARY OF CLOSED LANDFILL



0 50' 100'  
APPROXIMATE SCALE: 1 in. = 100 ft.

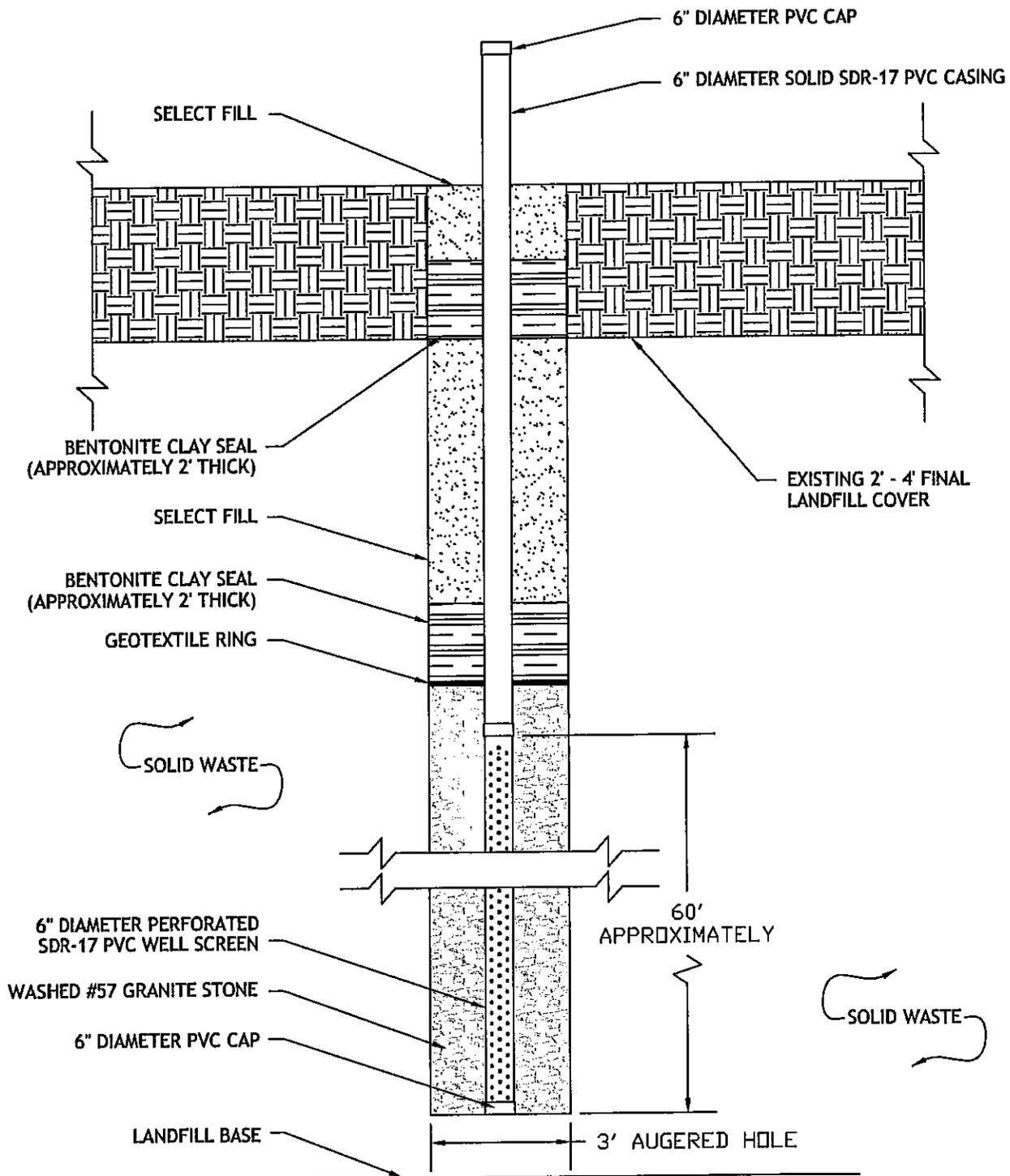
H:\PROJECTS\2007\1070249-01 ASU METHANE INVESTIGATION\FIGURES\METHANE CONTOUR MAP

**SHIELD**  
ENGINEERING, INC.  
4301 TAGGART CREEK ROAD  
CHARLOTTE, NC 28208  
704-394-6913  
704-394-6968 fax  
www.shieldengr.com

**METHANE CONTOUR MAP**

FORMER McDOWELL COUNTY LANDFILL  
MARION COUNTY, NORTH CAROLINA  
SHIELD # 1070249-01

DATE : 11/2/07	DRAWN BY : RBS
SCALE : AS SHOWN	FIGURE : 1



H:\PROJECTS\2007\1070249-01 ASU METHANE INVESTIGATION\FIGURES\FIGURE 2

 <b>SHIELD</b> ENGINEERING, INC.	4301 TAGGART CREEK ROAD CHARLOTTE, NC 28208 704-394-6913 704-394-6958 fax www.shieldengineering.com	
	<b>METHANE EXTRACTION WELL          CROSS-SECTION</b>	
<b>FORMER McDOWELL COUNTY LANDFILL          MARION COUNTY, NORTH CAROLINA</b>		
SHIELD # 1070249-01		
DATE :	11/14/07	DRAWN BY :
SCALE :	N.T.S.	FIGURE :
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