
Landfill Gas Monitoring Plan

Prepared for

Wayne County Subtitle D Landfill
Dudley, North Carolina

MESCO Project Number: G06096.6

This report is included in Appendix E, part of the Design Hydrogeologic Study
for the Wayne County Subtitle D Landfill, Phase 3.

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1 INTRODUCTION

1.1 BACKGROUND

The Landfill Gas Monitoring Plan objective is to provide clear guidelines and procedures for field and laboratory personnel when collecting and analyzing landfill gas samples. This plan applies to the Phase 1, Phase 2 and Phase 3 portions of the Wayne County Subtitle D Landfill. This analysis plan contains sampling procedures by which sampling will be performed. Facility conditions or unforeseen sampling variables may warrant deviation from the procedures; alternative sampling procedures must conform to the Solid Waste Section Landfill Gas Monitoring Document (Guidance Document).

1.2 SITE GEOLOGY AND HYDROGEOLOGY

Wayne County, North Carolina is located in the Coastal Plain physiographic province, characterized by flat to gently rolling topography and drainage features with narrow to moderately sloped sides. The lithology underlying the facility is mapped as the Black Creek Formation; described by Sohl & Owens (1991) as a late Mesozoic-age (Cretaceous) sedimentary formation consisting of black to dark grey thinly laminated clay with layers of sand, abundant mica and lignite with iron sulfides such as marcasite or pyrite. The Black Creek is approximately 211 feet thick, near Dudley. The upper 10 feet of the Black Creek formation (clay, silty clay, and sandy clay) act as a confining unit separating the overlying surficial aquifer from the underlying Black Creek aquifer (Winner & Coble, 1989).

Wayne County is located in the Neuse River Basin, which spans 6,235 square miles across north central and eastern North Carolina. Locally, the Neuse River travels between southwestern Goldsboro and Dudley approximately 2.5 miles north of the landfill facility. The primary drainage features are Edwards Branch and its unnamed tributary. General surface drainage flows southwest towards Edwards Branch. Topographic relief is approximately 70-75 feet.

1.3 REGULATORY LIMITS

Landfill gas probe readings will be collected quarterly in accordance with Rule 15A NCAC 13B and results will be submitted to the Solid Waste Section (SWS) in the event of a methane exceedance. Wayne County will follow the operational requirements for MSWLF facilities. Ensuring the measured concentration of methane gas does not exceed the Lower Explosive Limit (LEL) at the facility boundary and 25 % LEL in facility structures.

2 LANDFILL GAS MONITORING

2.1 WELL LOCATIONS

2.1.1 Existing Conditions

This monitoring plan includes seven methane probes numbered MP-17, MP-18, MP-19, MP-20, MP-21, MP-24 and MP-25. Monitoring points are summarized on **Table E-1**.

Existing probes are located outside the phase limits, 100 to 300 feet inside the property boundary. MP-17 is located west of phase one, near MW-5 and the leachate lagoon. MP-18 is located west of the Phase 1 near the leachate lagoon. MP-19 is located west of Phase 1, between MW-7 and MW-8. MP-20 is located on west of phase 1 and 2 near MW-11. MP-21 is located west of phase 2, near MW-12. Probe locations are illustrated on **Plate A**.

2.1.2 Additions for Phase 2

Five methane probes (MP-26, MP-27, MP-28, MP-29 and MP-30) are proposed for installation around the perimeter of the Phase 3 area. MP-26 is proposed west of phase 3 near MW-14. MP-27, MP-28 and MP-29 are proposed north of phase 3. MP-30 is proposed northeast of phase 3 near MW-1.

2.2 STRUCTURE AND AMBIENT SAMPLING

The shop and two scale houses, located at the facility entrance, will be sampled quarterly in accordance with the guidance document. The SWS will be notified if levels above 25% LEL occur.

2.3 LANDFILL GAS MONITORING FREQUENCY

Landfill gas monitoring wells will be sampled quarterly to insure that landfill gas does not exceed 100% LEL at the facility property boundary and 25% LEL at facility structures. Modifications to monitoring frequency can be obtained through the SWS.

If methane readings exceed the specified limits protection of human health is the primary objective. Additionally, the SWS will be notified in the event of a landfill gas exceedance. Within seven days the landfill gas levels detected will be recorded in the log with the steps taken to protect human health. Within 60 days a remediation plan that describes the nature and extent of the problem as well as the proposed solution will be implemented, a copy of the plan will be recorded in the log and the SWS will be notified.

3 LANDFILL GAS SAMPLING PROCEDURE

3.1 EQUIPMENT

Methane probes will be sampled with an accurately calibrated landfill gas monitoring instrument capable of reading methane, oxygen and carbon dioxide.

3.2 SAMPLING PROCEDURE

Portable methane field instruments will be calibrated in accordance with manufactures instructions; verification will be included with on-site documentation for each event. Calibration, to manufacturer's specifications, will occur prior to each sampling event. The expected gas levels will be considered when selecting the appropriate calibration gas for field instrument calibrations. Instrumentation will be allowed to properly warm up, prior to use, as directed by manufacturer's instructions. Prior to sample collection, the static pressure should read zero.

Following calibration, the instrument tubing will be purged for at least one minute prior to reading collection. Attach instrument tubing to the probe using the stopcock or quick connect coupling on the probe cap. Open the valve and record the initial and stabilized readings. A stabilized reading will not vary more than 0.5 percent by volume on the instrument's scale. Recorded readings will include the oxygen concentration and barometric pressure; oxygen will be two percent per volume or less to indicate air is not being drawn into the system providing false readings. Turn off the valve and disconnect the tubing. If deviation from the prescribed plan is warranted care will be taken to ensure the integrity of the samples and adherence to the Guidance Document. Method modifications will be noted on the sampling log.

4 RECORD KEEPING AND REPORTING

4.1 MONITORING DATA FORM

The Landfill Gas Monitoring Report Form will contain the facility name, permit number, landfill gas monitoring instrument type and serial number, instrument calibration date, field calibration date and time, gas used for field calibration (15/15 or 35/50), field gas canister expiration date, landfill gas monitoring event date, sample collector name and position, instrument pump rate, ambient air temperature, and general weather conditions. For each probe location the sampler will record the sample tube purge verification (collected prior to each sample), time pumped in seconds (at least one minute), barometric pressure, time stabilized reading was collected, %LEL, % methane by volume, % oxygen, % carbon dioxide and any notes, observations or comments relative to the sampling event. An example log is included as **Table E2**.

4.2 SAMPLING REPORTS

Quarterly monitoring event documentation will be recorded on site. Sampling reports will be submitted to the SWS regarding recorded detections above the specified limits within 60 days; including the nature of the exceedance and the initiated remedial action.

Documentation will be recorded on the Landfill Gas Monitoring Report Logs provided by NC Division of Waste Management – Solid Waste Section or logs established in the same fashion. An example log is included as **Table E2**.

4.3 PERMANENT RECORD KEEPING

Landfill gas monitoring records will be kept at the facility, including gas monitoring results and any required remediation plans. Records will be updated as the information becomes available. Reports will be sent to the SWS in the event of methane exceedance.

5 CONTINGENCY PLAN

If methane probes consistently exceed the established levels, probes closer to the property boundary will be constructed, in order to determine the landfill gas extent. If probes located at the facility boundary continually exceed regulated limits, action will be taken to release the landfill gas. The specific actions taken to release the gas will be determined on a site specific basis.

6 CONCLUSION

This report, included as part of the Design Hydrogeologic Report for the proposed Wayne County Subtitle D Landfill Phase 3, completes the requirements as described in Rule 15A NCAC 13B .1626 (4). The landfill gas monitoring plan is designed to be effective in the detection of methane to protect the health and safety of North Carolina citizens from asphyxiation and explosive landfill gas hazards.

Table E-1: Summary of Methane Monitoring Points

Sampling Point	Type	Total Depth (BGS)	Gradient	Location Description
MP-17	Methane Probe	5.08	Down	Phase 1 Monitoring
MP-18	Methane Probe	6.15	Down	Phase 1 Monitoring
MP-19	Methane Probe	5.9	Down	Phase 1 Monitoring
MP-20	Methane Probe	5.0	Down	Phase 1& 2 Monitoring
MP-21	Methane Probe	5.01	Down	Phase 2 Monitoring
MP-24	Methane Probe	6.1	Up	Phase 2 Monitoring
MP-25	Methane Probe	5.9	Up	Phase 2 Monitoring
MP-26	Methane Probe	8	Down	Future Phase 3 Monitoring
MP-27	Methane Probe	8	Down	Future Phase 3 Monitoring
MP-28	Methane Probe	10	Down	Future Phase 3 Monitoring
MP-29	Methane Probe	9	Down	Future Phase 3 Monitoring
MP-30	Methane Probe	15	Up	Future Phase 3 Monitoring

Facility Name: _____ **Permit Number:** _____
Date of Sampling: _____ **NC Landfill Rule (.0500 or .1600):** _____
Name and Position of Sample Collector: _____
Type and Serial number of Gas Meter: _____ **Calibration Date:** _____
Date and Time of Field Calibration: _____
Type of Field Calibration Gas (15/15 or 35/50): _____
Expiration Date of Field Calibration Gas Canister: _____
Pump Rate of Instrument: _____ **General Weather Conditions:** _____
Ambient Air Temperature: _____ **Barometric Pressure:** _____

Location or LFG Well	Sample Tube Purge	Time	Time Pumped (s)	Initial %LEL	Stabilized % LEL	% Methane By Volume	% Oxygen	% Carbon Dioxide	Observations or Comments
Background									
MP-17									
MP-18									
MP-19									
MP-20									
MP-21									
MP-24									
MP-25									
MP-26									
MP-27									
MP-28									
MP-29									
MP-30									
Background									

na = Not Available

Standard at property line 100% LEL, 5% By Volume, 50,000 PPM of Methane

Standard in Buildings 25% LEL, 1.25% By Volume, 12,500 PPM of Methane

Shaded indicates methane detected in exceedance of any applicable Standard

Certification

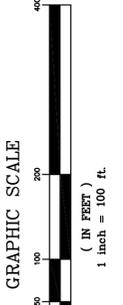
To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

SIGNATURE

TITLE

LEGEND

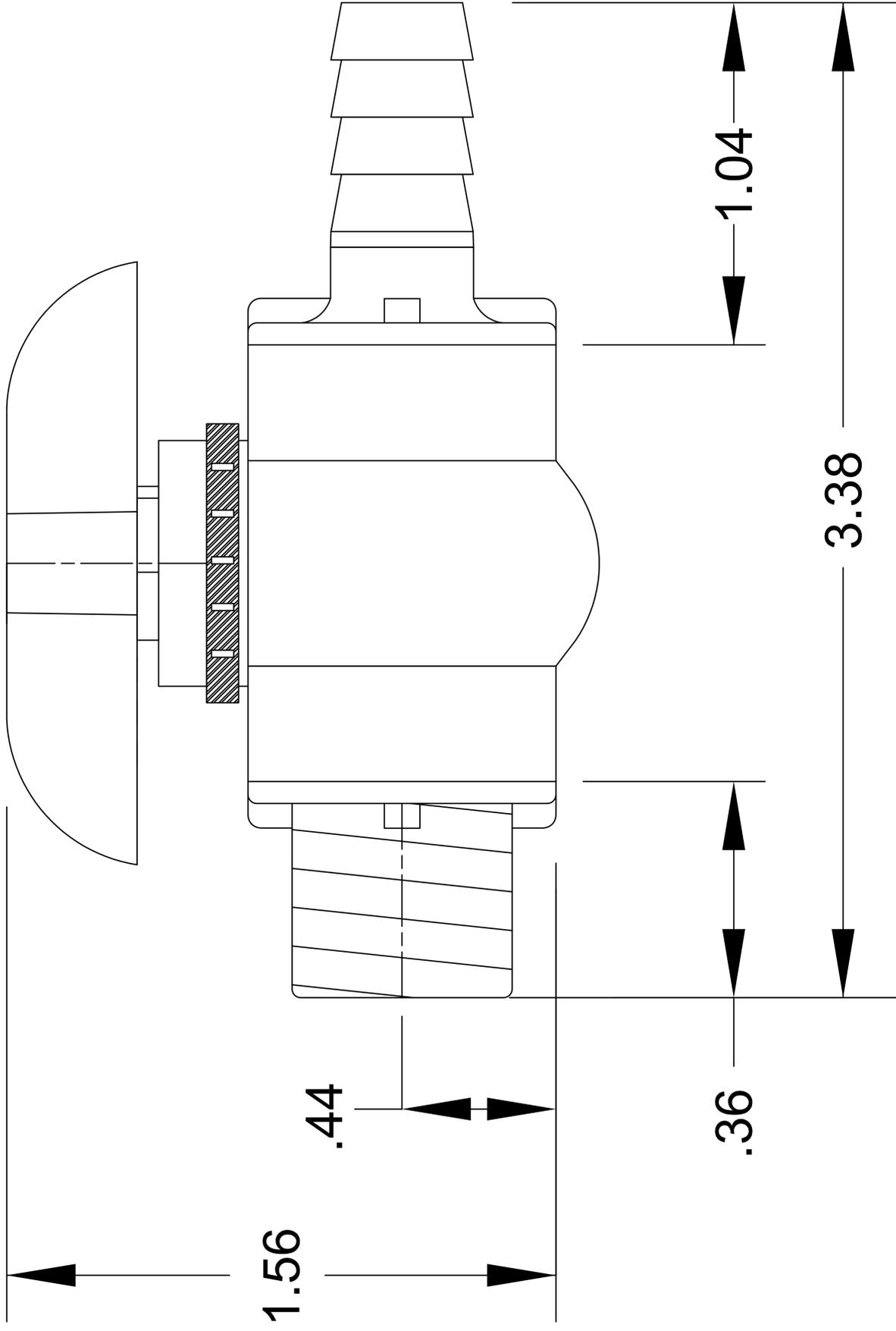
- MAJOR TOPOGRAPHIC CONTOUR INTERVAL: 10 FEET
- SINGLE DAY CONTOUR INTERVAL: 2 FEET
- EXISTING CONTOURS
- PROPERTY LINE
- EXISTING SOIL ROAD
- EXISTING DRAINAGE FEATURE
- PHASE LIMITS
- EXISTING LEACHATE COLLECTION LINES
- 300' BUFFER ZONE
- WETLANDS
- MONITORING WELL
- ABANDONED PIEZOMETER
- PIEZOMETER
- SURFACE WATER
- GROUNDWATER ELEVATION
- SINGLE DAY CONTOUR (10/27/2006)

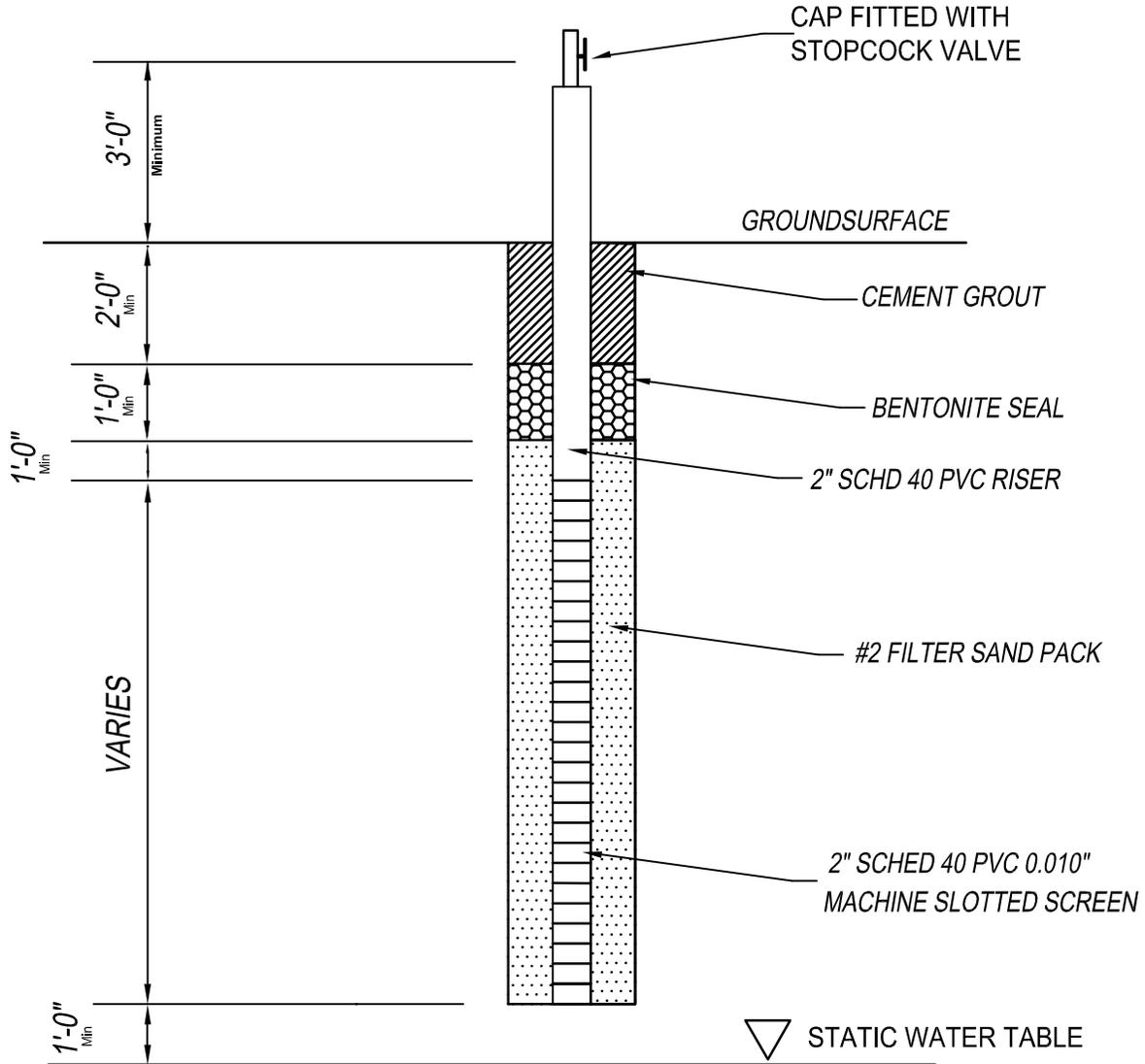


WELL	GROUNDWATER ELEVATION (FEET)
P3-1	145.92
P3-2S	149.02
P3-2D*	148.13
P3-3	146.73
P3-4	148.55
P3-5	147.67
P3-6S	146.33
P3-6D*	145.38
P3-7	146.36
P3-8	144.85
P3-9	145.98
P3-10S	147.28
P3-10D*	146.17
P3-11S	144.44
P3-11D*	143.69
P3-12	142.30
P3-13	138.60
P3-14	139.59
P3-15S	142.12
P3-15D*	142.05
P3-16	129.89
P3-17	135.83
P3-18S	129.02
P3-18D*	130.08
P3-19	134.16
P3-20	139.59
P3-21	142.30
P3-22	147.28
P3-23	147.67
P3-24	145.98
P3-25	149.02
P3-26	148.13
P3-27	146.73
P3-28	148.55
P3-29	147.67
P3-30	146.33
P3-31	145.38
P3-32	146.36
P3-33	144.85
P3-34	145.98
P3-35	147.28
P3-36	146.17
P3-37	144.44
P3-38	143.69
P3-39	142.30
P3-40	138.60
P3-41	139.59
P3-42	142.12
P3-43	142.05
P3-44	129.89
P3-45	134.16
P3-46	139.59
P3-47	142.30
P3-48	147.28
P3-49	147.67
P3-50	145.98
P3-51	149.02
P3-52	148.13
P3-53	146.73
P3-54	148.55
P3-55	147.67
P3-56	146.33
P3-57	145.38
P3-58	146.36
P3-59	144.85
P3-60	145.98
P3-61	147.28
P3-62	146.17
P3-63	144.44
P3-64	143.69
P3-65	142.30
P3-66	138.60
P3-67	139.59
P3-68	142.12
P3-69	142.05
P3-70	129.89
P3-71	134.16
P3-72	139.59
P3-73	142.30
P3-74	147.28
P3-75	147.67
P3-76	145.98
P3-77	149.02
P3-78	148.13
P3-79	146.73
P3-80	148.55
P3-81	147.67
P3-82	146.33
P3-83	145.38
P3-84	146.36
P3-85	144.85
P3-86	145.98
P3-87	147.28
P3-88	146.17
P3-89	144.44
P3-90	143.69
P3-91	142.30
P3-92	138.60
P3-93	139.59
P3-94	142.12
P3-95	142.05
P3-96	129.89
P3-97	134.16
P3-98	139.59
P3-99	142.30
P3-100	147.28
P3-101	147.67
P3-102	145.98
P3-103	149.02
P3-104	148.13
P3-105	146.73
P3-106	148.55
P3-107	147.67
P3-108	146.33
P3-109	145.38
P3-110	146.36
P3-111	144.85
P3-112	145.98
P3-113	147.28
P3-114	146.17
P3-115	144.44
P3-116	143.69
P3-117	142.30
P3-118	138.60
P3-119	139.59
P3-120	142.12
P3-121	142.05
P3-122	129.89
P3-123	134.16
P3-124	139.59
P3-125	142.30
P3-126	147.28
P3-127	147.67
P3-128	145.98
P3-129	149.02
P3-130	148.13
P3-131	146.73
P3-132	148.55
P3-133	147.67
P3-134	146.33
P3-135	145.38
P3-136	146.36
P3-137	144.85
P3-138	145.98
P3-139	147.28
P3-140	146.17
P3-141	144.44
P3-142	143.69
P3-143	142.30
P3-144	138.60
P3-145	139.59
P3-146	142.12
P3-147	142.05
P3-148	129.89
P3-149	134.16
P3-150	139.59
P3-151	142.30
P3-152	147.28
P3-153	147.67
P3-154	145.98
P3-155	149.02
P3-156	148.13
P3-157	146.73
P3-158	148.55
P3-159	147.67
P3-160	146.33
P3-161	145.38
P3-162	146.36
P3-163	144.85
P3-164	145.98
P3-165	147.28
P3-166	146.17
P3-167	144.44
P3-168	143.69
P3-169	142.30
P3-170	138.60
P3-171	139.59
P3-172	142.12
P3-173	142.05
P3-174	129.89
P3-175	134.16
P3-176	139.59
P3-177	142.30
P3-178	147.28
P3-179	147.67
P3-180	145.98
P3-181	149.02
P3-182	148.13
P3-183	146.73
P3-184	148.55
P3-185	147.67
P3-186	146.33
P3-187	145.38
P3-188	146.36
P3-189	144.85
P3-190	145.98
P3-191	147.28
P3-192	146.17
P3-193	144.44
P3-194	143.69
P3-195	142.30
P3-196	138.60
P3-197	139.59
P3-198	142.12
P3-199	142.05
P3-200	129.89
P3-201	134.16
P3-202	139.59
P3-203	142.30
P3-204	147.28
P3-205	147.67
P3-206	145.98
P3-207	149.02
P3-208	148.13
P3-209	146.73
P3-210	148.55
P3-211	147.67
P3-212	146.33
P3-213	145.38
P3-214	146.36
P3-215	144.85
P3-216	145.98
P3-217	147.28
P3-218	146.17
P3-219	144.44
P3-220	143.69
P3-221	142.30
P3-222	138.60
P3-223	139.59
P3-224	142.12
P3-225	142.05
P3-226	129.89
P3-227	134.16
P3-228	139.59
P3-229	142.30
P3-230	147.28
P3-231	147.67
P3-232	145.98
P3-233	149.02
P3-234	148.13
P3-235	146.73
P3-236	148.55
P3-237	147.67
P3-238	146.33
P3-239	145.38
P3-240	146.36
P3-241	144.85
P3-242	145.98
P3-243	147.28
P3-244	146.17
P3-245	144.44
P3-246	143.69
P3-247	142.30
P3-248	138.60
P3-249	139.59
P3-250	142.12
P3-251	142.05
P3-252	129.89
P3-253	134.16
P3-254	139.59
P3-255	142.30
P3-256	147.28
P3-257	147.67
P3-258	145.98
P3-259	149.02
P3-260	148.13
P3-261	146.73
P3-262	148.55
P3-263	147.67
P3-264	146.33
P3-265	145.38
P3-266	146.36
P3-267	144.85
P3-268	145.98
P3-269	147.28
P3-270	146.17
P3-271	144.44
P3-272	143.69
P3-273	142.30
P3-274	138.60
P3-275	139.59
P3-276	142.12
P3-277	142.05
P3-278	129.89
P3-279	134.16
P3-280	139.59
P3-281	142.30
P3-282	147.28
P3-283	147.67
P3-284	145.98
P3-285	149.02
P3-286	148.13
P3-287	146.73
P3-288	148.55
P3-289	147.67
P3-290	146.33
P3-291	145.38
P3-292	146.36
P3-293	144.85
P3-294	145.98
P3-295	147.28
P3-296	146.17
P3-297	144.44
P3-298	143.69
P3-299	142.30
P3-300	138.60
P3-301	139.59
P3-302	142.12
P3-303	142.05
P3-304	129.89
P3-305	134.16
P3-306	139.59
P3-307	142.30
P3-308	147.28
P3-309	147.67
P3-310	145.98
P3-311	149.02
P3-312	148.13
P3-313	146.73
P3-314	148.55
P3-315	147.67
P3-316	146.33
P3-317	145.38
P3-318	146.36
P3-319	144.85
P3-320	145.98
P3-321	147.28
P3-322	146.17
P3-323	144.44
P3-324	143.69
P3-325	142.30
P3-326	138.60
P3-327	139.59
P3-328	142.12
P3-329	142.05
P3-330	129.89
P3-331	134.16
P3-332	139.59
P3-333	142.30
P3-334	147.28
P3-335	147.67
P3-336	145.98
P3-337	149.02
P3-338	148.13
P3-339	146.73
P3-340	148.55
P3-341	147.67
P3-342	146.33
P3-343	145.38
P3-344	146.36
P3-345	144.85
P3-346	145.98
P3-347	147.28
P3-348	146.17
P3-349	144.44
P3-350	143.69
P3-351	142.30
P3-352	138.60
P3-353	139.59
P3-354	142.12
P3-355	142.05
P3-356	129.89
P3-357	134.16
P3-358	139.59
P3-359	142.30
P3-360	147.28
P3-361	147.67
P3-362	145.98
P3-363	149.02
P3-364	148.13
P3-365	146.73
P3-366	148.55
P3-367	147.67
P3-368	146.33
P3-369	145.38
P3-370	146.36
P3-371	144.85
P3-372	145.98
P3-373	147.28
P3-374	146.17
P3-375	144.44
P3-376	143.69
P3-377	142.30
P3-378	138.60
P3-379	139.59
P3-380	142.12
P3-381	142.05
P3-382	129.89
P3-383	134.16
P3-384	139.59
P3-385	142.30
P3-386	147.28
P3-387	147.67
P3-388	145.98
P3-389	149.02
P3-390	148.13
P3-391	146.73
P3-392	148.55
P3-393	147.67
P3-394	146.33
P3-395	145.38
P3-396	146.36
P3-397	144.85
P3-398	145.98
P3-399	147.28
P3-400	146.17
P3-401	144.44
P3-402	143.69
P3-403	142.30
P3-404	138.60
P3-405	139.59
P3-406	142.12
P3-407	142.05
P3-408	129.89
P3-409	134.16
P3-410	139.59
P3-411	142.30
P3-412	147.28
P3-413	147.67
P3-414	145.98
P3-415	149.02
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P3-417	146.73
P3-418	148.55
P3-419	147.67
P3-420	146.33
P3-421	145.38
P3-422	146.36
P3-423	144.85
P3-424	145.98
P3-425	147.28
P3-426	146.17
P3-427	144.44
P3-428	143.69
P3-429	142.30
P3-430	138.60
P3-431	139.59
P3-432	142.12
P3-433	142.05
P3-434	129.89
P3-435	134.16
P3-436	139.59
P3-437	142.30

Plate C

Methane Valve Diagram





METHANE GAS MONITORING PROBE

Copied from NCDENR Guidance Document

APPENDIX F

LOG OF BORING NO. 1											
PROJECT : Wayne County Lined Landfill Dudley, North Carolina					JOB NO.: 95181.02						
TYPE : HSA, SS					LOCATION : see Plan						
DEPTH (FT)	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	WATER CONTENT %	LIQUID LIMIT	PLASTIC LIMIT	COHESION LB / SQ FT		REMARKS
									PENETRO- METER	UNCONFINED COMPRESSION	
			SURF. EL: 169.8 ft								
			SAND (SP); Tan, moist, medium dense, with silt, fine	17							
5			CLAYEY SAND (SC); Tan faintly mottled, wet, dense, with silt, fine	44			40	27			
10			SAND (SP); Tan, moist, medium dense, trace silt, fine	26							
			SILTY SAND (SM); Light gray, moist, medium dense, with clay, fine								
15				21							
			- grades saturated								
20			- grades very loose	2							
25			End of Boring								
30											
35											
40											
COMPLETION DEPTH: 22.0 ft				DEPTH TO WATER IN BORING: 17 ft WD, 17 ft 24 hrs AD							
DATE: 1-10-96											

GAI CONSULTANTS

PLATE A-3

LOG OF BORING NO. 2											
PROJECT : Wayne County Lined Landfill Dudley, North Carolina					JOB NO.: 95181.02						
TYPE : HSA, SS					LOCATION : see Plan						
DEPTH (FT)	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	WATER CONTENT %	LIQUID LIMIT	PLASTIC LIMIT	COHESION		REMARKS
									PENETRO- METER	UNCONFINED COMPRESSION	
			SURF. EL: 167.1 ft								
			SAND (SP); Tan, wet, loose, with silt, fine	10							
5			CLAYEY SAND (SC); Tan mottled red, moist, dense, fine	42							
10			SILTY SAND (SM); White and orange, moist, very dense, trace clay, fine	51							
15			SANDY CLAY (CL); Gray, moist, very stiff, fine, some silt - grades gray	26							
20			SILTY SAND (SM); Gray, saturated, loose, fine - grades saturated	6							
25			- grades medium dense	25							
30			End of Boring								
35											
40											
COMPLETION DEPTH: 28.0 ft				DEPTH TO WATER IN BORING: 16.1 ft 7 days AD							
DATE: 12-27-95											

GAI CONSULTANTS

PLATE A-4

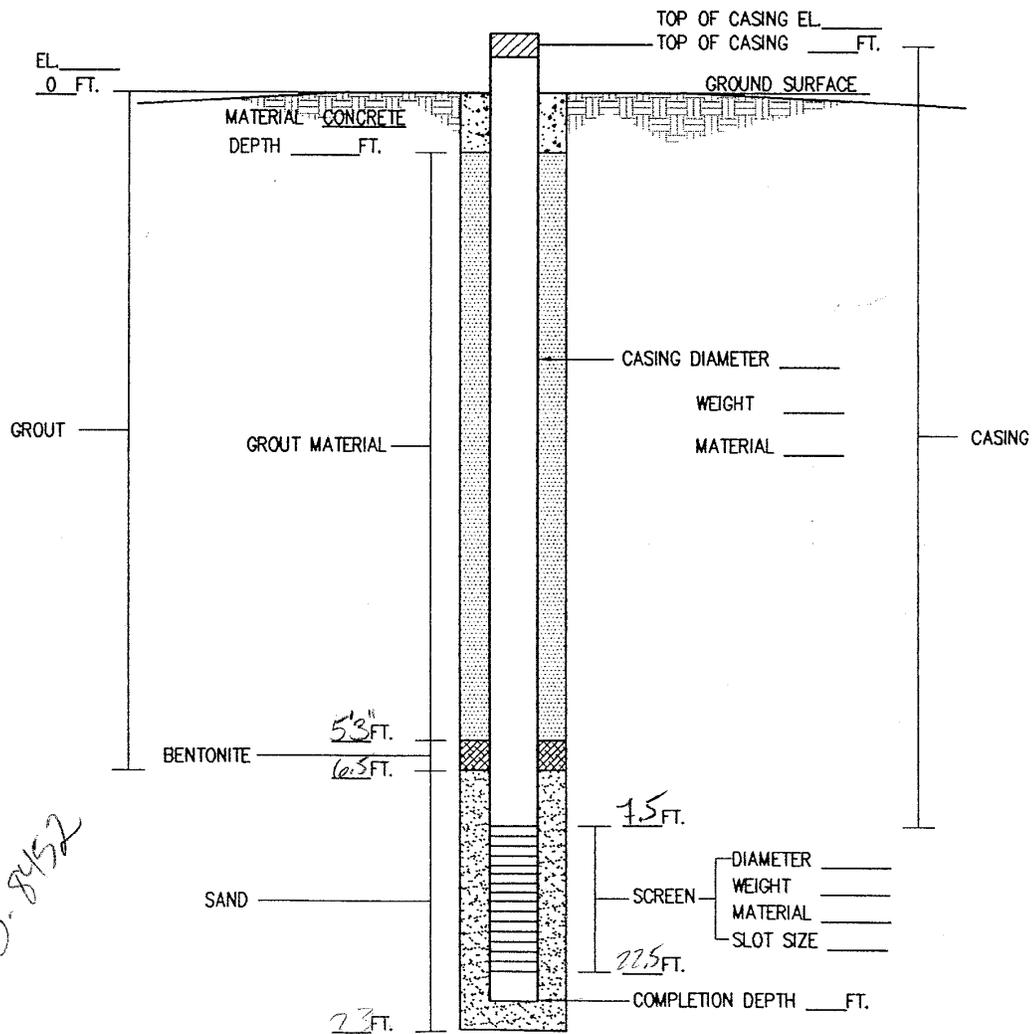
LOG OF BORING NO. 5											
PROJECT : Wayne County Lined Landfill Dudley, North Carolina					JOB NO.: 95181.02						
TYPE : HSA, SS, ST					LOCATION : see Plan						
DEPTH (FT)	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	WATER CONTENT %	LIQUID LIMIT	PLASTIC LIMIT	COHESION		REMARKS
									PENETRO- METER	UNCONFINED COMPRESSION	
			SURF. EL: 156.3 ft								
0			SILTY SAND (SM); Tan, moist, loose, fine	7							
5			- grades orange, wet, medium dense, with clay	21							
10			SANDY CLAY (CL); Gray mottled orange and red, moist, very stiff, fine, with silt	29	92	30					
15			SILTY SAND (SM); Tan and white, saturated, medium dense, fine	18							
20			End of Boring								
25											
30											
35											
40											
COMPLETION DEPTH: 19.0 ft				DEPTH TO WATER IN BORING: 11 ft WD; 13.1 ft 24 hrs AD							
DATE: 1-11-96											

GAI CONSULTANTS

PLATE A-7

PIEZOMETER CONSTRUCTION RECORD

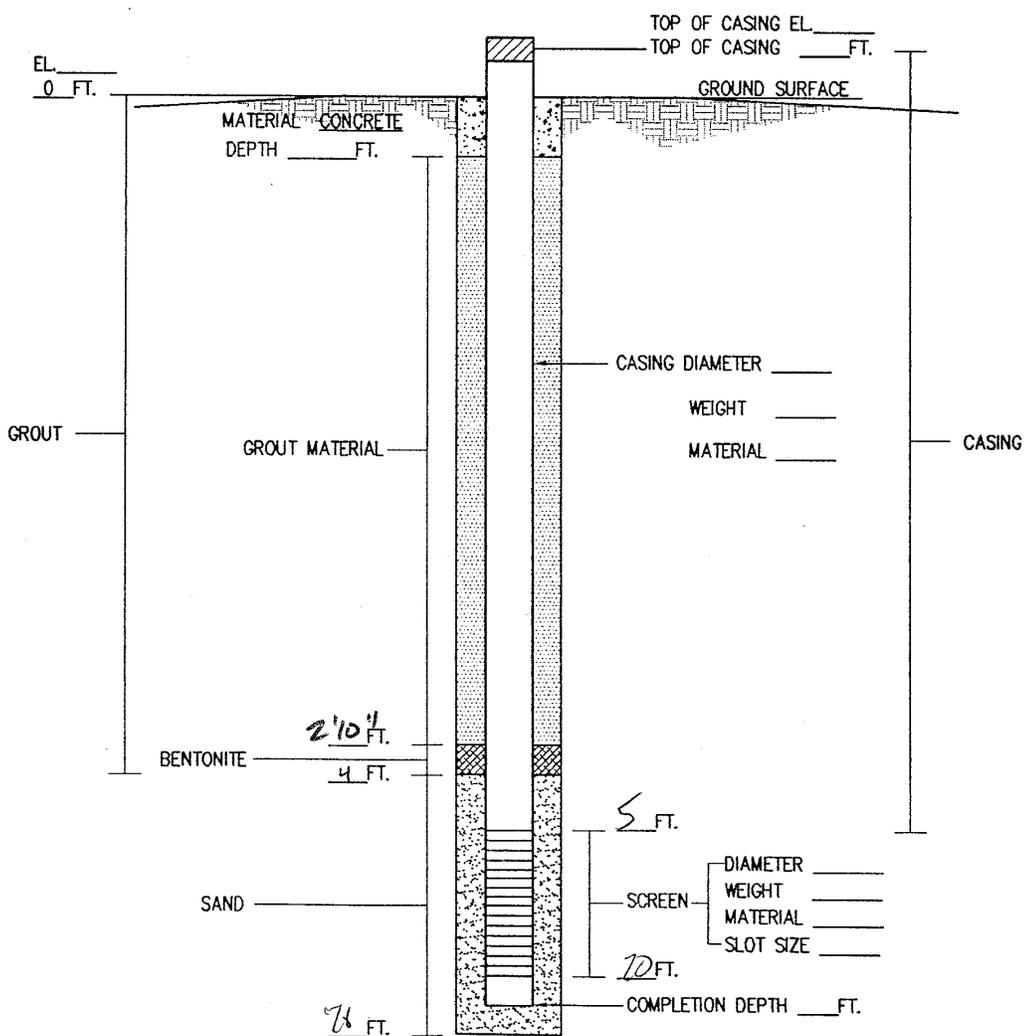
1. DRILLING CONTRACTOR _____
2. REGISTRATION NUMBER [REDACTED] _____
3. PIEZOMETER NUMBER MW-1 _____
4. TOWN Gold Star _____
5. COUNTY Wayne _____
6. OWNER WCC _____
7. LOCATED ON PLATE _____
8. BORING NUMBER MW-1 _____
9. STATIC WATER LEVEL BELOW TOP OF CASING _____
10. DATE DRILLED 12-5-97 _____
11. TOTAL DEPTH 23' _____
12. FORMATION DESCRIPTION BORING LOG NUMBER _____



I do hereby acknowledge that this record is true to the best of my knowledge _____
 Signature of Contractor or Agent Date

PIEZOMETER CONSTRUCTION RECORD

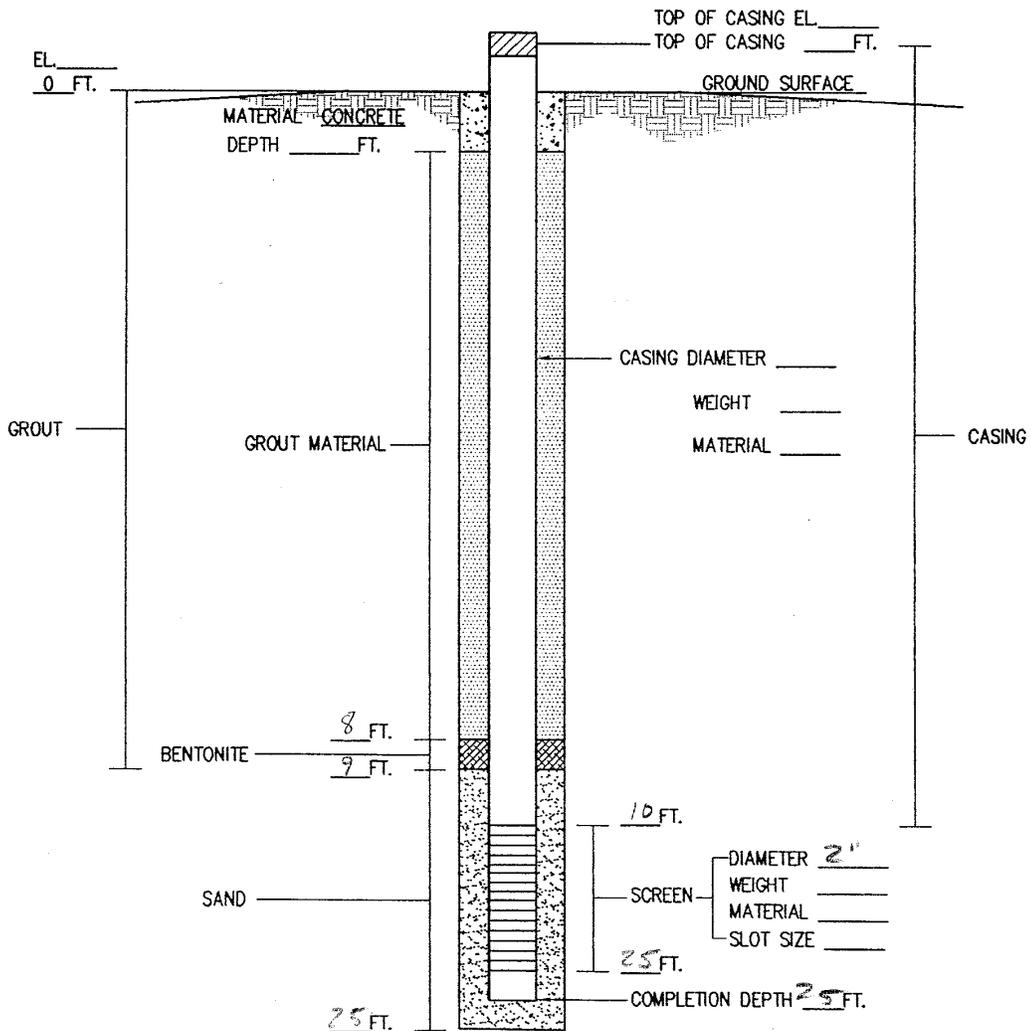
1. DRILLING CONTRACTOR _____
2. REGISTRATION NUMBER ██████ _____
3. PIEZOMETER NUMBER _____
4. TOWN _____
5. COUNTY _____
6. OWNER _____
7. LOCATED ON PLATE MW-2 _____
8. BORING NUMBER MW-2 _____
9. STATIC WATER LEVEL BELOW TOP OF CASING _____
10. DATE DRILLED 12-5-97 _____
11. TOTAL DEPTH 20' _____
12. FORMATION DESCRIPTION BORING LOG NUMBER _____



I do hereby acknowledge that this record is true to the best of my knowledge _____
 Signature of Contractor or Agent Date

PIEZOMETER CONSTRUCTION RECORD

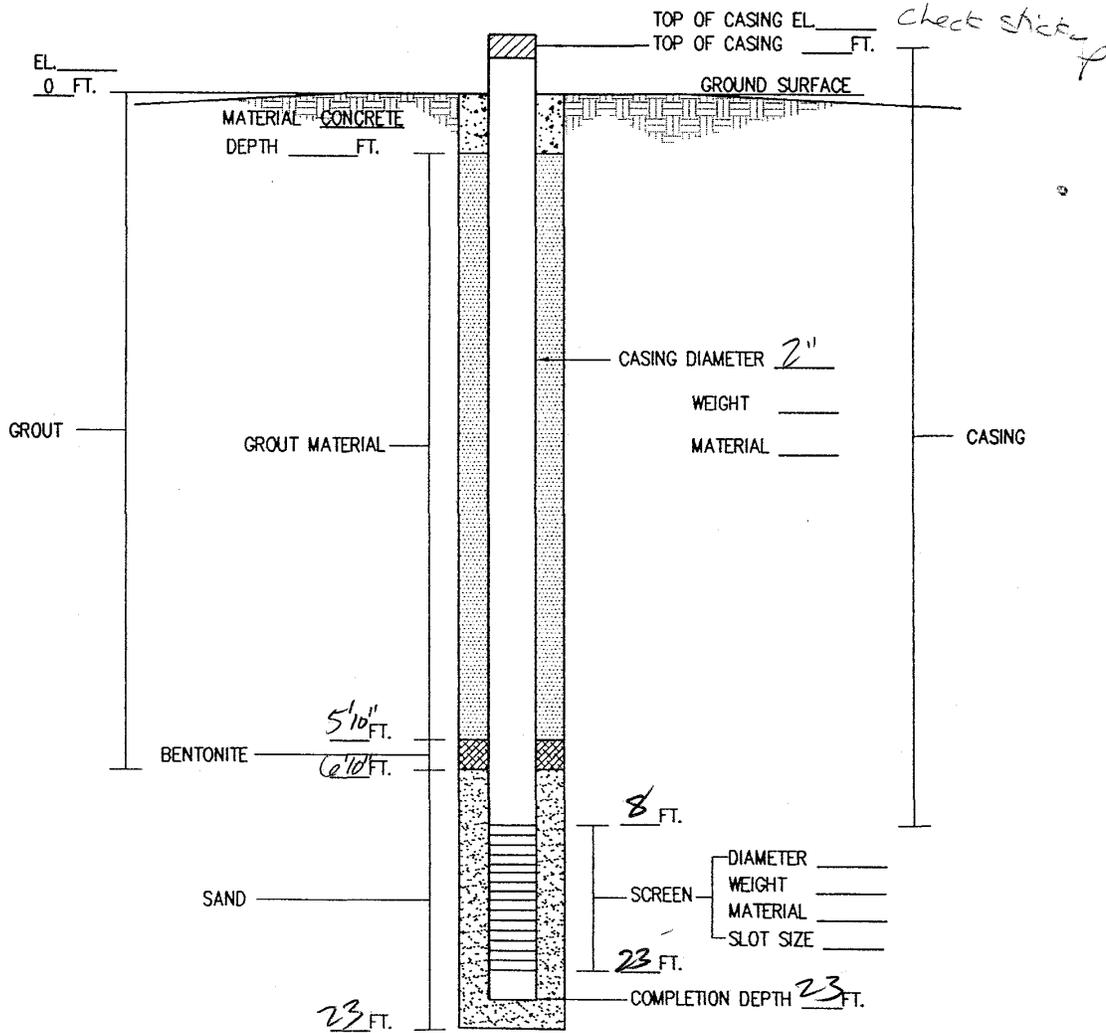
1. DRILLING CONTRACTOR _____
2. REGISTRATION NUMBER [REDACTED]
3. PIEZOMETER NUMBER MW-4
4. TOWN Caldwellsboro
5. COUNTY Wayne
6. OWNER Wayne County
7. LOCATED ON PLATE MW-40
8. BORING NUMBER MW-4
9. STATIC WATER LEVEL BELOW TOP OF CASING _____
10. DATE DRILLED 12-3-97
11. TOTAL DEPTH 25'
12. FORMATION DESCRIPTION BORING LOG NUMBER _____



I do hereby acknowledge that this record is true to the best of my knowledge _____
 Signature of Contractor or Agent Date

PIEZOMETER CONSTRUCTION RECORD

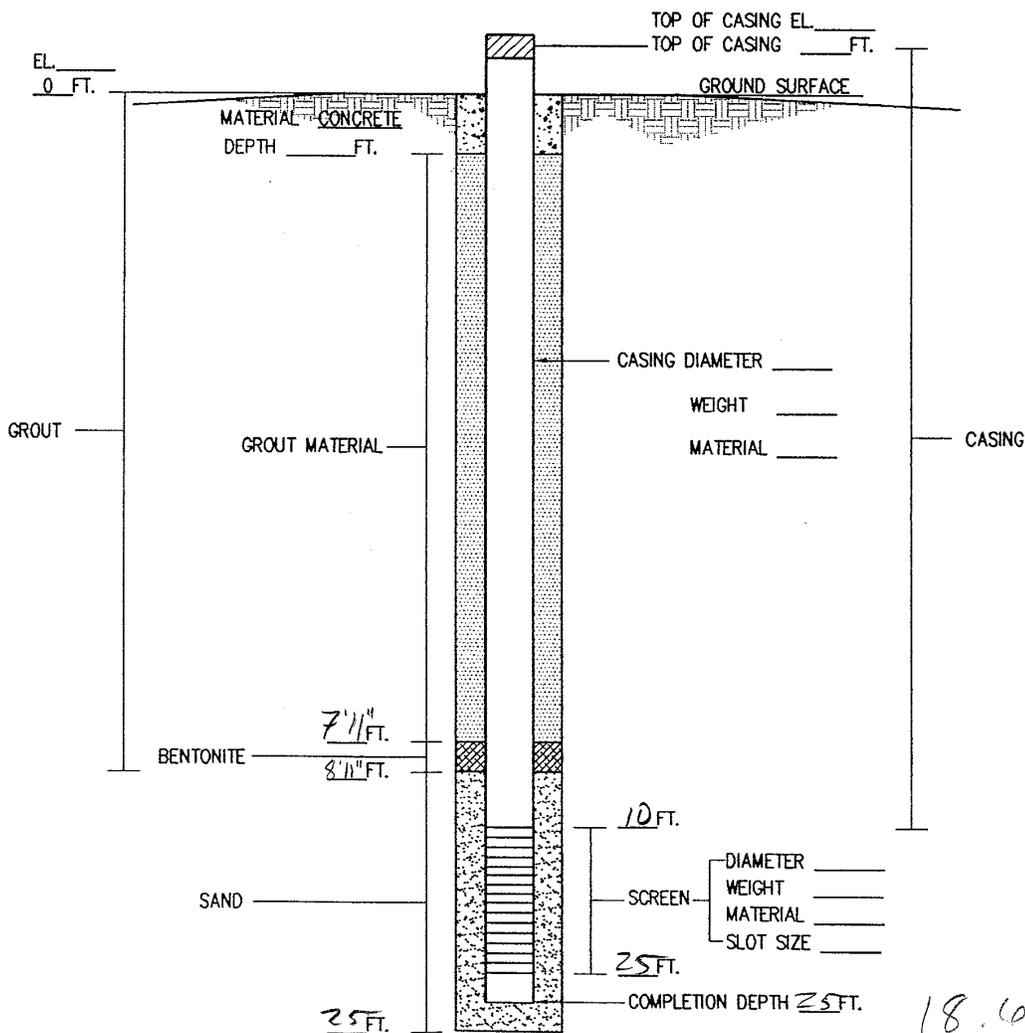
1. DRILLING CONTRACTOR _____
2. REGISTRATION NUMBER
3. PIEZOMETER NUMBER MW-5
4. TOWN Goldsboro
5. COUNTY Wayne
6. OWNER Wayne County
7. LOCATED ON PLATE _____
8. BORING NUMBER MW-5
9. STATIC WATER LEVEL BELOW TOP OF CASING _____
10. DATE DRILLED 12-3-97
11. TOTAL DEPTH _____
12. FORMATION DESCRIPTION BORING LOG NUMBER _____



I do hereby acknowledge that this record is true to the best of my knowledge _____
 Signature of Contractor or Agent Date

PIEZOMETER CONSTRUCTION RECORD

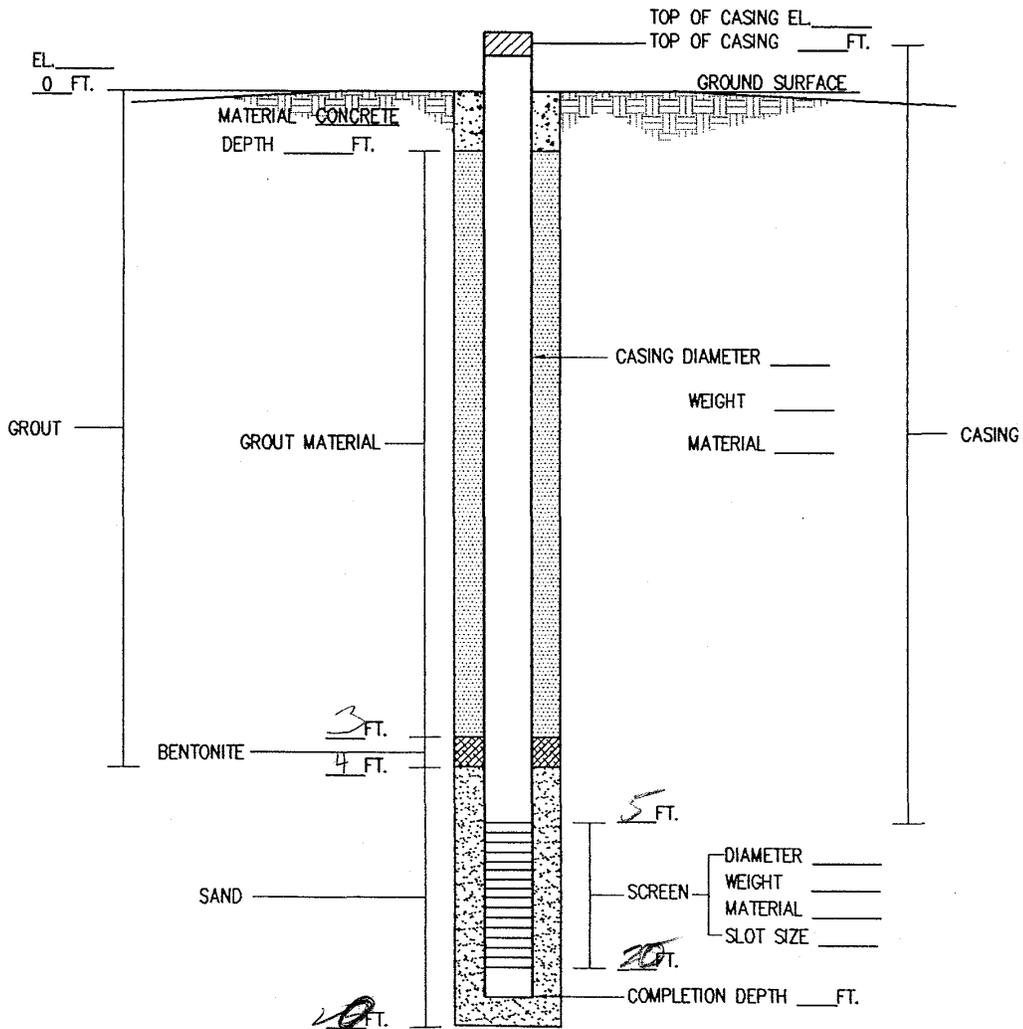
1. DRILLING CONTRACTOR _____
2. REGISTRATION NUMBER ██████
3. PIEZOMETER NUMBER MW-10
4. TOWN Goldsboro
5. COUNTY Wayne
6. OWNER WCO
7. LOCATED ON PLATE -
8. BORING NUMBER MW-10
9. STATIC WATER LEVEL BELOW TOP OF CASING _____
10. DATE DRILLED 12-3-97
11. TOTAL DEPTH 25
12. FORMATION DESCRIPTION BORING LOG NUMBER MW-10



I do hereby acknowledge that this record is true to the best of my knowledge _____
 Signature of Contractor or Agent Date

PIEZOMETER CONSTRUCTION RECORD

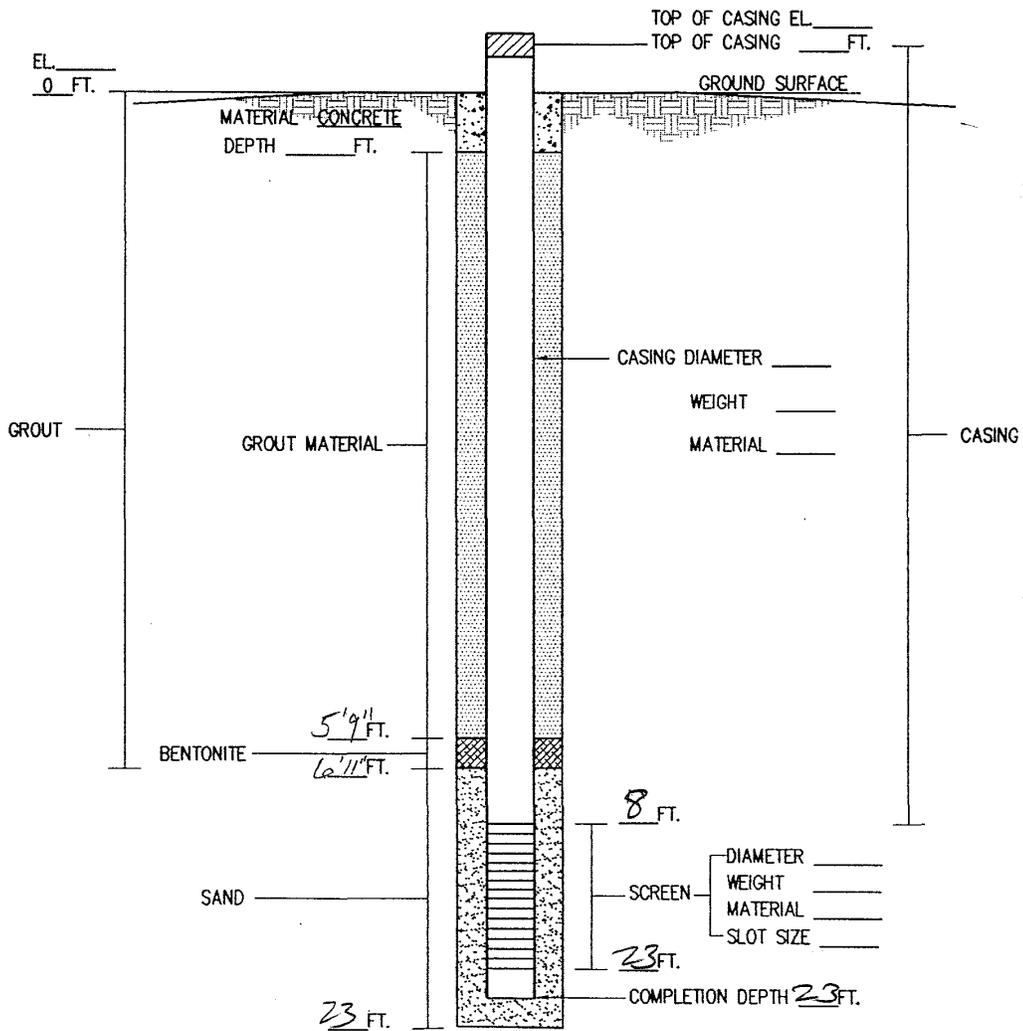
1. DRILLING CONTRACTOR _____
2. REGISTRATION NUMBER [REDACTED]
3. PIEZOMETER NUMBER MW-7
4. TOWN _____
5. COUNTY _____
6. OWNER _____
7. LOCATED ON PLATE _____
8. BORING NUMBER _____
9. STATIC WATER LEVEL BELOW TOP OF CASING _____
10. DATE DRILLED 12-4-97
11. TOTAL DEPTH 20'
12. FORMATION DESCRIPTION BORING LOG NUMBER _____



I do hereby acknowledge that this record is true to the best of my knowledge _____
 Signature of Contractor or Agent Date

PIEZOMETER CONSTRUCTION RECORD

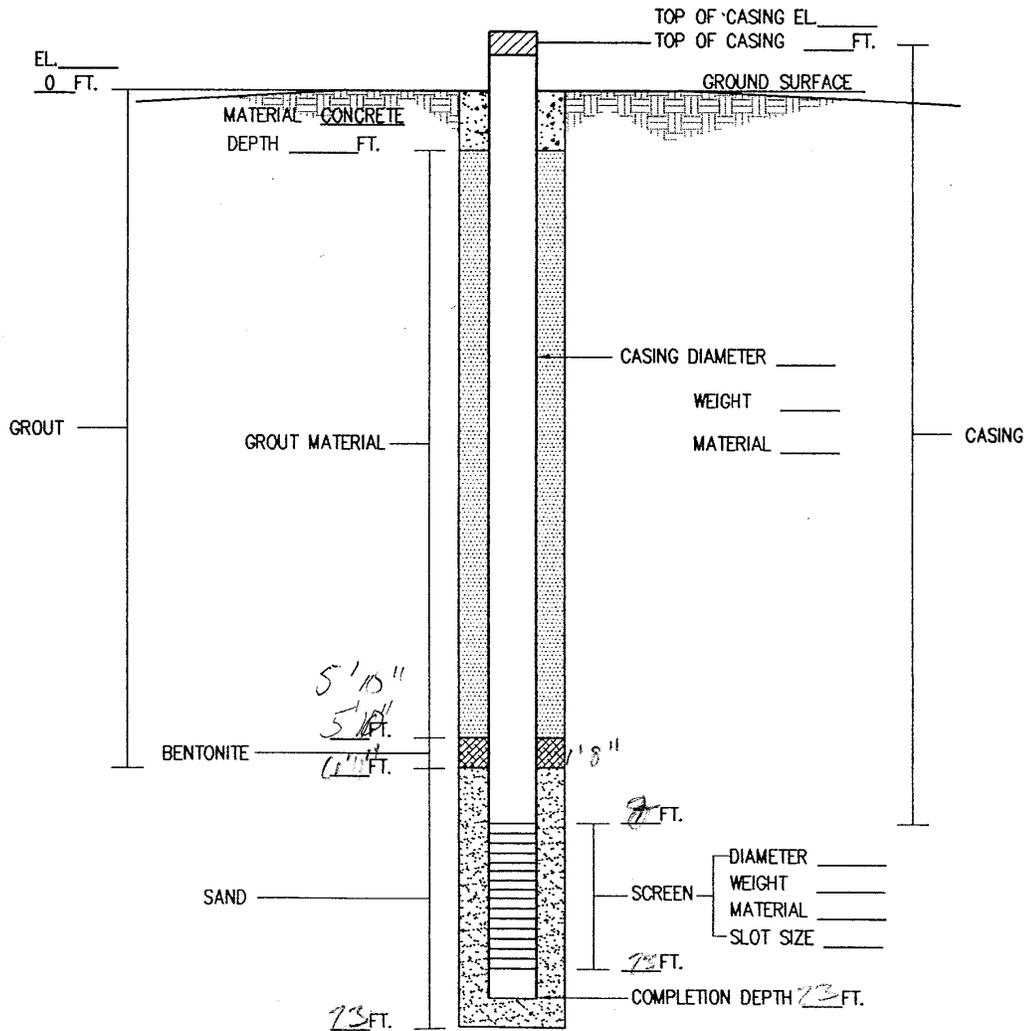
1. DRILLING CONTRACTOR _____
2. REGISTRATION NUMBER
3. PIEZOMETER NUMBER MW-9
4. TOWN _____
5. COUNTY Wayne
6. OWNER _____
7. LOCATED ON PLATE _____
8. BORING NUMBER MW-9
9. STATIC WATER LEVEL BELOW TOP OF CASING _____
10. DATE DRILLED 12-4-97
11. TOTAL DEPTH 23
12. FORMATION DESCRIPTION BORING LOG NUMBER _____



I do hereby acknowledge that this record is true to the best of my knowledge _____
 Signature of Contractor or Agent Date

PIEZOMETER CONSTRUCTION RECORD

1. DRILLING CONTRACTOR _____
2. REGISTRATION NUMBER _____
3. PIEZOMETER NUMBER MW-10
4. TOWN Gildersboro
5. COUNTY Wayne
6. OWNER _____
7. LOCATED ON PLATE _____
8. BORING NUMBER MW-10
9. STATIC WATER LEVEL BELOW TOP OF CASING _____
10. DATE DRILLED 12-4-97
11. TOTAL DEPTH _____
12. FORMATION DESCRIPTION BORING LOG NUMBER _____



I do hereby acknowledge that this record is true to the best of my knowledge _____
 Signature of Contractor or Agent Date

11W-11

WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Jonathan Pfohl CERTIFICATION # 3301
 WELL CONTRACTOR COMPANY NAME Antler Environmental PHONE # (919) 878-1259
 STATE WELL CONSTRUCTION PERMIT# _____ ASSOCIATED WQ PERMIT# _____
 (if applicable) (if applicable)

1. WELL USE (Check Applicable Box): Residential Municipal/Public Industrial Agricultural
 Monitoring Recovery Heat Pump Water Injection Other If Other, List Use _____

2. WELL LOCATION:
 Nearest Town: Dudley County Wayne
460B South Landfill Rd. Dudley NC 28333
 (Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/Land setting
 Ridge Slope Valley Flat
 (check appropriate box)
 Latitude/longitude of well location
35-17-53.34 / 78-04-22.44
 (degrees/minutes/seconds)

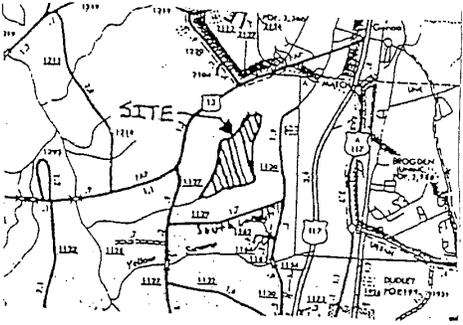
3. OWNER: Wayne Co. Landfill
 Address 460B South Landfill Rd.
 (Street or Route No.)
Dudley NC 28333
 City/Town State Zip Code
(919)-689-2994
 Area code- Phone number

Latitude/longitude source: GPS Topographic map
 (check box)

DEPTH		DRILLING LOG
From	To	Formation Description
0	1	Silty Sand
1	16	Clayey Sand

4. DATE DRILLED 4/15/04
 5. TOTAL DEPTH: 15.49
 6. DOES WELL REPLACE EXISTING WELL? YES NO
 7. STATIC WATER LEVEL Below Top of Casing: 5' BTOP FT.
 (Use "+" if Above Top of Casing)
 8. TOP OF CASING IS 3 FT. Above Land Surface*
 *Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C .0118.
 9. YIELD (gpm): N/A METHOD OF TEST -
 10. WATER ZONES (depth): _____

LOCATION SKETCH
 Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.



11. DISINFECTION: Type N/A Amount _____
 12. CASING:
 Depth Diameter Wall Thickness Material
 From +3 To 5.49 Ft. 2 sch 40 PVC
 From _____ To _____ Ft. _____ _____
 From _____ To _____ Ft. _____ _____
 13. GROUT: Depth Material Method
 From 0 To 2 Ft. Quikrete Pour
 From 2 To 4.8 Ft. 3/8" Bentonite Chips Pour
 14. SCREEN: Depth Diameter Slot Size Material
 From 5.49 To 15.49 Ft. 2 in. 0.10 in. PVC
 From _____ To _____ Ft. _____ in. _____ in. _____
 15. SAND/GRAVEL PACK:
 Depth Size Material
 From 4.5 To 16 Ft. #2 Filter Sand "DSI"
 From _____ To _____ Ft. _____ _____

16. REMARKS: Monitoring well for MSWLF Phase 2 MW-11

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER

Jonathan Pfohl SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE 4/20/04

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days. GW-1 REV. 07/2001

1W-12

WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Jonathan Pfohl CERTIFICATION # 3301

WELL CONTRACTOR COMPANY NAME Antler Environmental PHONE # (919) 878-1259

STATE WELL CONSTRUCTION PERMIT# _____ ASSOCIATED WQ PERMIT# _____
(if applicable) (if applicable)

1. WELL USE (Check Applicable Box): Residential Municipal/Public Industrial Agricultural
Monitoring Recovery Heat Pump Water Injection Other If Other, List Use _____

2. WELL LOCATION:
Nearest Town: Dudley County Wayne
460B South Landfill Rd. Dudley NC 28333
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/Land setting
 Ridge Slope Valley Flat
(check appropriate box)

Latitude/longitude of well location
35-17-56.785 / 78-04-22.04
(degrees/minutes/seconds)

3. OWNER: Wayne Co. Landfill
Address 460B South Landfill Rd.
(Street or Route No.)

Latitude/longitude source: GPS Topographic map
(check box)

Dudley NC 28333
City/Town State Zip Code

DEPTH		DRILLING LOG
From	To	Formation Description
0	1	Top Soil
1	4	Silty Clay - White
4	9	Silty Sand - Brown
9	15	Silty Sand - Dark Brown
15	17	Clay - Dark Gray

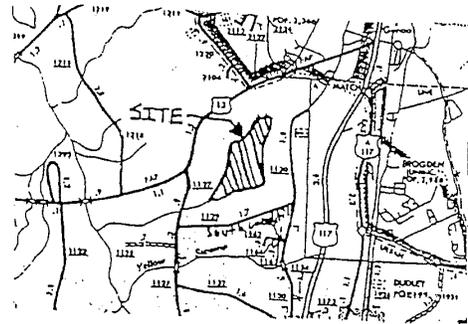
(919) - 689-2994
Area code- Phone number

4. DATE DRILLED 4/15/04
5. TOTAL DEPTH: 16.45
6. DOES WELL REPLACE EXISTING WELL? YES NO
7. STATIC WATER LEVEL Below Top of Casing: 5.24' BTOP FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 3 FT. Above Land Surface*
*Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C .0118.

9. YIELD (gpm): N/A METHOD OF TEST _____
10. WATER ZONES (depth): 5.24 - 16.45

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.



11. DISINFECTION: Type N/A Amount _____
12. CASING: Wall Thickness _____

From	To	Depth	Diameter	or Weight/Ft.	Material
From <u>3</u>	To <u>6.45</u>	Ft. <u>2</u>	<u>sch 40</u>	<u>PVC</u>	
From _____	To _____	Ft. _____	_____	_____	_____
From _____	To _____	Ft. _____	_____	_____	_____

13. GROUT: Depth _____ Material _____ Method _____
From 0 To 3 Ft. Quikrete Pour
From 3 To 5.5 Ft. 3/8" Bentonite Chips Pour

14. SCREEN: Depth _____ Diameter _____ Slot Size _____ Material _____
From 6.45 To 16.45 Ft. 2 in. 0.10 in. PVC
From _____ To _____ Ft. _____ in. _____ in. _____

15. SAND/GRAVEL PACK:
Depth _____ Size _____ Material _____
From 5.5 To 17 Ft. #2 Filter Sand "DSI"
From _____ To _____ Ft. _____ _____ _____

16. REMARKS: Monitoring well for MSWLF Phase 2 MW-12

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER
Jonathan Pfohl SIGNATURE OF PERSON CONSTRUCTING THE WELL 4/20/04 DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days. GW-1 REV. 07/2001

MW-13

WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Jonathan Pfohl CERTIFICATION # 3301

WELL CONTRACTOR COMPANY NAME Antler Environmental PHONE # (919) 878-1259

STATE WELL CONSTRUCTION PERMIT# _____ ASSOCIATED WQ PERMIT# _____
(if applicable) (if applicable)

1. WELL USE (Check Applicable Box): Residential Municipal/Public Industrial Agricultural
Monitoring Recovery Heat Pump Water Injection Other If Other, List Use _____

2. WELL LOCATION:
Nearest Town: Dudley County Wayne
460B South Landfill Rd. Dudley NC 28333
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/Land setting
 Ridge Slope Valley Flat
(check appropriate box)

Latitude/longitude of well location
35-17-42.92 / 78-04-07.6968
(degrees/minutes/seconds)

3. OWNER: Wayne Co. Landfill
Address 460B South Landfill Rd.
(Street or Route No.)

Latitude/longitude source: GPS Topographic map
(check box)

Dudley NC 28333
City/Town State Zip Code
(919)-689-2994
Area code- Phone number

DEPTH		DRILLING LOG
From	To	Formation Description
0	2	silty sand
2	8	silty clay
8	16	silty sand

4. DATE DRILLED 4/15/04
5. TOTAL DEPTH: 15.85

6. DOES WELL REPLACE EXISTING WELL? YES NO

7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 3 FT. Above Land Surface*
*Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.

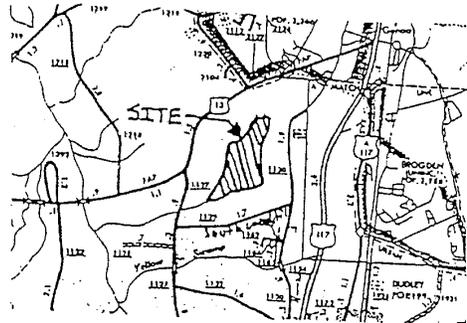
9. YIELD (gpm): N/A METHOD OF TEST _____

10. WATER ZONES (depth): 8.0' - 16'

11. DISINFECTION: Type N/A Amount _____

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

12. CASING: Wall Thickness _____
Depth Diameter or Weight/Ft. Material
From +3 To 5.85 Ft. 2 sch 40 PVC
From _____ To _____ Ft. _____ _____
From _____ To _____ Ft. _____ _____



13. GROUT: Depth Material Method
From 0 To 3 Ft. Quikrete Pour
From 3 To 5 Ft. 3/8" bentonite chips Pour

14. SCREEN: Depth Diameter Slot Size Material
From 5.85 To 15.85 Ft. 2 in. 0.10 in. PVC
From _____ To _____ Ft. _____ in. _____ in. _____

15. SAND/GRAVEL PACK: Depth Size Material
From 5 To 16 Ft. #2 Filter Sand "DSI"
From _____ To _____ Ft. _____ _____

16. REMARKS: Monitoring well for MSWLF Phase 2 MW-13

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER

Jonathan Pfohl SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE 4/20/04

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days. GW-1 REV. 07/2001