

Seaboard Group II and City of High Point, North Carolina



## Pre-Remedial Ground Water and Surface Water Monitoring Plan

*Former Seaboard Chemical/Riverdale Drive Landfill Site  
Jamestown, North Carolina*

January 12, 2009

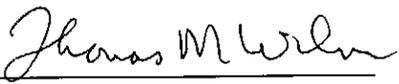
ERM NC, PC  
8000 Corporate Center Drive  
Suite 200  
Charlotte, NC 28226

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**Thomas M. Wilson, P.G.**

**Alan Martin, P.G.**

*Principal*

*Project Manager*

**ERM NC, PC**  
8000 Corporate Center Drive  
Suite 200  
Charlotte, NC 28226



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## 1.0 INTRODUCTION

This Pre-Remedial Ground Water and Surface Water Monitoring Plan has been developed to determine the ground water and surface water quality conditions prior to implementation of the remedial action program to be conducted at the Seaboard Chemical Company/Riverdale Drive Landfill Site (the "Site") in Jamestown, North Carolina. The proposed pre-remedial monitoring activities consist of additional ground water and surface water sampling and analyses and water level gauging. The scope of work and results of the pre-remedial monitoring will supplement the annual monitoring activities that were conducted at the site from 2000 to 2007. The results of the pre-remedial monitoring activities will establish a baseline against which to measure the performance and effectiveness of the approved remedial action at the Site. This plan was prepared by ERM NC, PC and Babb & Associates on behalf of the Seaboard Group II and the City of High Point.

A separate remedial monitoring program, the *Remedial Monitoring and Effectiveness Evaluation Plan*, has been developed for implementation during the remedial action phase of the project. The *Remedial Monitoring and Effectiveness Evaluation Plan* will be implemented beginning after the startup of the remediation system and will monitor and assess the results and effectiveness of the approved ground water and surface water remediation program to be conducted at the Site.

## 1.1 BACKGROUND

The general Site location is shown in Figure 1. The Site consists of two properties as shown on Figure 2. The former Seaboard Chemical facility property is located at 5899 Riverdale Drive, Jamestown, NC and consists of approximately 13 acres. Between 1974 and 1989, Seaboard Chemical Corporation operated solvent recovery and fuel blending processes at the facility. The adjacent Riverdale Drive Landfill, a closed municipal solid waste landfill, consists of approximately 150 acres and bounds the Seaboard facility on two sides. The Landfill was operated from the 1950's until October 1993. The Landfill was permitted by the North Carolina DENR Solid Waste Section in 1979. During Landfill operations, sections of the two tributary streams that dissect the landfill property were piped, and solid waste was used to fill the drainage valleys. From approximately 1966 to 1970, Landfill operations included the disposal and open burning

of spent solvents. Periodically the burn pits were cleaned of residue that was accumulated in a mound. Presently this mound consists of approximately 600 cubic yards of contaminated residue and is referred to as the "soil residue mound". In 1989, a leachate collection system was added to control surface seeps (leachate leakage) along the slopes of the landfill. The leachate from these seeps is presently collected in concrete storage tanks and subsequently pumped into tank trucks and treated off-site. The Landfill is now capped with a minimum of two feet of native soil and vegetative cover.

Seaboard Group II ("Group") was formed to perform a remedial investigation and to prepare a baseline risk assessment, feasibility study for the Seaboard site. The Group entered into an agreement with the City of High Point to perform a remedial investigation since the close proximity of the landfill and Seaboard Chemical Corporation facility made joint investigation of the two sites advantageous for both the City and the Group. The Parties then entered into an Administrative Order on Consent (AOC) dated January 30, 1996 with DENR to perform the remedial investigation. The feasibility study was conducted under another AOC dated July 22, 1997.

Remedial investigations conducted at the Site have documented the presence of chlorinated and non-chlorinated hydrocarbon compounds in soils, landfill leachate, ground water and surface water. The remedial investigation results indicate the presence of dense non-aqueous-phase liquids in the fractured bedrock aquifer underlying the Site.

The *Remedy Information and Recommendation* document dated February 2005 presents a protective remedial strategy for the impacted media based on the results of the remedial investigation, baseline risk assessment and feasibility study. The proposed remedial design consists of groundwater extraction and treatment in combination with institutional controls including site access control, recorded land use restrictions and restriction of water supply well construction. The remedial design includes the use of treatment wetlands in combination with an upland phytoremediation system comprised of deciduous and conifer trees to provide year-around treatment for the extracted ground water. The proposed remedy is designed to prevent movement of contaminants into the Randleman Reservoir/Deep River and the Southern Intermittent Stream and prevent exposure to impacted soils and groundwater at the Site. Groundwater and surface water sampling will monitor the effectiveness of the remedy to ensure that there is no unacceptable migration of contaminants to the Randleman Reservoir /Deep River.

*MONITORING OBJECTIVES*

The primary objectives of the pre-remedial ground water and surface water monitoring program are to:

- Monitor VOC concentrations and migration of the VOC-affected ground water at the Site;
- Monitor ground water elevations, hydraulic gradients and flow directions;
- Monitor natural attenuation indicator parameters in ground water;
- Measure the relative hydraulic gradient between ground water and surface water at the Site; and
- Monitor surface water quality in the Randleman Reservoir/Deep River, Northern Intermittent Stream and Southern Intermittent Stream to assess impacts from VOC-affected ground water discharge.

Ground water monitoring associated with the engineered constructed wetlands and upland phytoremediation system will be developed and presented in the future as part of the operating plans for the natural treatment system.

### 3.0

## *PRE-REMEDIAL MONITORING PLAN*

The pre-remedial ground water and surface water monitoring program will be a one-time event conducted prior to the startup of the remedial action at the Seaboard Chemical/Riverdale Drive Landfill Site. The proposed sampling and gauging locations are shown on Figure 2. The proposed monitoring program is summarized in Table 1 for ground water and Table 2 for surface water. The pre-remedial monitoring plan is described below.

### 3.1

## *GROUND WATER MONITORING*

Ground water level gauging is proposed at 104 monitor wells (Figure 2) to monitor ground water flow patterns at the site. The water level measurements will be made manually using electronic water level meters. In addition, five monitor wells (PW-6D, OW-DR4, OW-NIS1, OW-LFS2 & OW-SIS2) will be equipped with automated water level recorders (pressure transducers/dataloggers) to record ground water level data on a daily basis. The daily water level data will be collected at critical locations near the future recovery wells to monitor and document the static (pre-pumping) ground water levels, trends and fluctuations over time before the ground water extraction system is started.

Ground water sampling is proposed at 65 monitor/recovery wells to provide a site-wide snapshot of pre-remedial VOC plume concentrations and distribution. The ground water samples will be analyzed for VOCs, including 1,4-dioxane, by EPA Method 8260. Field parameters (pH, conductivity & temperature) will also be measured for each ground water sample using calibrated meters. In addition, ground water samples for natural attenuation analysis will be collected from 6 monitor well locations. Natural attenuation parameters to be analyzed include dissolved oxygen, nitrate, ferrous iron, sulfate, oxidation/reduction potential, total organic carbon and chloride by SW-846 methods or calibrated meters.

The sampling procedures will be in general accordance with the specifications provided in the project Sampling and Analysis Plan.

Surface water sampling is proposed at a total of 8 surface water stations (Figure 2), including 4 stations on the Randleman Reservoir/Deep River, 3 stations on the Southern Intermittent Stream and 1 station on the Northern Intermittent Stream. The surface water samples will be analyzed for VOCs, including 1,4-dioxane, by EPA Method 8260. Field parameters (pH, conductivity & temperature) will also be measured for each surface water sample using calibrated meters.

Stream discharge in the Southern Intermittent Stream and the Northern Intermittent Stream will be measured using the float method or visual estimation method, as feasible. The float method of stream flow measurement is summarized as follows:

- Measure off at least 50 feet along the bank of a straight section of the stream.
- Estimate the cross-sectional area of the stream at a transect across the measured stream segment by using the total stream width and the average depth. (Calculate the average depth from depths measured at 1- to 2-foot intervals.)

$$\text{Total width (ft)} \times \text{Average depth (ft)} = \text{area (ft}^2\text{)}$$

- Release the float at the upstream site. Using a stopwatch, record the time it takes to reach the downstream tape. Repeat the measurement two more times for a total of three measurements.
- Calculate the velocity as distance traveled divided by the average amount of time it took the float to travel the distance.  
$$\frac{\text{Distance traveled (ft)}}{\text{Average travel time (sec)}} = \text{Velocity (ft/sec)}$$
- If appropriate, correct for the surface versus mid-depth velocity by multiplying the surface velocity by 0.85.
- Calculate the discharge in cubic feet per second (cfs) by multiplying velocity (ft/sec) by the cross-sectional area (ft<sup>2</sup>) of the stream.

Discharge measurements are not applicable for the impounded surface water of the Randleman Reservoir and will not be collected.

The sampling procedures will be in general accordance with the specifications provided in the project Sampling and Analysis Plan. For the Randleman Reservoir sampling locations only, two samples will be collected at each station: one sample at the surface of the water and one sample at approximately 1 foot above the bottom of the reservoir/river. The deep sample will be collected using a subsurface grab sampling device (Kemmerer-style sampler or equivalent). The Randleman Reservoir sampling locations are intended to be near the historical surface water sampling locations on the Deep River that were sampled during the remedial investigation at the site and prior to the filling of the Randleman Reservoir.

### 3.3 *QUALITY CONTROL SAMPLES*

Quality control samples will consist of 3 types: trip blanks, equipment (rinse) blanks and field duplicates. Each type of QC sample will be collected at a frequency of 1 per 20 field samples or a minimum of 1 sample where fewer than 20 samples are collected. The sampling procedures will be in general accordance with the specifications provided in the project Sampling and Analysis Plan.

### 3.4 *MONITORING SCHEDULE*

The pre-remedial ground water and surface water monitoring program will be conducted on a one-time basis within approximately 180 days before the planned start up of the remediation system. After the start up of the remediation system, the remedial monitoring and effectiveness evaluation program will be implemented and will replace the pre-remedial monitoring program.

As practical, the pre-remedial monitoring field activities will typically be scheduled during August or September when low flow hydrological conditions are more prevalent. It is anticipated that the field activities for the pre-remedial monitoring can be completed within 10 to 12 days.

#### 4.0

#### *REPORTING*

The results of the pre-remedial ground water and surface water monitoring activities will be presented in a brief summary report including data tables, laboratory reports, ground water elevation contour maps and separate isoconcentration contour maps for total volatile organic compounds and four of the primary compounds of concern (i.e. 1,4-dioxane, 1,2-DCA, vinyl chloride & chlorobenzene). The summary report will be submitted to the North Carolina Division of Waste Management within 90 days of receipt of the laboratory report.

*Tables*

TABLE 1  
Pre-Remedial Ground Water Monitoring Program  
Seaboard Chemical/Riverdale Drive Landfill Site  
Jamestown, North Carolina

Well ID	Geology	Depth (ft)	Parameter	Frequency	Notes
<b>Monitor Wells (65):</b>					
MRF-1	SBR	43.5	X		
MW-1	SBR	57.7	X		
MW-2C	SBR	48	X		
MW-3C	SBR	57	X		X
MW-5	SAP	30	X		
MW-6	SBR	110	X		
MW-7B	PWR	68	X		
MW-8	SAP	33	X		
MW-9	SAP/PWR	32	X		
MW-10	SAP	28	X		X
MW-11	SBR	68	X		
MW-12A	SAP	20	X		X
MW-12B	SBR	58	X		
MW-12D	SBR	202	X		
MW-15A	SBR	34	X		X
MW-16	SBR	45	X		
MW-17	SBR	250	X		
OW-DR2	SBR	186	X		
OW-DR3	SBR	160	X		
OW-DR4	SBR	165	X		
OW-LFS1	SAP/SBR	50	X		
OW-LFS2	SAP/SBR	50	X		
OW-NIS1	SAP/SBR	40	X		
OW-SF1	SBR	120	X		
OW-SIS1	SAP/SBR	39	X		
OW-SIS2	SAP	40	X		
OW-SIS3	SAP/SBR	45	X		
PW-2D	SBR	101	X		
PW-4I	SBR	122	X		
PW-5D	SBR	306.5	X		
PW-6D	SBR	275	X		X
PW-6I	SBR	76	X		
PW-7I	SBR	101	X		
PW-8S	SAP	60	X		
PW-9I	SBR	100	X		
PW-10D	SBR	200	X		
PW-10I	SBR	100	X		
PW-11I	SBR	90	X		
PW-12I	SBR	105	X		
PW-13I	SBR	250	X		
PW-14D	SBR	198.8	X		
PW-14S	SAP	21.5	X		
PW-15D	SBR	163.5	X		
PW-15S	SAP	21.5	X		
PW-16D	SBR	179	X		
PW-17	SBR	128	X		
PW-18	SBR	225	X		
PW-19	SBR	260	X		
PW-DR1	SBR	185	X		
PW-SIS1	SAP/SBR	39	X		
RW-LFS1	SAP/SBR	50	X		
RW-LFS2	SAP/SBR	50	X		
RW-NIS1	SAP/SBR	40	X		
RW-SIS2	SAP/SBR	40	X		
RW-SIS3	SAP/SBR	40	X		
RW-SIS4	SAP/SBR	45	X		
RW-SIS5	SAP/SBR	50	X		
RW-SIS6	SAP/SBR	45	X		
W-1	SBR	64.7	X		
W-4A	SAP	38.5	X		X
W-5	SBR/PWR	60	X		
W-18	PWR	41.5	X		
W-21	SBR	33.4	X		
W-23A	SBR	75	X		
W-24	SBR	60	X		

SAP = Saprolite zone SBR = Shallow Bedrock zone PWR = Partially Weathered Rock zone  
Natural attenuation parameters include dissolved oxygen, nitrate, ferrous iron, sulfate, oxidation/reduction potential, total organic carbon and chloride

TABLE 1  
 Pre-Remedial Ground Water Monitoring Program  
 Seaboard Chemical/Riverdale Drive Landfill Site  
 Jamestown, North Carolina

Monitor Wells (704):			
	MW-1	PW-1D	W-1
	MW-2A	PW-2D	W-2
	MW-2B	PW-3D	W-3
	MW-2C	PW-4I	W-3A
	MW-3A	PW-5D	W-3B
	MW-3B	PW-6I	W-4
	MW-3C	PW-6D	W-4A
	MW-4	PW-7I	W-4B
	MW-5	PW-8S	W-5
	MW-6	PW-9I	W-6
	MW-7A	PW-10I	W-6A
	MW-7B	PW-10D	W-6B
	MW-8	PW-11I	W-12
	MW-9	PW-12I	W-12A
	MW-10	PW-13I	W-14
	MW-11	PW-14S	W-15
	MW-12A	PW-14D	W-16
	MW-12B	PW-15S	W-17
	MW-12D	PW-15D	W-18
	MW-14	PW-16S	W-19
	MW-15A	PW-16D	W-20
	MW-15B	PW-17	W-13
	MW-16	PW-18	W-21
	MW-17	PW-19	W-23A
	MRF-1	PW-DR1	W-23B
	MRF-2	PW-SF1	W-24
	OW-DR1	PW-SIS1	W-25
	OW-DR2		W-26
	OW-DR3	RW-LFS1	W-27
	OW-DR4	RW-LFS2	W-29
	OW-LFS1	RW-NIS1	W-30
	OW-LFS2	RW-SIS2	
	OW-NIS1	RW-SIS3	
	OW-SF1	RW-SIS4	
	OW-SF2	RW-SIS5	
	OW-SIS1	RW-SIS6	
	OW-SIS2		
	OW-SIS3		

TABLE 2  
*Pre-Remedial Surface Water Monitoring Program  
 Seaboard Chemical/Riverdale Drive Landfill Site  
 Jamestown, North Carolina*

<i>Randleman Reservoir (Deep River):</i>		
SW-6 <sup>1</sup>	Upstream at Kivett Rd. bridge	X
SW-7 <sup>1</sup>	Downstream at I-85 bridge	X
SW-DRP-2 <sup>1</sup>	At plume discharge zone above confluence of SIS (east-west river segment)	X
SW-DRP-11 <sup>1</sup>	Upstream of confluence of Richland Creek (downstream of I-85)	X
<i>SIS:</i>		
SW-3	Western segment of SIS near Seaboard (upstream of SIS pipe)	X
SW-4 <sup>1</sup>	Downstream SIS near confluence with Randleman Reservoir (Deep River)	X
SW-5	Upstream SIS	X
<i>NIS:</i>		
SW-2 <sup>1</sup>	Downstream NIS pipe outlet at confluence with Randleman Reservoir (Deep River)	X

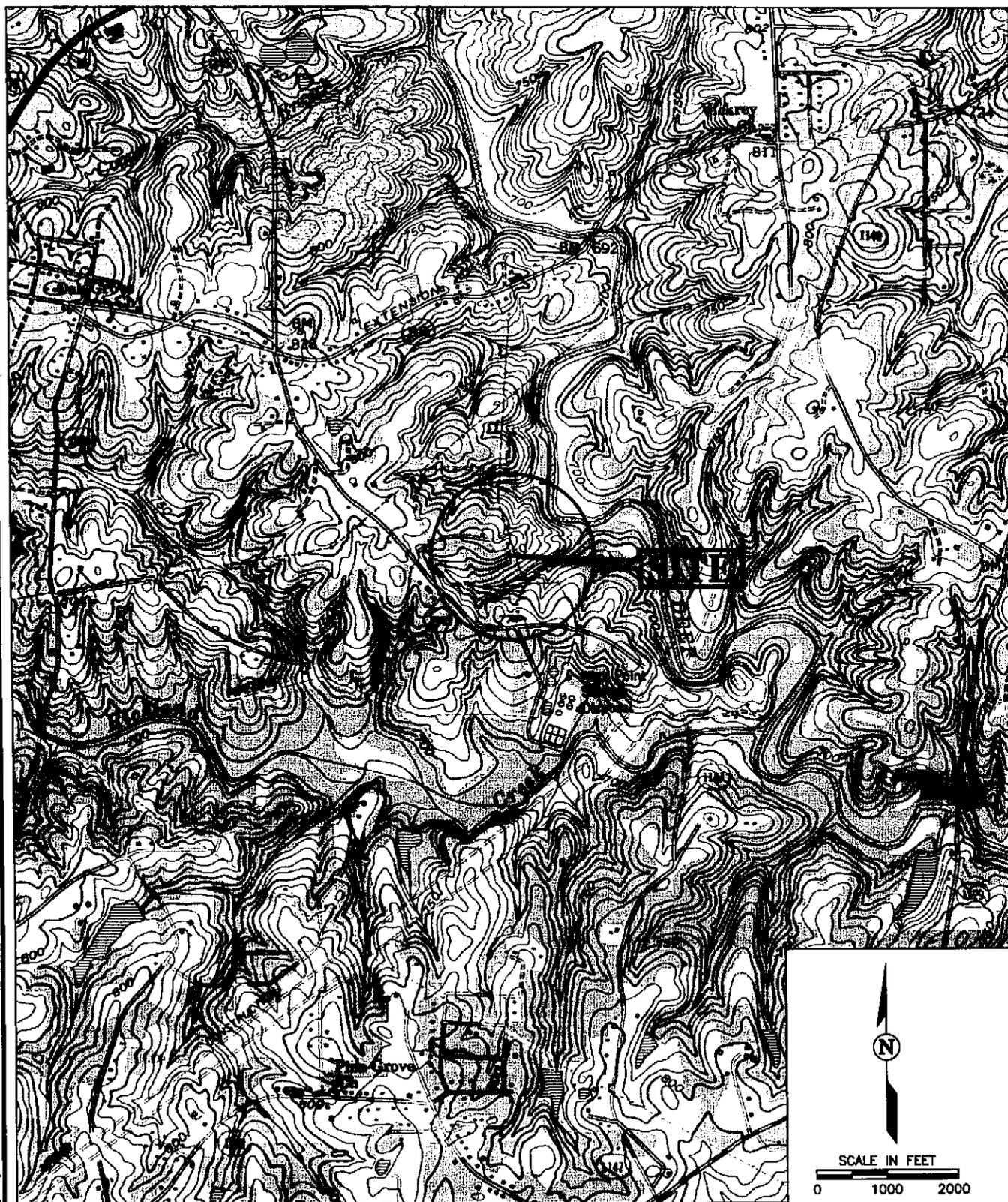
*Notes:*

*1 - The general locations of these historical surface water sampling stations on the Deep River will be utilized, if practical, as equivalent locations for the Randleman Reservoir at normal pool.*

*SIS = Southern Intermittent Stream; NIS = Northern Intermittent Stream*

*Figures*

FIG 1 9-02.DWG 11/12/02 1=1 CH/TW



MAP SOURCE: HIGH POINT EAST (1982) 7.5 MINUTE  
NC TOPOGRAPHIC QUADRANGLE



**ERM**

**ERM NC, PC**

**SITE LOCATION MAP**  
**FORMER SEABOARD CHEMICAL CORPORATION AND**  
**RIVERDALE DRIVE LANDFILL**  
**JAMESTOWN, NORTH CAROLINA**

FIGURE

**1**

