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GW_SAmpling

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Woodward-Clyde Consultants, Inc.

25 August 1983
Rev. 9 September 1983
82C4495-2G

Mr. James B. Marean
New York State Electric
and Gas Corporation
87-89 Chenango Street
Binghamton, NY 13902

Re: Results of Ground Water Sampling,
Lockport Coal Tar Site

Dear Mr. Marean:

Woodward-Clyde Consultants is pleased to present the results of two rounds of quarterly sampling at the Lockport Coal Tor Site. Samples of ground water, seepage along the Erie Canal wall, and a soil sample were collected on February 2-3, 1983. Samples of ground water were collected from monitoring wells MW-1, MW-2, MW-3, MW-4, and IW-2 (see Figure 1). The monitor wells were again sampled on May 4, 1983. Seepage samples were not collected in May because the canal was full of water at the time of sampling (the seepage points are below the high water line of the canal).

Sampling Program

Prior to collection of samples, three volumes of water present in each well casing were bailed utilizing a PVC bailer. Two samples were collected at each well: one sample utilizing a teflon bailer was collected to fill two septum vials for the analysis of aromatic organic compounds; and one gallon of sample was collected utilizing a PVC bailer for the other analyses. To minimize the opportunity for cross contamination of well samples, the collection of water for monitoring wells was sequenced from the least potentially contaminated to more highly potentially contaminated wells. Prior to utilizing the bailers, the bailers were rinsed in deionized water and a minimum of two bail fulls were discarded before a sample was collected.

Two seep samples were collected in February from the base of the south wall of the Lockport Canal north of the Transit Street bridge. Seep 1 was located 100 feet northeast of the Transit Street bridge, and Seep 2 was located 169 feet north of the bridge (Figure 1). At Seep 1, there were numerous places where seepage of oily material was evident, but none could be found which would allow collection of a sample directly into a sampling container. For this reason, field personnel constructed a small embankment that allowed the seepage to pond. The sample collected represents the ponded seepage that was scooped into the sampling containers. Distinct drip points at Seep 2 allowed field personnel to collect seepage samples directly into the glass sampling containers utilizing a funnel and some flexible tubing. Both samples represent seepage that was entering the canal from the bedding plane fractures of the De Cew formation. In addition to these water samples, a sample of soil was also collected in February by NYSEG personnel at the substation. The soil contained organic oils and tars that are presumed to be typical for residual coal tar wastes that were generated at that site.

The samples of ground water, seepage, and soils collected in February were analyzed for specific pollutants, including metals, aromatic organic compounds, phenolic compounds, and the base neutral compounds of the priority pollutants. In addition, a C_5 to C_{22} chromatogram scan was performed to characterize the range of organic compounds that were detected in ground water, the seeps, and the soil sample. The chromatograms of the samples from MW-1, MW-2, MW-3, MW-4, IW-2, Seep 1, and Seep 2 (no organic compounds were detected in MW-4) were compared to the chromatogram of the soil sample collected at the substation. The analysis laboratory reported that chromatograms for MW-1, MW-2, MW-3, Seep 1 and Seep 2 were virtually identical to the chromatogram of the soil sample. The results of the pollutant analysis shown in Table 1 indicate that pollutants characteristic of coal tars occur in the soil sample, the seep samples, MW-1, MW-2, and MW-3. Base neutral compounds characteristic of coal tars were not detected in wells IW-2 and MW-4. Due to an accident at the laboratory, the base neutral compounds were not analyzed for sample MW-2.

Samples were collected on May 4 from the same monitor wells sampled in February (MW-1, MW-2, MW-3, MW-4, and IW-2). Canal seepage samples were not collected, as previously mentioned. The samples were analyzed for an abbreviated list of parameters as compared to the February analyses. These included total phenol, aromatic compounds (EPA 602 series), acenaphthylene, napthalene and phenanthrene. These parameters were selected as the best indicators of coal tar pollution. Sampling and analysis procedures were the same for both sampling events.

Samples collected from MW-1 and MW-3 were split and separate hydrocarbon scan analyses were performed by General Testing Laboratories in Rochester, NY and Measurement Sciences Corporation in Garden City, NY. Chromatogram comparisons resulted in a high degree of similarity regarding the presence of coal tar compounds.

Conclusions

The results of the two sampling events are summarized on Table 1 and suggest the following:

1) Coal tar waste occurs in the soils at the substation at shallow depths.

2) Ground water below the substation contains the same chemicals found in the substation soils.

3) Upgradient ground water (MW-4) does not contain chemical compounds related to coal tar.

4) Seepage samples collected at the canal in February contained coal tar related compounds, and

5) the measured concentrations in MW-2 and MW-1 suggest that pathways for coal tar migration are highly selective along bedrock fractures and bedding planes.

Comparison of results of the two sampling events indicates an increase in concentration for most parameters. An exception is the aromatic compounds in MW-1 which exhibited consistently lower values. This may be due to the effect of a full canal adjacent to MW-1 diluting the more soluble compounds. The concentrations of the base neutral compounds showed relatively large increases from February to May. The significance of these increases cannot be well defined at this time.

Recommendations

Tasks 1 and 2 studies at the Lockport site were designed to determine whether or not a potential link could be estabished between seeps of coal tar chemicals observed in the walls of the Erie Canal and the NYSEG substation site (a former coal gasification plant site decommissioned in the early 1920's and subsequently purchased by NYSEG). Results obtained through two rounds of ground water sampling and analyses of preliminary monitoring wells installed during Task 2 suggests that sufficient evidence exists to continue with Task 3 studies. This evidence is primarily in the form of chemical similarity between coal tar substances found at the site and the water chemistry of ground water and seeps in the canal wall. Continuation of Task 2 studies through an additional two rounds of ground water sampling is thought to offer no additional data of value in addressing the purpose of Task 2 studies. It is recommended, therefore, that Task 3 studies begin.

The purpose of Task 3 studies is to address questions regarding the source of potential contaminants, the pathways of contaminants to local ground water, and the distribution of any contaminants that may exist within the surface and ground waters. Task 3 studies are, therefore, designed 1) to investigate site soils for areas of existing coal tors, 2) to investigate (to the degree possible) bedrock fractures as the pathways by which coal tar compounds may migrate from soils into the bedrock and ground water system, 3) to delineate the distribution of coal tar compounds within the ground water beneath and adjacent to the site and 4) to provide the necessary information to complete subsequent tasks (risk analysis and preliminary remedial design). Pursuant to this end, and addressing potential ground water contamination in a more predictive way, hydrologic conditions at the site including both ground water gradients and flow patterns as well as aquifer parameters must be further defined.

To address questions regarding the contaminant source, a site trenching and soil augering program is proposed. Specifically, the purpose of this effort is to define existing locations of coal tar compounds within site soils. As identified in Task 2 studies, coal tar substances were found in site soils at the northwest corner of the site. Prior knowledge of this location of coal tar within the soils, and subsequent confirmation of potential soil contamination as inferred by site geophysical studies identified this location as a small pocket of coal tar within the soil. As no widespread distribution of soil contamination was inferred from site geophysical studies, the trenching and augering program will be used to confirm these conditions through direct observation over limited portions of the site.

We recommend that two trenches be excavated by backhoe at the site to bedrock (10 to 12 feet deep). We assume that a backhoe and operator can be supplied by NYSEG. The approximate locations of trenches are shown in Figure 1. Trenches will be inspected and logged during excavation to estimate the occurrence and distribution of coal tar wastes in the overburden at the site. Soil samples will be collected and analyzed for total phenol, method 602 series aromatic compounds, acenapthylene, napthalene, and phenanthrene. We estimate that five soil samples will be analyzed.

Bedrock fractures must act as conduits between contaminants in the soils and the underlying ground water (within the bedrock) if existing coal tars within the soil provide the ground water with the chemical compounds observed. To investigate these fractures, two borings are proposed. Each boring will be drilled at an angle of about 35° from the vertical along a west-northwest (N70°W) azimuth. These borings are being drilled specifically to Intercept vertical fractures within the underlying bedrock at locations shown on Figure 1.

The first angled boring, B3-1, will be drilled onsite to intercept vertical fractures in bedrock beneath a known location of coal tar within site soils. The second angled boring, B3-2, will be drilled along the supposed flow path of contaminants between the site and the observed seep in the canal walls. As the fracture spacing within the insitu bedrock is not well known, there is some likelihood that either or both of these borings could miss all vertical fractures during drilling. Should this possibility result, we will address the cost effectiveness of this approach with any further recommendations regarding this effort in an Interim progress report. Should either or both of these borings successfuly intercept vertical fractures as expected, the nature of fractures intercepted will be charcterized and evaluated in terms of their efficiency as vertical conduits. In addition to these borings, two of the additional monitoring wells will be cored during installation such that additional data regarding the bedrock section will be obtained.

To address questions regarding character and distribution of observed coal tar compounds within the ground water, thirteen additional monitoring wells are proposed. The well locations shown on Figure 1, are designed such that many of the planned well locations should be beyond the area containing any site related contaminant compounds. Based on data obtained from these wells (and in conjunction with data obtained during Task 2) ground water characteristics, gradient, flow and aquifer parameters should be sufficiently well defined to satisfy the data needs of defining source, transport and potential ground water contamination.

At least three of these proposed wells will be drilled contingent upon finding contaminants in other wells. For example, MW-14, MW-15 and MW-16 are planned to be located beyond the expected limits of contaminated ground water. If adjacent wells, MW-9, MW-13 and MW-8 are found to have ground water without coal tar compounds (as determined qualitatively during drilling using a portable field gas chromatograph), these additional three wells should not be required.

Wells MW-6, MW-7 and MW-12 will be installed at locations shown, and will be screened to isolate the shale members (DeCew/Rochester) from the overlying Lockport Dolomite. Each of these wells is located proximate to wells completed in the dolomite. The purpose of these nested wells is to define vertical gradient of ground water and vertical distribution of ground water quality. These data are required, as are data regarding aquifer parameters to be gathered by "slug" testing of each of the wells, both to understand existing conditions and how these conditions were derived.

Upon completion of the monitoring wells and initial sampling and analyses, we will attempt to identify approximately ten wells that should become part of the quarterly sampled monitoring wells. This should minimize the future costs associated with routine sampling, both in terms of personnel time and sample analyses. Recommended sampling parameters are listed in Table 2.

To evaluate the effect of ground water quality on the surface water regime of the canal, three locations in the canal will be sampled and analyzed for those parameters listed in Table 2. Recommended sampling locations (see Figure 1) are 1) at least 1,000 feet southwest of the Transit Street Bridge (beyond the influence of potential ground water seepage from the substation) 2) near seeps Nos. 1 and 2 northeast of the Transit Street Bridge and 3) in the vicinity of the Lockport emergency water supply intake approximately 1/4 mile northeast (downstream) of seeps 1 and 2. We recommend that the canal water samples be collected three times in 1983 before the canal is drained and three times in 1984 after refilling. Sampling events will be coordinated with ground water sampling.

If you have any questions concerning the recent ground water sampling program results or our recommendations for future work at the Lockport Coal Tar Site, please do not hesitate to call.

Very truly yours,

Donald R. Ganser
Project Manager

DRG/cd
C471/113

Table 1

Chemical Parameters Detected In One or More Samples at the Lockport Coal Tar Site

February 2-3, 1983 May 4, 1983

			Sample Location							Sampling Location				
Parameter	Units^a	Soil	Seep 1	Seep 2	MW-1	MW-2	MW-3	MW-4	IW-2	MW-1	MW-2	MW-3	MW-4	IW-2
Total Phenol	ppm	8.4^b	1.971	0.045	0.028	0.030	0.747	ND	0.016	ND	0.115	0.424	0.022	ND
BOD (5 day)	ppm	NA	420	15.6	11.7	19.2	120	6.3	7.2					
Chromium (total)	ppm	9.5^b	1.45	ND	ND	ND	ND	ND	ND					
Chromium (hexavalent)	ppm	NA	0.28	ND	ND	ND	ND	ND	ND					
Copper	ppm	16.5^b	1.53	ND	ND	ND	ND	ND	ND					
Zinc	ppm	30^b	7.2	0.03	ND	ND	ND	ND	0.08					
Antimony	ppm	26^b	0.9	ND	ND	ND	0.3	0.4	ND					
Method 602 (Aromatics)														
Benzene	ppm	ND	0.059	ND	0.066	ND	3.05	ND	0.014	0.014	1.58	4.12	0.003	0.008
Toluene	ppm	0.071^b	ND	ND	0.120	ND	2.38	ND	0.003	ND	0.95	3.90	0.003	0.003
Ethyl Benzene	ppm	0.072^b	ND	ND	0.033	ND	0.73	ND	ND	0.001	0.43	1.61	ND	0.001
p-Xylene	ppm	ND	0.072	0.002	0.019	ND	0.20	ND	ND	0.010	0.48	0.34	ND	0.001
o-Xylene	ppm	ND	0.120	0.025	0.032	ND	0.39	ND	0.002	0.020	0.57	0.57	ND	0.001
Styrene	ppm	ND	ND	ND	0.004	ND	0.51	ND	ND	ND	ND	0.43	ND	ND
n-Propylbenzene	ppm	ND	ND	ND	0.003	ND	0.03	ND	ND	ND	0.07	ND	ND	ND
Method 604 (phenolics)														
Phenol	ppm	ND	ND	0.03	ND	ND	ND	ND	ND					
4-chloro-3-Methylphenol	ppm	ND	0.60	ND	ND	ND	ND	ND	ND					
Dinitrophenol	ppm	ND	3.5	ND	ND	ND	ND	ND	ND					
Pentochlorophenol	ppm	ND	2.7	ND	ND	ND	ND	ND	ND					
Base Neutrals														
Acenaphthene	ppb	48,000	310	140	ND	ND	190	ND	ND					
Acenaphthylene	ppb	16,000	440	110	ND	NA	570	ND	ND	60	ND	5,700	ND	ND
Anthracene	ppb	15,000	110	27	ND	NA	130	ND	ND					
Benzo (A) Anthracene	ppb	20,000	100	16	ND	NA	81	ND	ND					
Benzo (A) pyrene	ppb	14,000	ND	ND	ND	NA	51	ND	ND					
3,4-Benzofiuoranthene	ppb	19,000	13	13	ND	NA	69	ND	ND					
Benzoperylene	ppb	5,600	ND	ND	ND	NA	43	ND	ND					
Benzo (K) fluoranthene	ppb	19,000	13	13	ND	NA	69	ND	ND					
Bis(2-Ethylhexyl)Phthalate	ppb	ND	84	ND	ND	NA	ND	ND	ND					
Chrysene	ppb	14,000	67	10	ND	NA	60	ND	ND					
Fluoranthene	ppb	32,000	240	37	ND	NA	120	ND	ND					
Indeno (1,2,3-CD) Pyrene	ppb	9,600	ND	ND	ND	NA	ND	ND	ND					
Naphthalene	ppb	220,000	3,100	79	250	NA	5,700	ND	ND	750	280	28,300	ND	ND
Phenanthrene	ppb	96,000	750	120	ND	NA	500	ND	ND	66	180	10,000	ND	ND
Pyrene	ppb	52,000	320	44	ND	NA	140	ND	ND					

NOTES:

a. ppm means mg/l for water samples and mg/kg for soil sample.
ppb means g/l for water samples and g/kg for soil sample.

b. Sample collected November 23, 1982, delivered to laboratory December 6, 1982.

NA means not analyzed
ND means not detected

TABLE 2

RECOMMENDED CHEMICAL PARAMETERS

Temperature	(field)
pH	(field)
Specific conductance	(field)
Total phenol	
Benzene	
Toluene	
Ethyl Benzene	
p-Xylene	
o-Xylene	
Styrene	
n-Propylbenzene	
Acenapthalene	
Napthalene	
Phenanthrene	

EXPLANATION:

◑	MW–4	– WCC EXISTING MONITORING WELLS/BORINGS;
	627.57	– ELEVATION OF TOP OF CASING AND;
	(588)	– ELEVATION OF TOP OF ROCK
✱		– SEEP SAMPLE LOCATIONS
⊕		– PROPOSED MONITORING WELLS
◕		– PROPOSED BORINGS
☒		– PROPOSED SURFACE WATER SAMPLING LOCATIONS

NOTES:

1. DEPTH TO ROCK COMPLIED FROM BORING INFORMATION AND GEOPHYSICAL DATA
2. GROUND SURFACE TOPOGRAPHY FROM AERIAL PHOTOGRAMMATRY BY LOCKWOOD SERVICES

LOCATION OF PROPOSED MONITORING WELLS
TASK 3
LOCKPORT COAL TAR SITE

WOODWARD—CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR.BY:	BTD	**SCALE:**	AS SHOWN	**PROJ. NO.:**	82C4495–2
CK'D. BY:	HG	**DATE:**	26 AUGUST 1983	**FIG. NO.:**	1

NOTE:
CS-1 IS LOCATED 200 FT
DOWN STREAM OF CS-2.

NOTE:
CS-7 AND CS-8 ARE LOCATED
1000 FT AND 2500 FT UPSTREAM
OF CS-6.

EXPLANATION:

◑	MW-4 627.57 (588)	– WCC MONITORING WELLS/BORINGS; – ELEVATION OF TOP OF CASING AND; – ELEVATION OF TOP OF ROCK
◉	SS-1	PROPOSED SURFACE SOIL AND SOIL GAS SAMPLING LOCATION
⊖	CS-1	PROPOSED CANAL SEDIMENT SAMPLING LOCATION

PROPOSED SURFACE SOIL, SOIL GAS AND CANAL
SEDIMENT SAMPLING LOCATIONS
NYSEG LOCKPORT GAS PLANT SITE

WOODWARD—CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR.BY:	RTL	SCALE:	AS SHOWN	PROJ. NO.:	87C4574 A
CK'D. BY:	DFP	DATE:	6 APRIL 1988	FIG. NO.:	1