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NWS EARLE
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278

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Dear Mr. Hoover:

This is a follow up to our telephone conversation of March 10, 1992, whereby you requested a copy of Versar's split sample analysis for the Remedial Investigation Study.

Therefore, I have enclosed a copy of Versar's Data Comparison and Evaluation Report for the first round of sampling. When I receive the reports for the second and third round of sampling I will forward them to you.

If you have any questions concerning this matter, please contact me at 212-264-6609.

Sincerely yours,

Paul G. Ingrisano

Paul G. Ingrisano
Project Manager
Federal Facilities Section

Enclosure

PRINTED ON RECYCLED PAPER

DATA COMPARISON AND EVALUATION REPORT
NAVAL WEAPONS STATION EARLE SITE
COLTS NECK, NEW YORK

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Waste Programs Enforcement
Washington, D.C. 20460

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EPA Region	: II
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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	SAMPLING SUMMARY AND EVALUATION APPROACH	4
3.0	SPECIFIC COMMENTS	15
4.0	PROPOSED ROUND TWO SAMPLING EVALUATION	17
5.0	CONCLUSIONS AND RECOMMENDATIONS	18

TABLES

TABLE 1.	SUMMARY OF SPLIT SAMPLE RESULTS FOR TAL INORGANIC COMPOUNDS	5
TABLE 2.	SUMMARY OF SPLIT SAMPLE RESULTS FOR ORGANIC COMPOUNDS	9

1.0 INTRODUCTION

CDM Federal Programs Corporation (FPC) received a work assignment (EPA Contract No. 68-W9-0002, WA No. C02023) to provide enforcement support to the U.S. Environmental Protection Agency (EPA) Region II during the Department of Defense (DOD) Installation Restoration Program (IRP) Remedial Investigation (RI) at the Naval Weapons Station (NWS) Earle Site in Colts Neck, New Jersey. Versar, Inc., under subcontract to CDM FPC, will provide the enforcement support.

The NWS Earle base encompasses approximately 16 square miles, comprising the main base and the waterfront area. Since 1943, the principal mission of the Earle facility has been the handling, storage, renovation, and transshipment of munitions.

Past and present operations at NWS Earle generate wastes classified as hazardous. Industrial operations, including the repainting and repairing of munitions and explosive ordnance, have produced wastes at 29 sites on the base. Wastes include zinc, chromium, lead, toluene, acetone, acids, caustics, benzene, asbestos, tetrachloroethane, titanium, ethyl alcohol, and ethylene glycol.

The IRP RI is to be conducted by the Department of the Navy or its contractor. The IRP has been developed as a four-phase program: (1) Phase I - Preliminary Assessment (PA), formerly known as the Initial Assessment Study; (2) Phase II - Site Inspection (SI), previously known as the Confirmation Study; (3) Phase III - Remedial Investigation/Feasibility Study; and (4) Phase IV - Remedial Action Plan (RAP). In the Initial Assessment Study (IAS) Report of February 1983, the Naval Energy and Environmental Support Activity (NEESA) identified 29 sites and recommended that 4 of these sites be included in a confirmation study involving sampling and monitoring activities to assess the extent of any problems which may exist. In April 1985, EPA, the New Jersey Department of Environmental Protection (NJDEP), and the Navy agreed that 11 of the 29 sites had the potential for contamination of soils and ground water, and that these 11 sites would be investigated in confirmation studies. The Confirmation Study (CS) Report was available in June 1987.

In December 1988, the Navy contractor prepared a report summarizing the data collected on the 11 sites during the IAS and CS and proposing investigations necessary to supplement existing data on the initial 11 sites. EPA provided comments to the Navy on this Draft Plan of Action (POA). Weston, on behalf of the NWS, submitted an RI/FS Work Plan in October 1989 which incorporated EPA's comments on the POA for the initial 11 sites and included a Quality Assurance Project Plan and Health and Safety Plan. These RI/FS documents for 11 sites were reviewed by Versar in November 1989.

Under the TES III contract, Versar reviewed the IAS Report to evaluate the information on the 18 sites that were not further studied as part of the CS to determine whether additional investigations were necessary. Versar concluded that 16 of the 18 sites merited further study in the form of either collecting additional background information to fill data gaps, or sampling environmental media to deny or confirm the presence of suspected contamination. Weston, on behalf of NWS, submitted an SI work plan addressing these 16 sites, in November 1989.

Versar provided technical evaluation of the SI work plan and presented the evaluation in January 1990. In June 1990, the RP contractor submitted the final Phase III Work Plan, Quality Assurance Project Plan, and Health and Safety Plan for Naval Weapons Station Earle in Colts Neck, New Jersey. Versar provided technical review of the three documents and incorporated all comments in a report to EPA. In turn, the RP contractor responded to the comments and incorporated them as an addendum to the final documents.

Versar also performed oversight of the RP contractor's field activities. These activities commenced in January 1991 with monitoring well installation. Round one sampling of soil, ground water, surface water, and sediment was conducted in March 1991, and Versar accepted split samples at a frequency of 10 percent during this sampling round.

This report presents an evaluation of the analytical results from the March 1991 sampling event. Section 2.0 presents a summary of the sampling event and documents the data evaluation approach, including data summary tables. Section 3.0 presents specific comments on the data, and Section 4.0 presents an evaluation and comments on the proposed round two sampling.

Finally, Section 5.0 presents conclusions and recommendations from Versar's comparison and evaluation of the split sampling data.

2.0 SAMPLING SUMMARY AND EVALUATION APPROACH

Between March 1 and March 18, 1991, Versar conducted oversight and accepted split samples during the round one sampling at the Naval Weapons Station (NWS) Earle site in Colts Neck, New Jersey. During this sampling event, the RP contractor, Weston, collected soil, ground water, surface water, and sediment samples from 11 different sites at NWS Earle. The samples were analyzed for a variety of parameters including Target Compound List (TCL) organics (i.e., volatiles, semivolatiles, pesticides and PCBs), Target Analyte List (TAL) inorganics (i.e., TAL metals and cyanide), explosives (i.e., HMX; RDX; nitrocellulose; nitroglycerin; picric acid; tetryl; 2,4,6-TNT; 1,3,5-TNT; 2,4-DNT; 2,6-DNT; and 1,3-DNT), and total petroleum hydrocarbons (TPH).

During the round one sampling, Versar obtained split samples at a frequency of approximately 10 percent, as requested by the EPA primary contact. Versar accepted 42 split samples, including 13 field duplicates, to evaluate the sampling and analysis procedures used by Weston. These split samples included 10 soil samples (i.e., 6 samples and 4 duplicates), 19 ground water samples (i.e., 14 samples and 5 duplicates), 3 surface water samples (i.e., 2 samples and 1 duplicate), and 10 sediment samples (i.e., 7 samples and 3 duplicates). Of the 42 split samples, 14 were analyzed for TCL organics; 16 were analyzed for TAL inorganics; 8 were analyzed for explosives; and 4 were analyzed for TPH.

In order to facilitate evaluation of the data, Versar summarized the data for each split sample location by listing only the compounds that were detected. If a particular parameter was detected in any of the split samples (i.e., in either the Weston or the Versar portion of the sample), it was listed. However, if the parameter was not detected in any of the split samples, it was eliminated from the analysis (e.g., thallium and cyanide were not detected at any of the split sampling locations, so they are not included on the summary table).

After determining the compounds of interest, summary tables were prepared by listing the Versar split data and the Weston sample data for each sample location. If either the Versar split or the Weston sample was duplicated, the duplicate sample data was also listed on the summary table. One summary table

TABLE 1. SUMMARY OF SPLIT SAMPLE RESULTS FOR TAL INORGANIC COMPOUNDS

SAMPLE LOCATION:	02-004-S001				02-002-M001			02-006-M001		
SAMPLE MATRIX:	SOIL				GROUND WATER			GROUND WATER		
PARAMETER	VERSAR SPLIT (mg/kg)	VERSAR DUPLICATE (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE PERCENT DIFFERENCE
Aluminum	3,260	3,960	3,860	6.7	3,200 NJ	3,000	6.5	9,640 J	11,400	16.7
Antimony	6.9 BNJ	4.2 BNJ	ND	NC	ND	ND	0.0	ND	ND	0.0
Arsenic	3.6	4.2	1.7	78.6	ND	ND	0.0	ND	ND	0.0
Barium	6 BJ	3 B	1.3	110.3	48.2 BJ	55	13.2	64.8 BJ	72	10.5
Beryllium	ND	0.26 B	0.43	49.3	ND	ND	0.0	ND	1.4	NC
Cadmium	ND	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
Calcium	37.5 B	36.6 B	15.0	84.7	1,550 BJ	1,500	3.3	36,600 J	33,200	9.7
Chromium	65.6	76.1	92.0	26.0	48.6	35	32.5	263	330	22.6
Cobalt	ND	ND	ND	0.0	ND	ND	0.0	ND	5.0	NC
Copper	4.8 B	3.8 B	3.4	23.4	5.1 B	ND	NC	14.2 B	26	58.7
Iron	12,200	14,700	13,800	2.6	6,210	5,300	15.8	27,700	42,000	41.0
Lead	7 NJ	13.2 NJ	7.5	29.5	2.7 B	1.4	63.4	15	15	0.0
Magnesium	663 B	856 B	686	10.2	1,130 B	1,200	6.0	5,010	5,700	12.9
Manganese	3.5 B	4.2	6.5	51.2	55.6	58	4.2	174	180	3.4
Mercury	ND	ND	ND	0.0	ND	ND	0.0	0.35	0.28	22.2
Nickel	ND	2.2 B	ND	NC	ND	ND	0.0	ND	4.4	NC
Potassium	2,200 J	2,580 J	2,040	15.8	1,950 B	1,800	8.0	6,870	8,900	25.7
Selenium	0.44 BNJ	ND	ND	NC	ND	ND	0.0	ND	ND	0.0
Silver	ND	ND	ND	0.0	ND	ND	0.0	ND	ND	0.0
Sodium	NR	26 B	32.2	21.3	4,530 B	4,200	7.6	3,840 B	3,300	15.1
Vanadium	NR	72.4	81.6	11.9	30.8 B	25	20.8	118	190	46.8
Zinc	NR	14.8	10.2	36.8	74.8	78	4.2	56.9	67	16.3

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

TABLE 1. SUMMARY OF SPLIT SAMPLE RESULTS FOR TAL INORGANIC COMPOUNDS (Continued)

SAMPLE LOCATION:	02-007-M001				04-002-M001					04-005-M001		
SAMPLE MATRIX:	GROUND WATER				GROUND WATER					GROUND WATER		
PARAMETER	VERSAR SPLIT (ug/l)	VERSAR DUPLICATE (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	VERSAR DUPLICATE (ug/l)	WESTON SAMPLE (ug/l)	WESTON DUPLICATE (ug/l)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE PERCENT DIFFERENCE
Aluminum	8,090 NJ	6,370 NJ	13,400	59.8	2,750	3,190	1,500	1,400	68.8	14,100	9,500	39.0
Antimony	ND	ND	ND	0.0	ND	ND	ND	ND	0.0	ND	ND	0.0
Arsenic	1.3 BNJ	1.2 BNJ	ND	NC	3.1 BNJ	NR	ND	ND	NC	2.6 BNJ	ND	NC
Barium	30.8 BJ	24.9 BJ	35	22.8	16.8 B	18.7 B	15	27	16.8	60.9 BJ	61	0.2
Beryllium	ND	ND	2.5	NC	ND	ND	ND	ND	0.0	ND	ND	0.0
Cadmium	ND	ND	4.5	NC	ND	ND	ND	ND	0.0	ND	ND	0.0
Calcium	5,180 J	4,860 BJ	5,200	3.5	23,900 J	33,100 J	29,900	34,800	12.7	7,980	8,900	10.9
Chromium	164.0	133	330	75.9	ND	ND	ND	ND	0.0	27.5	26	5.6
Cobalt	ND	ND	ND	0.0	ND	ND	ND	ND	0.0	ND	ND	0.0
Copper	11.8 B	9.5 B	26	83.8	ND	ND	3.7	ND	NC	10.9 BJ	15	31.7
Iron	22,900	17,800	51,300	86.4	46,700	51,300	44,000	53,200	0.8	34,500	29,300	16.3
Lead	26.8	20.2	21	11.2	3.8 NJ	3.4 NJ	2.3	4.1	11.8	18.6 NJ	13	35.4
Magnesium	2,200 B	1,890 B	4,100	66.9	11,500	16,000	14,400	16,400	11.3	1,520 B	1,400	8.2
Manganese	73	64.9	79	13.6	146	202	190	220	16.4	147	150	2.0
Mercury	ND	ND	ND	0.0	ND	ND	ND	ND	0.0	ND	ND	0.0
Nickel	NR	NR	51	NC	ND	ND	ND	ND	0.0	9.4 B	ND	NC
Potassium	4,830 B	3,930 B	10,300	80.7	4,240 B	5,670	4,800	5,200	0.9	2,330 B	2,000	15.2
Selenium	ND	ND	ND	0.0	ND	ND	1.5	ND	NC	ND	ND	0.0
Silver	ND	ND	ND	0.0	ND	ND	ND	ND	0.0	ND	ND	0.0
Sodium	13,900	12,800	13,500	1.1	NR	NR	3,500	3,500	NC	NR	2,100	NC
Vanadium	140	111	280	76.2	14.2 B	11.7 B	5.2	5.4	83.8	37.9 B	28	30.0
Zinc	76.9	66.8	91	23.5	9 BJ	ND	ND	ND	NC	47.4 J	15	103.8

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

TABLE 1. SUMMARY OF SPLIT SAMPLE RESULTS FOR TAL INORGANIC COMPOUNDS (Continued)

SAMPLE LOCATION:	04-006-M001			04-001-D001				19-027-D001			
SAMPLE MATRIX:	GROUND WATER			SEDIMENT				SEDIMENT			
PARAMETER	VERSAR SPLIT (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE PERCENT DIFFERENCE	VERSAR SPLIT (mg/kg)	WESTON SAMPLE (mg/kg)	WESTON DUPLICATE (mg/kg)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (mg/kg)	WESTON SAMPLE (mg/kg)	WESTON DUPLICATE (mg/kg)	RELATIVE* PERCENT DIFFERENCE
Aluminum	1,340	980	31.0	393	935	731	71.8	2,780	3,110	2,527	1.4
Antimony	ND	ND	0.0	4.9 BNJ	ND	ND	NC	ND	ND	ND	0.0
Arsenic	ND	ND	0.0	ND	ND	ND	0.0	1.2 B	1.7	1.7	34.5
Barium	36.6 BJ	51	32.9	1.7 B	3.8	2.8	64.0	78.7	64.2	63.5	20.8
Beryllium	ND	ND	0.0	ND	ND	ND	0.0	ND	0.25	0.15	NC
Cadmium	ND	ND	0.0	0.57 B	ND	ND	NC	1.6	1.9	1.5	6.1
Calcium	2,720 B	2,800	2.9	70.9 B	208	115	78.0	498 BJ	508	396	9.7
Chromium	ND	ND	0.0	ND	3.0	1.7	NC	56 NJ	100	76.8	44.9
Cobalt	ND	ND	0.0	ND	ND	ND	0.0	1.8 B	3.1	1.7	28.6
Copper	ND	5.1	NC	1.2 B	ND	ND	NC	20 J	27.8	16.7	10.7
Iron	2,830	2,700	4.7	476	652	456	15.1	5,100	5,280	4,237	6.9
Lead	2.5 BNJ	2.7	7.7	3.9 NJ	4.8	4.6	18.6	NR	233	157	NC
Magnesium	1,220 B	1,100	10.3	18.7 B	34.5	18.3	34.1	434 B	473	408	1.5
Manganese	46.1	47	1.9	2.5 B	1.7	1.6	41.0	42	43.7	35.7	5.6
Mercury	ND	ND	0.0	ND	ND	ND	0.0	ND	0.13	0.10	NC
Nickel	ND	ND	0.0	ND	1.0	ND	NC	3 B	ND	ND	NC
Potassium	783	750	4.3	ND	ND	ND	0.0	268 B	332	330	21.0
Selenium	ND	ND	0.0	ND	ND	ND	0.0	0.36 B	ND	ND	NC
Silver	ND	ND	0.0	ND	0.78	ND	NC	49.8 B	ND	ND	NC
Sodium	NR	2,100	NC	30.6 B	55.8	20.1	21.4	NR	33.7	32.3	NC
Vanadium	ND	3.3	NC	1.5 B	1.8	1.3	3.3	13	14.6	11.6	0.8
Zinc	16.3 BJ	10	47.9	4.8 B	10.7	6.0	54.0	819	1,050	780	11.1

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

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TABLE 1. SUMMARY OF SPLIT SAMPLE RESULTS FOR TAL INORGANIC COMPOUNDS (Continued)

SAMPLE LOCATION:	19-028-D001			19-029-D001			19-030-D001		
SAMPLE MATRIX:	SEDIMENT			SEDIMENT			SEDIMENT		
PARAMETER	VERSAR SPLIT (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE PERCENT DIFFERENCE	VERSAR SPLIT (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE PERCENT DIFFERENCE	VERSAR SPLIT (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE PERCENT DIFFERENCE
Aluminum	4,000	NR	NC	1,920	NR	NC	5,280	NR	NC
Antimony	ND	NR	NC	ND	NR	NC	64.9	NR	NC
Arsenic	2 B	NR	NC	1.8 B	NR	NC	15.2	NR	NC
Barium	67	NR	NC	21.6 B	NR	NC	2,780	NR	NC
Beryllium	ND	NR	NC	ND	NR	NC	ND	NR	NC
Cadmium	1.7	1.6	6.1	0.8 B	ND	NC	24.2	25.9	6.8
Calcium	2,630 J	NR	NC	1,050 BJ	NR	NC	1,800 J	NR	NC
Chromium	62.4 NJ	NR	NC	33.6 NJ	NR	NC	2,200 NJ	NR	NC
Cobalt	3.8 B	NR	NC	1.4 B	NR	NC	30.5	NR	NC
Copper	23.4 J	NR	NC	8.8 J	NR	NC	157 J	NR	NC
Iron	7,150	NR	NC	3,500	NR	NC	15,100	NR	NC
Lead	NR	267	NC	NR	69.6	NC	NR	5,380	NC
Magnesium	808 B	NR	NC	687 B	NR	NC	2,030	NR	NC
Manganese	146	NR	NC	32.6	NR	NC	116	NR	NC
Mercury	ND	NR	NC	ND	NR	NC	0.45	NR	NC
Nickel	6.9 B	NR	NC	ND	NR	NC	13.2	NR	NC
Potassium	343 B	NR	NC	191 B	NR	NC	1,030 B	NR	NC
Selenium	0.61 B	NR	NC	0.32 B	NR	NC	0.56 B	NR	NC
Silver	ND	NR	NC	ND	NR	NC	ND	NR	NC
Sodium	116 B	NR	NC	45.8 B	NR	NC	161 B	NR	NC
Vanadium	23.4	NR	NC	7.9 B	NR	NC	42.6	NR	NC
Zinc	612	NR	NC	312	NR	NC	NR	NR	NC

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

TABLE 2. SUMMARY OF SPLIT SAMPLE RESULTS FOR ORGANIC COMPOUNDS

SAMPLE LOCATION:	02-004-S001				11-001-S001				11-002-S001		
SAMPLE MATRIX:	SOIL				SOIL				SOIL		
PARAMETER	VERSAR SPLIT (mg/kg)	VERSAR DUPLICATE (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (mg/kg)	VERSAR DUPLICATE (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE PERCENT DIFFERENCE
VOLATILES											
Methylene Chloride	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
Acetone	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
Chloroform	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
Carbon Disulfide	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
1,2-Dichloroethene	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
Trichloroethene	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
Benzene	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
SEMIVOLATILES											
bis(2-ethylhexyl) phthalate	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
Di-n-butyl phthalate	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
PESTICIDES/PCBs											
Endosulfan I	NR	NR	NR	NC	NR	NR	NR	NC	NR	NR	NC
EXPLOSIVES											
Nitrocellulose	ND	ND	ND	0.0	3,450	NR	ND	NC	NR	ND	NC
Pentaerythritol-tetranitrate	ND	ND	ND	0.0	3.34	NR	ND	NC	NR	ND	NC
Picric Acid	ND	ND	ND	0.0	ND	NR	ND	NC	NR	ND	NC
RDX	ND	ND	ND	0.0	ND	NR	ND	NC	NR	ND	NC
2,4-DNT	ND	ND	ND	0.0	ND	NR	ND	NC	NR	ND	NC
PETROLEUM HYDROCARBONS (ppm)	NR	NR	NR	NC	530.1 J	477.9 J	640	23.8	222.2 J	290	26.5

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

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TABLE 2. SUMMARY OF SPLIT SAMPLE RESULTS FOR ORGANIC COMPOUNDS (Continued)

SAMPLE LOCATION:	19-028-S002					02-002-M001			02-006-M001			
SAMPLE MATRIX:	SOIL					GROUND WATER			GROUND WATER			
PARAMETER	VERSAR SPLIT (mg/kg)	VERSAR DUPLICATE (mg/kg)	WESTON SAMPLE (mg/kg)	WESTON DUPLICATE (mg/kg)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	VERSAR DUPLICATE (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE* PERCENT DIFFERENCE
VOLATILES												
Methylene Chloride	ND	ND	60 B	4 JB	NC	ND	58 B	NC	ND	ND	2 JB	NC
Acetone	ND	ND	9 JB	32	NC	ND	11 B	NC	ND	ND	11 B	NC
Chloroform	ND	ND	ND	ND	0.0	ND	4 J	NC	ND	ND	ND	0.0
Carbon Disulfide	ND	ND	ND	1 JB	NC	ND	ND	0.0	ND	ND	ND	0.0
1,2-Dichloroethene	ND	ND	ND	ND	0.0	ND	ND	0.0	ND	ND	ND	0.0
Trichloroethene	ND	ND	ND	ND	0.0	ND	ND	0.0	ND	ND	ND	0.0
Benzene	ND	ND	ND	ND	0.0	ND	ND	0.0	4 J	4 J	ND	NC
SEMIVOLATILES												
bis(2-ethylhexyl) phthalate	NR	NR	NR	NR	NC	ND	1 J	NC	ND	ND	ND	0.0
Di-n-butyl phthalate	NR	NR	NR	NR	NC	ND	ND	0.0	ND	ND	ND	0.0
PESTICIDES/PCBs												
Endosulfan I	NR	NR	NR	NR	NC	ND	ND	0.0	ND	ND	ND	0.0
EXPLOSIVES												
Nitrocellulose	NR	NR	NR	NR	NC	ND	ND	0.0	NR	NR	ND	NC
Pentaerythritol-tetranitrate	NR	NR	NR	NR	NC	ND	ND	0.0	NR	NR	ND	NC
Picric Acid	NR	NR	NR	NR	NC	ND	ND	0.0	NR	NR	2.1	NC
RDX	NR	NR	NR	NR	NC	ND	ND	0.0	NR	NR	4.12	NC
2,4-DNT	NR	NR	NR	NR	NC	ND	ND	0.0	NR	NR	3.2	NC
PETROLEUM HYDROCARBONS (ppm)	NR	NR	3,500 B	NR	NC	NR	NR	NC	NR	NR	NR	NC

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

TABLE 2. SUMMARY OF SPLIT SAMPLE RESULTS FOR ORGANIC COMPOUNDS (Continued)

SAMPLE LOCATION:	02-007-M001			04-002-M001					04-005-M001		
SAMPLE MATRIX:	GROUND WATER			GROUND WATER					GROUND WATER		
PARAMETER	VERSAR SPLIT (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	VERSAR DUPLICATE (ug/l)	WESTON SAMPLE (ug/l)	WESTON DUPLICATE (ug/l)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE PERCENT DIFFERENCE
VOLATILES											
Methylene Chloride	ND	3 JB	NC	ND	ND	3 JB	ND	NC	ND	ND	0.0
Acetone	ND	9 JB	NC	ND	ND	16 B	ND	NC	ND	ND	0.0
Chloroform	ND	ND	0.0	ND	ND	ND	ND	0.0	ND	ND	0.0
Carbon Disulfide	ND	ND	0.0	ND	ND	ND	ND	0.0	ND	ND	0.0
1,2-Dichloroethene	ND	ND	0.0	ND	ND	20.0	18.0	NC	ND	7.0	NC
Trichloroethene	2 J	ND	NC	ND	ND	ND	ND	0.0	ND	14.0	NC
Benzene	ND	ND	0.0	ND	ND	ND	ND	0.0	ND	ND	0.0
SEMIVOLATILES											
bis(2-ethylhexyl) phthalate	ND	1 J	NC	ND	ND	ND	ND	0.0	ND	ND	0.0
Di-n-butyl phthalate	2 J	ND	NC	ND	ND	ND	ND	0.0	ND	ND	0.0
PESTICIDES/PCBs											
Endosulfan I	ND	ND	0.0	ND	ND	ND	ND	0.0	ND	ND	0.0
EXPLOSIVES											
Nitrocellulose	NR	ND	NC	NR	NR	NR	NR	NC	NR	NR	NC
Pentaerythritol-tetranitrate	NR	ND	NC	NR	NR	NR	NR	NC	NR	NR	NC
Picric Acid	NR	ND	NC	NR	NR	NR	NR	NC	NR	NR	NC
RDX	NR	ND	NC	NR	NR	NR	NR	NC	NR	NR	NC
2,4-DNT	NR	ND	NC	NR	NR	NR	NR	NC	NR	NR	NC
PETROLEUM HYDROCARBONS (ppm)	NR	NR	NC	NR	NR	NR	NR	NC	NR	NR	NC

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

5302DCER.005

TABLE 2. SUMMARY OF SPLIT SAMPLE RESULTS FOR ORGANIC COMPOUNDS (Continued)

SAMPLE LOCATION:	04-006-M001			04-001-W001					02-001-D001			
SAMPLE MATRIX:	GROUND WATER			SURFACE WATER					SEDIMENT			
PARAMETER	VERSAR SPLIT (ug/l)	WESTON SAMPLE (ug/l)	RELATIVE PERCENT DIFFERENCE	VERSAR SPLIT (ug/l)	VERSAR DUPLICATE (ug/l)	WESTON SAMPLE (ug/l)	WESTON DUPLICATE (ug/l)	RELATIVE* PERCENT DIFFERENCE	VERSAR SPLIT (mg/kg)	VERSAR DUPLICATE (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE* PERCENT DIFFERENCE
VOLATILES												
Methylene Chloride	ND	ND	0.0	ND	ND	30 B	29 B	NC	NR	NR	NR	NC
Acetone	ND	52.0	NC	ND	ND	32 B	39 B	NC	NR	NR	NR	NC
Chloroform	ND	ND	0.0	ND	ND	ND	ND	0.0	NR	NR	NR	NC
Carbon Disulfide	ND	ND	0.0	ND	ND	1 JB	1 JB	NC	NR	NR	NR	NC
1,2-Dichloroethene	ND	ND	0.0	ND	ND	ND	ND	0.0	NR	NR	NR	NC
Trichloroethene	ND	ND	0.0	ND	ND	ND	ND	0.0	NR	NR	NR	NC
Benzene	ND	ND	0.0	ND	ND	ND	ND	0.0	NR	NR	NR	NC
SEMIVOLATILES												
bis(2-ethylhexyl) phthalate	ND	ND	0.0	NR	NR	NR	NR	NC	NR	NR	NR	NC
Di-n-butyl phthalate	ND	ND	0.0	NR	NR	NR	NR	NC	NR	NR	NR	NC
PESTICIDES/PCBs												
Endosulfan I	0.0092 J	ND	NC	NR	NR	NR	NR	NC	NR	NR	NR	NC
EXPLOSIVES												
Nitrocellulose	NR	NR	NC	NR	NR	NR	NR	NC	ND	ND	ND	0.0
Pentaerythritol-tetranitrate	NR	NR	NC	NR	NR	NR	NR	NC	ND	ND	ND	0.0
Picric Acid	NR	NR	NC	NR	NR	NR	NR	NC	ND	ND	ND	0.0
RDX	NR	NR	NC	NR	NR	NR	NR	NC	ND	ND	ND	0.0
2,4-DNT	NR	NR	NC	NR	NR	NR	NR	NC	ND	ND	ND	0.0
PETROLEUM HYDROCARBONS (ppm)	NR	NR	NC	ND	NR	ND	ND	0.0	NR	NR	NR	NC

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

TABLE 2. SUMMARY OF SPLIT SAMPLE RESULTS FOR ORGANIC COMPOUNDS (Continued)

SAMPLE LOCATION:	04-002-D001			
SAMPLE MATRIX:	SEDIMENT			
PARAMETER	VERSAR SPLIT (mg/kg)	VERSAR DUPLICATE (mg/kg)	WESTON SAMPLE (mg/kg)	RELATIVE* PERCENT DIFFERENCE
VOLATILES				
Methylene Chloride	ND	ND	100 B	NC
Acetone	98 JB	250 JB	69 B	86.4
Chloroform	ND	ND	ND	0.0
Carbon Disulfide	ND	ND	2 J	NC
1,2-Dichloroethene	ND	ND	ND	0.0
Trichloroethene	ND	ND	ND	0.0
Benzene	ND	ND	ND	0.0
SEMIVOLATILES				
bis(2-ethylhexyl) phthalate	ND	ND	370 J	NC
Di-n-butyl phthalate	ND	ND	ND	0.0
PESTICIDES/PCBs				
Endosulfan I	ND	ND	ND	0.0
EXPLOSIVES				
Nitrocellulose	NR	NR	NR	NC
Pentaerythritol-tetranitrate	NR	NR	NR	NC
Picric Acid	NR	NR	NR	NC
RDX	NR	NR	NR	NC
2,4-DNT	NR	NR	NR	NC
PETROLEUM HYDROCARBONS (ppm)	NR	NR	NR	NC

ND = Not Detected; NR = Not Reported (i.e., analysis was not requested); NC = Not Calculated; J = indicates an estimated value;
B = indicates that analyte was found in the associated laboratory blank; N = indicates spike recovery was not within control limits
* = Relative percent differences were calculated for split samples involving duplicates by using the average duplicate concentration.

5302DCER.005

was prepared for the TAL inorganic compounds (see Table 1), and one table was prepared for the TCL organic compounds, explosives, and TPH (see Table 2).

After summarizing the split sample data, the analytical results for the Versar and Weston samples were compared by calculating the relative percent difference (RPD) between the sample results. The RPD is a measure of precision and is defined as the difference between the split sample values divided by the average of the split sample values. The RPD is calculated as follows:

$$RPD = \frac{|X_1 - X_2|}{(X_1 + X_2)/2} \times 100\%$$

Where:

X_1 = concentration of specific parameter in sample
X_2 = concentration of specific parameter in split sample
$|X_1 - X_2|$ = absolute value of difference between concentrations
$(X_1 + X_2)/2$ = average concentration of split samples

If duplicate samples were collected by either Versar or Weston, or both, at any sample location, the average of the duplicate values was used to calculate the RPD. If the specific parameter was not detected in either the Weston sample or the Versar split, the RPD was assumed to be zero. The calculated RPD values are also shown in Table 1 and Table 2.

In addition to evaluating and summarizing the split sample data, Versar reviewed all of the Weston data, including the data for the locations that were not split, to determine the primary contaminants of interest at each sample location. Versar then reviewed Weston's proposed round two sampling to determine whether it adequately addressed the contaminants of concern at each site. Versar's findings from this review are discussed in Section 4.0.

3.0 SPECIFIC COMMENTS

In general, the data presented in Table 1 and Table 2 indicate that the results of the Weston samples and the Versar splits were comparable. The RPD is generally below 50 percent, which indicates good precision between field split samples. In almost all cases where the RPD exceeded 50 percent, the particular parameter was either found in the associated laboratory blank, or the sample concentration was at or near the method detection limit, which results in RPD values that are biased high. Including the RPD values of zero for the not detected parameters, the average RPD for the metals split samples is 17.8 percent. Excluding the zero RPD values for the not detected parameters, the average RPD for the metals split samples is 26.7 percent, which indicates excellent precision between split samples.

The data in Table 1 also indicate that, in general, the concentrations in the Weston samples were slightly higher than those found in the corresponding Versar splits. Therefore, it is unlikely that Weston reported "false negatives" for the sample locations that were not split by Versar.

The data in Table 1 and Table 2 also indicate that metals are the primary contaminants of interest detected in the split samples. Beryllium, cadmium, chromium, and lead appear to be the most significant contaminants found, because they were detected at levels that exceeded primary drinking water standards and NJDEP guidelines.

As shown in Table 2, very few organic compounds were detected in either the Weston sample or the Versar split. Only seven volatile organic compounds (i.e., methylene chloride; acetone; chloroform; carbon disulfide; 1,2-dichloroethene; trichloroethene; and benzene), two semivolatile organic compounds (i.e., bis(2-ethylhexyl)phthalate and di-n-butylphthalate), and one pesticide/PCB (i.e., endosulfan I) were detected in any of the split samples analyzed for TCL organics. In addition, four of these compounds, chloroform, benzene, di-n-butylphthalate, and endosulfan I, were detected in only one sample at an estimated concentration at or below the detection limit.

In some cases, an organic compound was detected in either the Weston sample or the Versar split, but not in both. For the majority of these cases, the organic compound was detected at or near the detection limit, was found in

the associated laboratory blank, or was a common laboratory contaminant (e.g., methylene chloride, acetone, and bis(2-ethylhexyl)phthalate). However, there were some exceptions. For example, 1,2-dichloroethene was detected in the Weston samples collected from monitoring wells 4-2 and 4-5, but was not detected in the corresponding Versar splits. Similarly, trichloroethene was detected in the Weston sample from well 4-5, but was not detected in the Versar split.

Explosives were not detected in either the Weston sample or the corresponding Versar split for all but one of the sampling locations. At site 11, soil sample SB-1, nitrocellulose and pentaerythritoltetranitrate were detected in the Versar split but not in the corresponding Weston sample. Therefore, the Weston sample results for this location may be suspect.

Total petroleum hydrocarbons (TPH) were detected in either both the Weston sample and the Versar split, or in neither the Weston sample or the Versar split. The average RPD for the TPH split samples is 16.8 percent, suggesting that the TPH results are valid and reproducible.

4.0 PROPOSED ROUND TWO SAMPLING EVALUATION

Versar reviewed Weston's data from the round one sampling and evaluated the proposed round two sampling with respect to this data. In general, Weston proposes to collect ground water samples from all wells at each site for the parameters that were detected in any samples from that site during the round one sampling. During round two sampling, only ground water samples will be collected. Versar believes that this is a sound approach and will yield valuable data. However, our review of the round one data and the proposed round two sampling raised the following questions and comments.

- At site 5, there are currently eight monitoring wells installed, however, Weston proposes to sample only seven. Therefore, they should indicate which well will not be sampled and the rationale for not sampling it, or should propose to sample eight wells for the parameters indicated.

- At site 10, semivolatile organic compounds were detected in the sediment, but not in the ground water. Weston proposes to sample the ground water for only volatile organics, metals, and typical landfill parameters. Because semivolatiles were found in the sediment during the round one sampling, Weston may want to consider also sampling the ground water for semivolatile organic compounds.

- During the round one sampling at site 11, the Versar split sample collected at location SB-1 contained explosives that were not detected in the Weston sample. Although Weston's round one ground water sampling indicated that no explosives were detected, they may want to re-sample the wells at site 11 for explosives.

- During round one sampling, low concentrations of pesticides were detected in the ground water samples from wells 19-2 and 19-6 at site 19. Weston should either sample these wells for pesticides during the round two sampling, or provide rationale for not sampling these wells for pesticides.

- Some of the highest concentrations of semivolatile organic compounds and metals found at NWS Earle were detected at sites 20 and 22 in the soil and sediment samples from round one. Because no wells are present at these sites, no sampling is proposed for round two. However, because of the high concentrations of semivolatiles and metals in the soils and sediments, Weston should consider installing ground water monitoring wells at these locations.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Between March 1 and March 18, 1991, Versar accepted split samples during the round one sampling at the Naval Weapons Station (NWS) Earle site in Colts Neck, New Jersey. During this sampling event, Weston collected soil, ground water, surface water, and sediment samples from 11 different sites at NWS Earle. The samples were analyzed for a variety of parameters including TCL organics, TAL inorganics, explosives, and total petroleum hydrocarbons (TPH). Versar accepted split samples at a frequency of approximately 10 percent to evaluate the sampling and analysis procedures used by Weston.

In order to compare the analytical results for the split samples, Versar calculated the relative percent difference (RPD) for each split sample set. The average RPD was approximately 25 percent, indicating that the sample results were comparable. Therefore, the Weston sample results appear to be valid.

The analytical results indicated that metals are the primary contaminants of concern at the NWS Earle site. Several metals, including beryllium, cadmium, chromium, and lead, were detected at levels that exceeded primary drinking water standards and/or NJDEP guidelines. In general, organic compounds and explosives were not detected significantly above the method detection limit in the split samples, except in cases where they were also found in the associated laboratory blank.

Based on the results of the round one sampling, Weston has proposed analytical parameters and sample locations for the round two sampling. During round two sampling, only ground water samples will be collected. Weston has proposed to sample the monitoring wells at each site for the parameters that were detected in the round one samples. Versar agrees with this sampling approach, but provides the following recommendations for additional round two sampling.

1. Versar recommends that Weston sample all eight wells at site 5 for the parameters indicated, or else they should provide rationale for only sampling seven of the eight wells.

2. During the round one sampling at site 11, the Versar split sample collected at location SB-1 contained explosives that were not detected in the Weston sample. Therefore, although Weston's round one ground water sampling indicated that no explosives were detected, Versar recommends that Weston sample the wells at site 11 for explosives.

3. During round one sampling, low concentrations of pesticides were detected in the ground water samples from wells 19-2 and 19-6 at site 19. Versar recommends that Weston either sample these wells for pesticides during the round two sampling, or provide rationale for not sampling these wells for pesticides.

4. Some of the highest concentrations of semivolatile organic compounds and metals found at NWS Earle were detected at sites 20 and 22 in the soil and sediment samples from round one. Because no wells are present at these sites, no sampling is proposed for round two. Versar recommends that ground water monitoring wells be installed at these locations to determine whether these contaminants have leached from the soil into the ground water.

5. Versar recommends that split samples be collected at a frequency of approximately 10 percent during the round two sampling event. These split samples should be collected for metals, which are the primary contaminants of concern, and volatiles organic compounds (VOCs). The VOC samples should be collected to determine if the most commonly detected volatile organics, methylene chloride and acetone, are environmental contaminants or laboratory artifacts.