

DSC 91

ANALYTICAL RESULTS

FOR

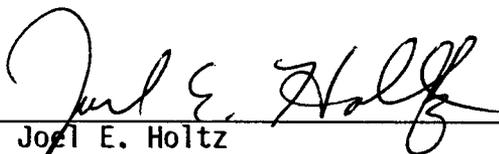
SIGNETICS

ENSECO-RMAL NO. 015418



JUNE 26, 1991

Reviewed by:


Joel E. Holtz


Sue Dalla

Introduction

This report presents the analytical results as well as supporting information to aid in the evaluation and interpretation of the data and is arranged in the following order:

- o Sample Description Information
- o Analytical Test Requests
- o Analytical Results
- o Quality Control Report

Sample Description Information

The Sample Description Information lists all of the samples received in this project together with the internal laboratory identification number assigned for each sample. Each project received at Enseco - RMAL is assigned a unique six digit number. Samples within the project are numbered sequentially. The laboratory identification number is a combination of the six digit project code and the sample sequence number.

Also given in the Sample Description Information is the Sample Type (matrix), Date of Sampling (if known) and Date of Receipt at the laboratory.

Analytical Test Requests

The Analytical Test Requests lists the analyses that were performed on each sample. The Custom Test column indicates where tests have been modified to conform to the specific requirements of this project.

SAMPLE DESCRIPTION INFORMATION
for
Signetics

Lab ID	Client ID	Matrix	Sampled		Received Date
			Date	Time	
015418-0001-SA	Ground Water Well #1	AQUEOUS	12 JUN 91	14:45	14 JUN 91
015418-0002-SA	Ground Water Well #2	AQUEOUS	12 JUN 91	11:20	14 JUN 91
015418-0003-SA	Ground Water Well #3	AQUEOUS	13 JUN 91	13:40	14 JUN 91
015418-0004-SA	Ground Water Well #4	AQUEOUS	13 JUN 91	11:40	14 JUN 91

ANALYTICAL TEST REQUESTS
for
Signetics

Lab ID: 015418	Group Code	Analysis Description	Custom Test?
0001 - 0004	A	Total Organic Carbon (TOC) Total Kjeldahl Nitrogen (TKN) Halogenated Volatile Organics	N N N

Analytical Results

The analytical results for this project are presented in the following data tables. Each data table includes sample identification information, and when available and appropriate, dates sampled, received, authorized, prepared and analyzed. The authorization data is the date when the project was defined by the client such that laboratory work could begin.

Data sheets contain a listing of the parameters measured in each test, the analytical results and the Enseco reporting limit. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e. no correction is made for moisture content.

Enseco-RMAL is no longer routinely blank-correcting analytical data. Uncorrected analytical results are reported, along with associated blank results, for all organic and metals analyses. Analytical results and blank results are reported for conventional inorganic parameters as specified in the method. This policy is described in detail in the Enseco Incorporated Quality Assurance Program Plan for Environmental Chemical Monitoring, Revision 3.3, May, 1989.

The results from the Standard Enseco QA/QC Program, which generates data which are independent of matrix effects, is provided subsequently.

Halogenated Volatile Organics



Method 8010

Client Name: Signetics
 Client ID: Ground Water Well #1
 Lab ID: 015418-0001-SA
 Matrix: AQUEOUS
 Authorized: 14 JUN 91
 Sampled: 12 JUN 91
 Prepared: NA
 Received: 14 JUN 91
 Analyzed: 18 JUN 91

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	14	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

Surrogate	Recovery	
Bromochloromethane	81	%

ND = Not detected
 NA = Not applicable

Reported By: Bret Collins

Approved By: Mike Hoffman

Halogenated Volatile Organics

Method 8010

Client Name: Signetics
 Client ID: Ground Water Well #2
 Lab ID: 015418-0002-SA
 Matrix: AQUEOUS
 Authorized: 14 JUN 91
 Sampled: 12 JUN 91
 Prepared: NA
 Received: 14 JUN 91
 Analyzed: 18 JUN 91

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	9.2	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0
Surrogate	Recovery		
Bromochloromethane	87	%	

ND = Not detected
 NA = Not applicable

Reported By: Bret Collins

Approved By: Mike Hoffman

Halogenated Volatile Organics



Method 8010

Client Name: Signetics
 Client ID: Ground Water Well #3
 Lab ID: 015418-0003-SA
 Matrix: AQUEOUS
 Authorized: 14 JUN 91

Sampled: 13 JUN 91
 Prepared: NA

Received: 14 JUN 91
 Analyzed: 18 JUN 91

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

Surrogate	Recovery	
Bromochloromethane	84	%

ND = Not detected
 NA = Not applicable

Reported By: Bret Collins

Approved By: Mike Hoffman

Halogenated Volatile Organics



Method 8010

Client Name: Signetics
 Client ID: Ground Water Well #4
 Lab ID: 015418-0004-SA
 Matrix: AQUEOUS
 Authorized: 14 JUN 91

Sampled: 13 JUN 91
 Prepared: NA

Received: 14 JUN 91
 Analyzed: 18 JUN 91

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	6.5	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0
Surrogate	Recovery		
Bromochloromethane	81	%	

) = Not detected
 \ = Not applicable

Reported By: Bret Collins

Approved By: Mike Hoffman

General Inorganics



Client Name: Signetics
 Client ID: Ground Water Well #1
 Lab ID: 015418-0001-SA
 Matrix: AQUEOUS
 Authorized: 14 JUN 91

Sampled: 12 JUN 91
 Prepared: See Below

Received: 14 JUN 91
 Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50	351.2	NA	19 JUN 91
Total Organic Carbon	0.68	mg/L	0.50	9060	NA	18 JUN 91

ND = Not detected
 NA = Not applicable

Reported By: Pam Rosas

Approved By: Toni Stovall

General Inorganics

Client Name: Signetics
 Client ID: Ground Water Well #2
 Lab ID: 015418-0002-SA
 Matrix: AQUEOUS
 Authorized: 14 JUN 91
 Sampled: 12 JUN 91
 Prepared: See Below
 Received: 14 JUN 91
 Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50	351.2	NA	19 JUN 91
Total Organic Carbon	0.87	mg/L	0.50	9060	NA	18 JUN 91

ND = Not detected
 NA = Not applicable

Reported By: Pam Rosas

Approved By: Toni Stovall

General Inorganics



Client Name: Signetics
 Client ID: Ground Water Well #3
 Lab ID: 015418-0003-SA
 Matrix: AQUEOUS
 Authorized: 14 JUN 91
 Sampled: 13 JUN 91
 Prepared: See Below
 Received: 14 JUN 91
 Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50	351.2	NA	19 JUN 91
Total Organic Carbon	ND	mg/L	0.50	9060	NA	18 JUN 91

ND = Not detected
 NA = Not applicable

Reported By: Pam Rosas

Approved By: Toni Stovall

General Inorganics

Client Name: Signetics
 Client ID: Ground Water Well #4
 Lab ID: 015418-0004-SA
 Matrix: AQUEOUS
 Authorized: 14 JUN 91
 Sampled: 13 JUN 91
 Prepared: See Below
 Received: 14 JUN 91
 Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50	351.2	NA	19 JUN 91
Total Organic Carbon	1.1	mg/L	0.50	9060	NA	18 JUN 91

ND = Not detected
 NA = Not applicable

Reported By: Pam Rosas

Approved By: Toni Stovall

Quality Control Results

The Enseco laboratories operate under a vigorous QA/QC program designed to ensure the generation of scientifically valid, legally defensible data by monitoring every aspect of laboratory operations. Routine QA/QC procedures include the use of approved methodologies, independent verification of analytical standards, use of duplicate Laboratory Control Samples to assess the precision and accuracy of the methodology on a routine basis, and a rigorous system of data review.

In addition, the Enseco laboratories maintain a comprehensive set of certifications from both state and federal governmental agencies which require frequent analyses of blind audit samples. Enseco - Rocky Mountain Analytical Laboratory is certified by the EPA under the EPA/CLP program for both Organic and Inorganic analyses, under the USATHAMA (U.S. Army) program, by the Army Corps of Engineers, and the states of Colorado, New Jersey, New York, Utah, and Florida, among others.

The standard laboratory QC package is designed to:

- 1) establish a strong, cost-effective QC program that ensures the generation of scientifically valid, legally defensible data
- 2) assess the laboratory's performance of the analytical method using control limits generated with a well-defined matrix
- 3) establish clear-cut guidelines for acceptability of analytical data so that QC decisions can be made immediately at the bench, and
- 4) provide a standard set of reportables which assures the client of the quality of his data.

The Enseco QC program is based upon monitoring the precision and accuracy of an analytical method by analyzing a set of Duplicate Control Samples (DCS) at frequent, well-defined intervals. Each DCS is a well-characterized matrix which is spiked with target compounds at 5-100 times the reporting limit, depending upon the methodology being monitored. The purpose of the DCS is not to duplicate the sample matrix, but rather to provide an interference-free, homogeneous matrix from which to gather data to establish control limits. These limits are used to determine whether data generated by the laboratory on any given day is in control.

Control limits for accuracy (percent recovery) are based on the average, historical percent recovery +/- 3 standard deviation units. Control limits for precision (relative percent difference) range from 0 (identical duplicate DCS results) to the average, historical relative percent difference + 3 standard deviation units. These control limits are fairly narrow based on the consistency of the matrix being monitored and are updated on a quarterly basis.

For each batch of samples analyzed, an additional control measure is taken in the form of a Single Control Sample (SCS). The SCS consists of a control matrix that is spiked with either representative target compounds or surrogate compounds appropriate to the method being used. An SCS is prepared for each sample lot for which the DCS pair are not analyzed.

Accuracy for DCS and SCS is measured by Percent Recovery.

$$\% \text{ Recovery} = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Precision for DCS is measured by Relative Percent Difference (RPD).

$$\text{RPD} = \frac{|\text{Measured Concentration DCS1} - \text{Measured Concentration DCS2}|}{(\text{Measured Concentration DCS1} + \text{Measured Concentration DCS2})/2} \times 100$$

All samples analyzed concurrently by the same test are assigned the same QC lot number. Projects which contain numerous samples, analyzed over several days, may have multiple QC lot numbers associated with each test. The QC information which follows includes a listing of the QC lot numbers associated with each of the samples reported, DCS and SCS (where applicable) recoveries from the QC lots associated with the samples, and control limits for these lots. The QC data is reported by test code, in the order that the tests are reported in the analytical results section of this report.

QC LOT ASSIGNMENT REPORT
Volatile Organics by GC

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
015418-0001-SA	AQUEOUS	601-A	17 JUN 91-F	18 JUN 91-F
015418-0002-SA	AQUEOUS	601-A	17 JUN 91-F	18 JUN 91-F
015418-0003-SA	AQUEOUS	601-A	17 JUN 91-F	18 JUN 91-F
015418-0004-SA	AQUEOUS	601-A	17 JUN 91-F	18 JUN 91-F

DUPLICATE CONTROL SAMPLE REPORT
 Volatile Organics by GC

Analyte	Concentration Spiked	Concentration Measured		AVG	Accuracy Average(%)		Precision (RPD)		
		DCS1	DCS2		DCS	Limits	DCS	Limit	
Category: 601-A									
Matrix: AQUEOUS									
QC Lot: 17 JUN 91-F									
Concentration Units: ug/L									
1,1-Dichloroethane	5.0	4.85	4.98	4.92	98	80-130	2.6	20	
Chloroform	5.0	5.49	5.53	5.51	110	80-120	0.7	20	
Bromodichloromethane	10	8.73	8.76	8.74	87	80-120	0.3	20	
Trichloroethene	5.0	5.55	5.63	5.59	112	70-120	1.4	20	
Chlorobenzene	5.0	4.73	4.77	4.75	95	80-120	0.8	20	

Calculations are performed before rounding to avoid round-off errors in calculated results.

SINGLE CONTROL SAMPLE REPORT
Volatile Organics by GC

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	SCS	Limits
Category: 601-A				
Matrix: AQUEOUS				
QC Lot: 17 JUN 91-F				
QC Run: 18 JUN 91-F				
Concentration Units: ug/L				
Bromochloromethane	5.00	4.30	86	20-160

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Volatile Organics by GC

Analyte	Result	Units	Reporting Limit
Test: 601-A			
Matrix: AQUEOUS			
QC Lot: 17 JUN 91-F	QC Run: 18 JUN 91-F		
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

QC LOT ASSIGNMENT REPORT
Wet Chemistry Analysis and Preparation

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
015418-0001-SA	AQUEOUS	TOC-A	18 JUN 91-A	-
015418-0001-SA	AQUEOUS	TKN-A	18 JUN 91-A	18 JUN 91-A
015418-0002-SA	AQUEOUS	TOC-A	18 JUN 91-A	-
015418-0002-SA	AQUEOUS	TKN-A	18 JUN 91-A	18 JUN 91-A
015418-0003-SA	AQUEOUS	TOC-A	18 JUN 91-A	-
015418-0003-SA	AQUEOUS	TKN-A	18 JUN 91-A	18 JUN 91-A
015418-0004-SA	AQUEOUS	TOC-A	18 JUN 91-A	-
015418-0004-SA	AQUEOUS	TKN-A	18 JUN 91-A	18 JUN 91-A

DUPLICATE CONTROL SAMPLE REPORT
Wet Chemistry Analysis and Preparation

Analyte	Concentration Spiked	Concentration Measured		AVG	Accuracy Average(%)		Precision (RPD)		
		DCS1	DCS2		DCS	Limits	DCS	Limit	
Category: TOC-A Matrix: AQUEOUS QC Lot: 18 JUN 91-A Concentration Units: mg/L									
Total Organic Carbon	25	25.3	25.5	25.4	102	91-109	0.8	20	
Category: TKN-A Matrix: AQUEOUS QC Lot: 18 JUN 91-A Concentration Units: mg/L									
Total Kjeldahl Nitrogen as N	1.8	1.85	1.69	1.77	98	78-122	9.0	20	

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Wet Chemistry Analysis and Preparation

Analyte	Result	Units	Reporting Limit
Test: TKN-TEC-A			
Matrix: AQUEOUS			
QC Lot: 18 JUN 91-A QC Run: 18 JUN 91-A			
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50