

**ULSTER COUNTY RESOURCE RECOVERY AGENCY
INTERIM CONSOLIDATION LANDFILL AT NEW PALTZ**

**POST CLOSURE MONITORING AND
MAINTENANCE MANUAL**

NYSDEC Facility No. 56S13

CHA Project No. 3581.07.03

**October, 1994
(Revised November, 1994)
(Revised February, 1995)**

Prepared by:

**CLOUGH, HARBOUR & ASSOCIATES
ENGINEERS, SURVEYORS, PLANNERS &
LANDSCAPE ARCHITECTS
III Winners Circle
Albany, New York 12205**

(518) 453-4500

Table of Contents

Volume I
Volume II

Environmental Monitoring Plan
Site Analytical Plan

1.0 INTRODUCTION

This Post-Closure Monitoring and Maintenance Operations Manual has been prepared for the Ulster County Resource Recovery Agency (the Agency) for the Interim Consolidation Landfill at New Paltz (the Landfill) by Clough, Harbour & Associates, in accordance with 6 NYCRR Part 360 effective October 9, 1993. This manual describes all aspects of the groundwater and gas monitoring problems, as well as the site inspection and maintenance procedures that shall be performed after final closure of the Landfill. This report is intended to serve as a summary and a guide for all monitoring and maintenance of the Landfill for a minimum of thirty (30) years. The manual consists of two (2) separate volumes, a Site Maintenance Program will be prepared upon closure of this facility, as follows:

- Environmental Monitoring Plan
- Site Analytical Plan

The list of phone numbers below has been included to serve as a quick reference of Agency, Town of New Paltz and area personnel in case of emergency or other inquiries in reference to the Landfill.

Ulster County Resource Recovery Agency	(914)336-0600
UCRRA - Landfill Manager	(914)339-1223
Fire Department	(914)255-1323
Ambulance	(914)255-1323
Town Police	(914)255-1323
State Police	(914)691-2922

**ULSTER COUNTY RESOURCE RECOVERY AGENCY
INTERIM CONSOLIDATION LANDFILL AT NEW PALTZ**

ENVIRONMENTAL MONITORING PLAN

NYSDEC Facility No. 56S13

CHA Project No. 3581.07.02

July, 1993

(Revised October, 1994)

(Revised January, 1995)

Prepared by:

**CLOUGH, HARBOUR & ASSOCIATES
ENGINEERS, SURVEYORS, PLANNERS &
LANDSCAPE ARCHITECTS**

**III Winners Circle
Albany, New York 12205**

(518) 453-4500

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1-1
2.0 EXCEPTIONS TO PART 360 REGULATIONS	2-1
3.0 MONITORING NETWORK	3-1
3.1 GROUNDWATER SAMPLING POINTS	3-1
3.2 SURFACE WATER AND SEDIMENT SAMPLING POINTS	3-4
3.3 LEACHATE SAMPLING	3-4
4.0 EXISTING WATER QUALITY MONITORING	4-1
5.0 OPERATIONAL WATER QUALITY MONITORING	5-1
6.0 CONTINGENCY WATER QUALITY MONITORING	6-1
7.0 DATA EVALUATION AND REPORTING	7-1
7.1 DATA QUALITY ASSESSMENT	7-1
7.2 DATA HANDLING	7-2
7.3 DATA INTERPRETATION	7-3
7.4 DATA REPORTING	7-3

LIST OF FIGURES

FIGURE 1	Site Location Map
FIGURE 2	Site Map
FIGURE 3	Surface Water/Sediment Monitoring Points
FIGURE 4	Flow Diagram - Operational Water Quality Monitoring
FIGURE 5	Flow Diagram - Contingency Water Quality Monitoring

LIST OF TABLES

TABLE 1	Summary of Monitoring Points
TABLE 2	Groundwater Protection Standards for Water Quality Parameters

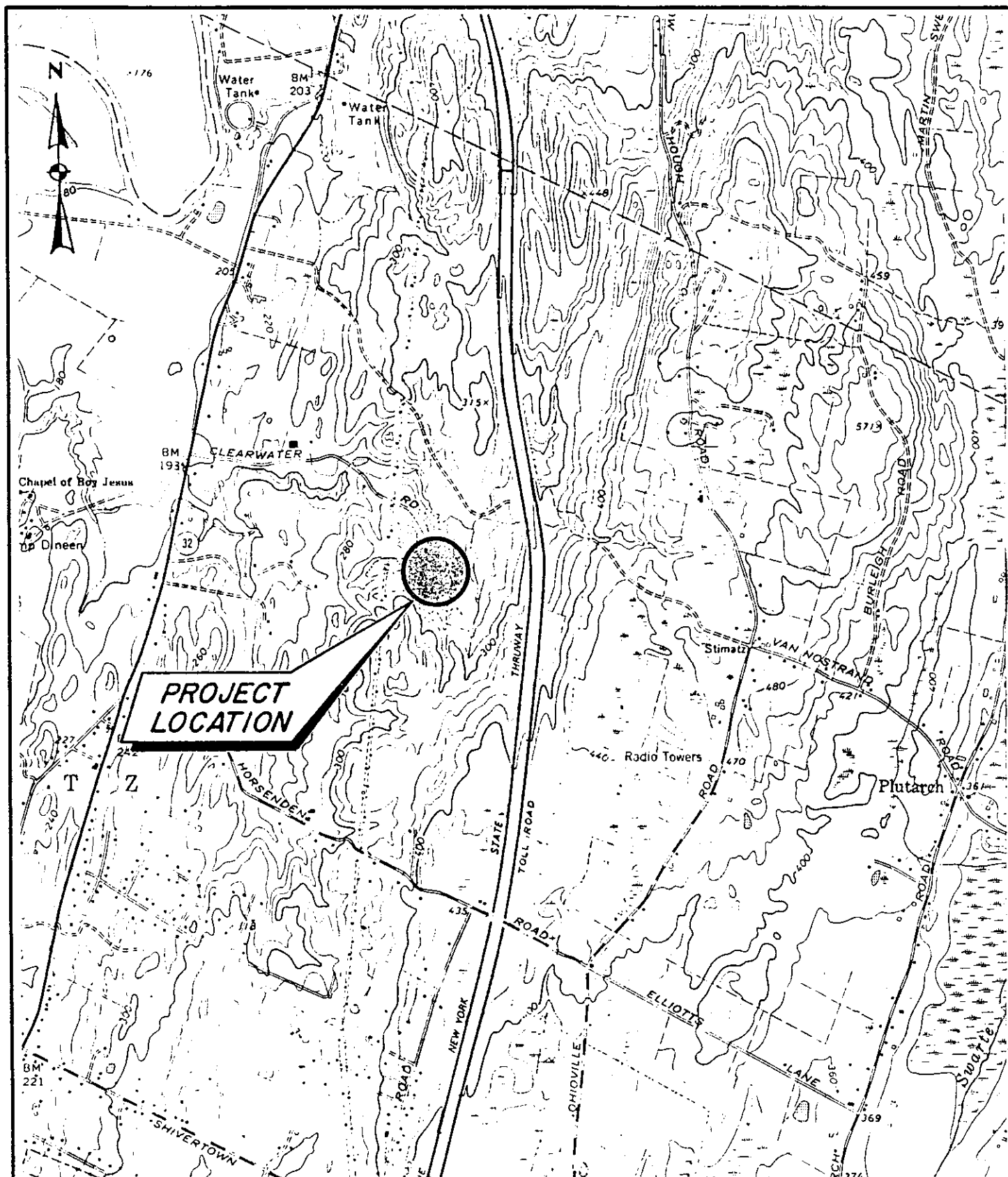
1.0 INTRODUCTION

This Environmental Monitoring Plan (EMP) describes the environmental monitoring of ground water, surface water, sediment, and leachate that will be performed at the Interim Consolidation Landfill at New Paltz. The Interim Consolidation Landfill at New Paltz is an unlined landfill located in the Town of New Paltz, Ulster County, New York (Figure 1).

Specifically, the EMP describes the on-site and off-site monitoring network, the schedule for sampling, the analytical parameters to be monitored, and the procedures that will be used in evaluating the analytical data for the landfill. The EMP has been developed in accordance with the New York State Department of Environmental Conservation (NYSDEC) current 6 NYCRR Part 360-2.11(c) Solid Waste Management Facilities Regulations.

Procedures for sample collection and analysis and a description of the data quality objectives for this project are described in the Site Analytical Plan, which is submitted under separate cover.

Typically, an EMP would consist of three plans; an Existing Water Quality Plan, an Operational Water Quality Plan, and a Contingency Water Quality Plan. Existing water quality is intended to be established prior to the deposition of any waste in a landfill. However, because the Interim Consolidation Landfill at New Paltz is an existing landfill, existing water quality cannot be established and therefore this EMP does not contain an Existing Water Quality Plan. The EMP does contain an Operational Water Quality Plan



SOURCE: NYSDOT 7.5' Topographic
QUADRANGLE: ROSENDALE, NY

SCALE: 1"=2000'



**CLOUGH, HARBOUR
& ASSOCIATES**
ENGINEERS, SURVEYORS & PLANNERS
III WINNERS CIRCLE ALBANY, NEW YORK, 12205

ULSTER COUNTY RESOURCE RECOVERY AGENCY
INTERIM CONSOLIDATION LANDFILL AT NEW PALTZ
TOWN OF NEW PALTZ, ULSTER COUNTY
STATE OF NEW YORK

FIGURE 1

SITE LOCATION MAP

to be implemented during the operational, closure, and post-closure periods for the landfill. This EMP also contains a Contingency Water Quality Monitoring Plan to be implemented at times when significant increases are noted in water quality monitoring parameters. Further details regarding triggers for initiating contingency monitoring are discussed below.

2.0 EXCEPTIONS TO PART 360 REGULATIONS

The Interim Consolidation Landfill at New Paltz is an existing unlined landfill, therefore, evidence of landfill leachate infiltration affecting regional surface waters and groundwaters would not be unexpected and has already been demonstrated. Because the focus of the Part 360 regulations regarding environmental monitoring are to detect leaks from lined landfills, certain aspects of the regulations do not appear to be especially relevant to this particular landfill and would cause an undue cost burden to comply with all regulations. Because of this condition, it is important to note that this EMP contains 4 provisions that do not comply with Part 360 regulations. The provisions are as follows:

1. Under Operational Water Quality Monitoring, only significant increases in the baseline parameters of volatile organic compounds, toxic metals and cyanide will be cause to trigger Contingency Water Quality Monitoring.
2. If Contingency Monitoring is triggered, after the initial round of samples is collected, an additional 2 rounds of samples collected within 30 days of receiving the results from the initial round will not be collected. This work will not be performed because of the logistical difficulty in meeting the schedule and because of the large cost burden.
3. If Contingency Monitoring is triggered, after the initial round of samples is collected, only the affected monitoring points will be sampled for those expanded parameters previously detected at each well. A sample from the upgradient monitoring point will be analyzed for all parameters collectively

being analyzed at the downgradient monitoring points.

4. Under Contingency Monitoring, on an annual basis, all monitoring points must be sampled and analyzed for expanded parameters. However, as described above, on a continuing basis under Contingency Monitoring, samples will only be analyzed for the specific expanded parameters that have previously been detected at each monitoring point.

3.0 MONITORING NETWORK

The monitoring points for the Interim Consolidation Landfill at New Paltz consists of groundwater monitoring wells screened in the both the bedrock and in the overburden, monitoring points for surface water and sediment, and monitoring points for leachate. Table 1 provides a list of all proposed monitoring points, sampling parameters, monitoring frequency, designation of upgradient and downgradient points, and geologic units monitored.

3.1 GROUNDWATER SAMPLING POINTS

There are seven downgradient monitoring wells and one upgradient monitoring well included in the environmental monitoring network for the landfill (Figure 2). The bedrock wells are designated with a "D", and the overburden wells with an "S". One deep bedrock well is designated with "CHA".

The locations of these monitoring wells have been chosen to account for existing well locations, site geology, hydrogeologic units, groundwater flow rates, and the nature of potential contaminants disposed of at the facility. The monitoring wells are located to detect landfill-derived contamination.

TABLE 1

**Ulster County Resource Recovery Agency
Interim Consolidation Landfill at New Paltz
Environmental Monitoring Plan**

Summary of Monitoring Points

MONITORING POINT	SAMPLING FREQUENCY	SAMPLING PARAMETERS	MEDIA	LOCATION	GEOLOGIC UNIT	TOTAL DEPTH (ft bls)
MW-1D	Quarterly	2 Baseline/2 Routine	Ground Water	Downgradient	Bedrock	18.11
MW-2S	Quarterly	2 Baseline/2 Routine	Ground Water	Downgradient	Overburden	15.2
MW-2D	Quarterly	2 Baseline/2 Routine	Ground Water	Downgradient	Bedrock	34.7
MW-3D	Quarterly	2 Baseline/2 Routine	Ground Water	Downgradient	Bedrock	31.2
MW-4D	Quarterly	2 Baseline/2 Routine	Ground Water	Upgradient	Bedrock	22.8
MW-5S	Quarterly	2 Baseline/2 Routine	Ground Water	Downgradient	Overburden	15.5
MW-5D	Quarterly	2 Baseline/2 Routine	Ground Water	Downgradient	Bedrock	28.6
CHA-5	Quarterly	2 Baseline/2 Routine	Ground Water	Downgradient	Bedrock	98.0
SW-1/SED-1	Quarterly	2 Baseline/2 Routine*	Surface Water/Sediment	Downgradient	NA	NA
SW-2/SED-2	Quarterly	2 Baseline/2 Routine*	Surface Water/Sediment	Upgradient	NA	NA
SW-3/SED-3	Quarterly	2 Baseline/2 Routine*	Surface Water/Sediment	Upgradient	NA	NA
L-1	Semi-Annually	Expanded	Leachate	Downgradient	NA	NA

* Sediment Samples analyzed for Priority Pollutant Metals and PCBs only.

NA - Not Applicable

ND - No Data

D:\3561\07\02\NP\SITEMP.dwg J.FORTE 2/16/95 1"=150'



LEGEND

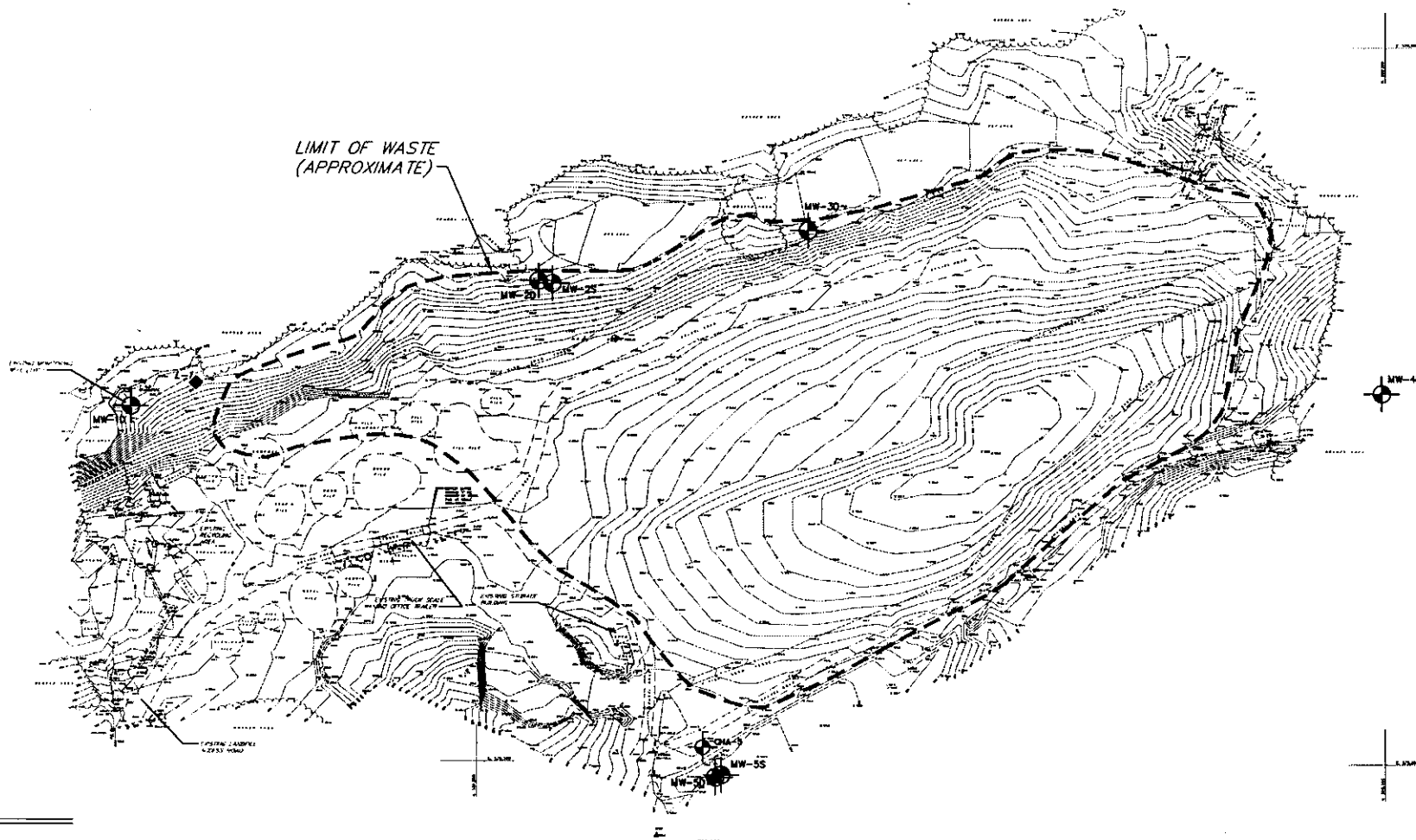
LEACHATE
COLLECTION
POINT



GROUNDWATER
MONITORING
WELL



LIMIT OF WASTE
(APPROXIMATE)



SCALE: 1" = 150'



**CLOUGH, HARBOUR
& ASSOCIATES**
ENGINEERS, SURVEYORS, PLANNERS
& LANDSCAPE ARCHITECTS
111 WINNERS CIRCLE ALBANY, NEW YORK, 12205

FIGURE 2

DATE FEBRUARY, 1995

ULSTER COUNTY RESOURCE RECOVERY AGENCY
INTERIM CONSOLIDATION LANDFILL AT NEW PALTZ
TOWN OF NEW PALTZ, ULSTER COUNTY
STATE OF NEW YORK

SITE MAP

3.2 SURFACE WATER AND SEDIMENT SAMPLING POINTS

An intermittent stream flows north on the east side of the fill area and joins another stream at the north end of the fill area. A pond lies to the south of the Landfill. Three surface water and sediment monitoring points have been established and will be sampled during operational and contingency water quality monitoring, if needed. An upgradient location has been established at the pond and has been designated SW-3/SED-3. The downgradient monitoring points are located on the above-mentioned streams. The location of these monitoring points are shown on Figure 3. Sample parameters and sampling frequency for these monitoring points are outlined on Table 1.

3.3 LEACHATE SAMPLING

A manhole located at the northeast end of the Landfill serves as the access point to the leachate collection system (Figure 2). One representative leachate sample will be collected from the manhole on a semi-annual basis and analyzed for expanded parameters.



COPYRIGHT
© 1995

**CLOUGH, HARBOUR
& ASSOCIATES**

ENGINEERS, SURVEYORS, PLANNERS
& LANDSCAPE ARCHITECTS
III WINNERS CIRCLE ALBANY, NEW YORK, 12205

ULSTER COUNTY RESOURCE RECOVERY AGENCY
INTERIM CONSOLIDATION LANDFILL AT NEW PALTZ
TOWN OF NEW PALTZ, ULSTER COUNTY
STATE OF NEW YORK

FIGURE 3

SURFACE WATER/SEDIMENT MONITORING POINTS

4.0 EXISTING WATER QUALITY MONITORING

As mentioned in the Introduction, since operation of the Interim Consolidation Landfill at New Paltz began prior to water quality monitoring, existing water quality cannot be established for this landfill. However, in order to evaluate potential changes in water quality over time, existing water quality must be established in some manner.

Existing water quality will be defined in two ways. For systems where upgradient monitoring points exist (bedrock aquifer), existing water quality will be defined and based on the mean concentration of each parameter measured at the upgradient monitoring point during Operational and Contingency monitoring. The existing water quality value may change through time as the mean concentration of all parameters measured at the upgradient monitoring point will continually be recalculated as data are collected from each quarterly monitoring event.

For systems where upgradient monitoring points do not exist (e.g., overburden aquifer), existing water quality will be defined by applicable water quality standards.

5.0 OPERATIONAL WATER QUALITY MONITORING

Operational water quality will be performed during the operational, closure, and post-closure periods of the landfill. The monitoring points used to assess operational water quality will include the seven on-site monitoring wells. Two different categories of analytical parameter scans are to be used in the monitoring program and include routine and baseline scans as defined in Part 360-2.11(d). Groundwater, surface water, and sediments samples are to be analyzed for routine parameters every other quarter and for baseline parameters on alternate quarters every year. Leachate samples will be monitored semi-annually for expanded parameters.

Within 90 days of completing the quarterly field sampling activities, a determination will be made whether or not there is a significant increase from existing water quality levels established for each parameter. This determination will be made through comparison of the groundwater quality of each parameter at each monitoring well to the existing water quality value of that parameter. A significant change (specifically, an increase in concentration) will be noted if:

1. the ground water quality for any parameter at any monitoring well exceeds the existing water quality value of an established upgradient monitoring point by three standard deviations; or
2. the groundwater quality for any parameter at any monitoring well exceeds the existing water quality and exceeds the water quality standards for the parameter specified in Part 701, 702, 703 of 6 NYCRR. Note, if upgradient

locations do not exist, then only this condition applies.

If it is determined that there is a significant increase from existing water quality levels for one or more parameters during a field sampling event for the routine parameters, excluding the field parameters, at any monitoring well, the following will be performed:

1. Within 14 days of this finding the NYSDEC will be notified of which parameters have shown significant increases from existing water quality levels; and,
2. All monitoring points will be analyzed for baseline parameters during the next quarterly sampling event.

If it is determined that there is a significant increase from existing water quality for one or more of the baseline parameters (specifically the volatile organic compounds, toxic metals, and cyanide) at any monitoring well, the following will be performed:

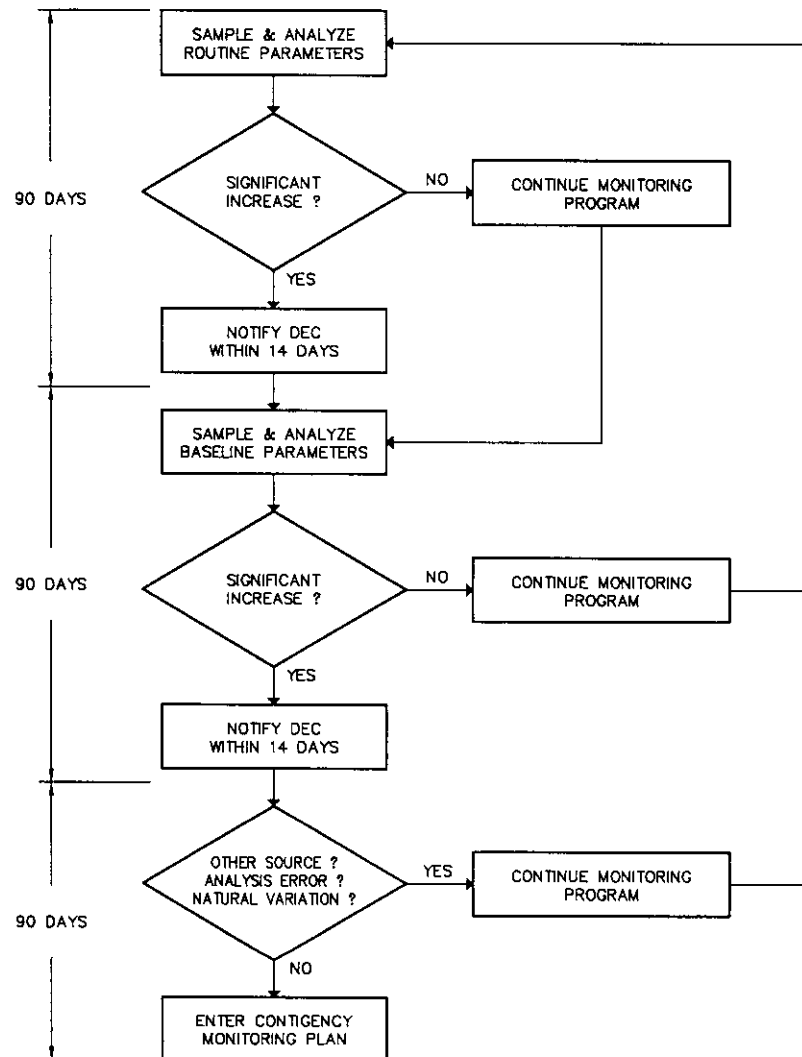
1. Within 14 days of this finding the NYSDEC will be notified of which parameters have shown significant increases from existing water quality levels; and,
2. An attempt may be made to demonstrate that a source other than the facility caused the contamination, or that the significant increase resulted from error in sampling, analysis, or natural variation in groundwater quality. A report making this demonstration will be submitted to the NYSDEC for approval.

If a successful demonstration is made to the satisfaction of the NYSDEC, operational water quality monitoring will continue as previously specified. If, after 90 days, a successful demonstration is not made, Contingency Water Quality Monitoring must be initiated.

Note that significant increases in parameters that do pose a health threat (parameters other than volatile organic compounds, toxic metals, and cyanide) will be noted, but will not trigger contingency monitoring.

Figure 4 summarizes the above described program in a flow chart.

Under Post-Closure activities for the Landfill, environmental monitoring will be performed as described for five (5) years. After 5 years, depending upon site conditions and monitoring results, the sampling and analysis requirements may be modified with the approval of the NYSDEC.



6.0 CONTINGENCY WATER QUALITY MONITORING

Should a significant increase over existing water quality be detected for one or more of the baseline parameters, as noted above, within 90 days all monitoring points will be sampled and analyzed for expanded parameters. Additional monitoring points may be added at the direction of the NYSDEC.

After obtaining the results from the initial sampling event, the following will be performed:

1. Within 14 days, NYSDEC will be notified of the expanded parameters that are detected.
2. On a quarterly basis thereafter, all monitoring points will be sampled and analyzed for all baseline parameters and all affected monitoring points for those expanded parameters that were previously detected at each point. One sample from the upgradient monitoring point will be collected and analyzed for all parameters collectively being analyzed at the downgradient monitoring points. A deletion of any of the expanded parameters may be conducted if it can be demonstrated that the removed parameters are not reasonably expected to be in or derived from the waste contained in the landfill. The demonstration must be made to the satisfaction of the NYSDEC.
3. Groundwater protection standards for all parameters detected will be established as per draft Part 360-2.11(c)(5)(iii)(f) regulations.

The groundwater protection standard for each expanded parameter detected in the groundwater shall be:

- for parameters for which a maximum contaminant level (MCL) has been promulgated under section 1412 of the Safe Drinking Water Act (codified) under 40 CFR Part 141 or for which a standard has been established pursuant to Part 701, 702, or 703 of 6 NYCRR, whichever is more stringent when the parameters are the same, the MCL or standard for that constituent.
- for parameters for which MCLs or standards have not been promulgated, the existing water quality concentration for the parameter established from on-site wells; or
- for parameters for which the existing water quality level is higher than the MCL or standard the existing water quality concentration.

Table 2 summarizes the groundwater standards for the Interim Consolidation Landfill at New Paltz, including existing water quality values for the bedrock aquifer based on the results of sampling performed to date.

If the concentrations of all expanded parameters are shown to be at or below existing water quality values for two consecutive sampling events, the facility may return to operational water quality monitoring if written approval is obtained from the NYSDEC.

If the concentrations of any expanded parameters are above existing water quality

TABLE 2
Ulster County Resource Recovery Agency
Interim Consolidation Landfill at New Paltz
Environmental Monitoring Plan

Groundwater Protection Standards for Water Quality Parameters

PARAMETER	METHOD	MDL	MEAN CONC.	TRIGGER VALUE	REGULATORY STANDARD
pH	EPA-150.1	0.1 SU	7.2	6.9-8.2	6.5-8.5(1,4,5)
Turbidity	EPA-180.1	0.1 NTU	38	127	5(1,3,4,5),50(7)
Color	EPA-110.2	1.0 CPU	6	19	15(1,3,5)
Total Dissolved Solids	EPA-160.1	1.0 mg/l	153	304	500(1,4,5)
Chemical Oxygen Demand	EPA-410.4	5.0 mg/l	14.9	76	2(4)
Sulfate	EPA-375.4	2.0 mg/l	22	57	250(1,3,4,5)
Bromide	EPA-320.1	1.0 mg/l	0.7	1.6	2(2)
Chloride	EPA-325.3	1.0 mg/l	1	4	250(1,3,4,5)
Total Kjeldahl Nitrogen	EPA-351.3	1.0 mg/l	1.3	5.7	0.5(4)
Ammonia	EPA-350.1	0.1 mg/l	0.1	0.2	2(4)
Nitrate	EPA-353.1	0.02 mg/l	0.09	0.19	10(1,3,4,5)
Phenols	EPA-420.1	0.002 mg/l	0.002	0.008	0.001(1,4),0.05(3)
Cyanide	EPA-335.2	0.01 mg/l	0.01	0.01	0.1(1,4)
Aluminum	EPA-200.7	0.03 mg/l	1.36	6.59	0.2(5)
Antimony	EPA-200.7	0.05 mg/l	0.02	0.05	0.003(2)
Arsenic	EPA-206.2	0.005 mg/l	0.003	0.004	0.025(1),0.05(3,4,5)
Barium	EPA-200.7	0.01 mg/l	0.025	0.080	1(1,4,5),2(3)
Beryllium	EPA-200.7	0.0007 mg/l	0.0021	0.0086	0.003(2)
Boron	EPA-200.7	0.016 mg/l	0.048	0.190	0.125(2),1(1,4)
Cadmium	EPA-200.7	0.003 mg/l	0.002	0.004	0.01(1,4,5),0.05(3)
Chromium	EPA-218.2	0.004 mg/l	0.003	0.013	0.05(1,5),0.1(3)
Hexavalent Chromium	SM-312B	0.02 mg/l	0.01	0.02	0.05(1,3,4,5)
Copper	EPA-200.7	0.008 mg/l	0.076	0.286	1.0(3,5),0.2(1,4)
Iron	EPA-200.7	0.019 mg/l	1.135	5.261	0.3(1,3,5)
Lead	EPA-239.2	0.003 mg/l	0.004	0.015	0.025(1),0.05(3,4,5)
Magnesium	EPA-200.7	0.5 mg/l	11	30	35(2)
Manganese	EPA-200.7	0.003 mg/l	0.416	1.460	0.3(1,3),0.05(5)
Mercury	EPA-245.1	0.00003 mg/l	0.00006	0.0002	0.002(1,3,5),0.005(4)
Nickel	EPA-200.7	0.01 mg/l	0.01	0.04	0.7(6)
Selenium	EPA-270.2	0.002 mg/l	0.001	0.002	0.01(1,3,4,5)
Silver	EPA-200.7	0.003 mg/l	0.004	0.009	0.05(1,3,4),0.1(5)
Sodium	EPA-200.7	0.5 mg/l	5.3	19.1	20-170(3),20(1,4)
Thallium	EPA-279.2	0.004 mg/l	0.003	0.007	0.004(2)

TABLE 2
Ulster County Resource Recovery Agency
Interim Consolidation Landfill at New Paltz
Environmental Monitoring Plan

Groundwater Protection Standards for Water Quality Parameters

PARAMETER	METHOD	MDL	MEAN CONC.	TRIGGER VALUE	REGULATORY STANDARD
Zinc	EPA-200.7	0.002 mg/l	0.035	0.119	5(3,5),0.3(1,4)
Volatile Organic Compounds	91-1	10-25 ug/l			
Vinyl Chloride	91-1	10 ug/l	5	5	2.5(1),5(4)
Chloromethane	91-1	10 ug/l	5	5	5(4)
Toluene	91-1	10 ug/l	5	5	5(4)
Benzene	91-1	10 ug/l	5	5	0.7(1),5(4,5)
1,1,1-Trichloroethane	91-1	10 ug/l	5	5	5(4)
1,1-Dichloroethane	91-1	10 ug/l	5	5	5(4)
Chloroethane	91-1	10 ug/l	5	5	5(4)
Chlorobenzene	91-1	10 ug/l	5	5	5(4)
Semivolatile Organic Compounds	EPA-8270	10-25 ug/l			5,50(3)
Bis(2-ethylhexyl)phthalate	EPA-8270	10 ug/l	5	5	4200(1),50(3)
1,4-Dichlorobenzene	EPA-8270	10 ug/l	5	5	4.7(1),5(3),75(5)
Pesticides	EPA-8270	0.1-1 ug/l			5,50(3)
Pronamide	EPA-8270	0.1 ug/l	0.05	0.05	50(3)
Pesticides/PCBs	EPA-8080	0.05-2 ug/l	0.025-1	0.025-1	5,50(3)
Organophosphorous Pesticides	EPA-8140	0.5 ug/l	0.025	0.025	5,50(3)
Herbicides	EPA-8150	1-5 ug/l	0.5-2.5	0.5-2.5	5,50(3)
Dinoseb	EPA-8150	5 ug/l	2.5	2.5	50(3)

Notes:

1. Title 6, Chapter X, Part 703.3 and 703.5, New York State Codes, Rules and Regulations, Classes and Quality Standards for Groundwaters (6 NYCRR 703, 703.5). Combined concentration of iron and manganese shall not exceed 0.5 ppm.
2. NYSDEC, Ambient Water Quality Standards and Guidance Values. TOGS 1.1.1, October, 1993.
3. Title 10, Chapter I, Part 5-1.52, New York State Codes, Rules and Regulations, State Sanitary Code, Drinking Water Supplies (10 NYCRR 5-1.52). Water containing more than 20 mg/l of sodium should not be used by people on severely restricted sodium diets. Water containing more than 270 mg/l of sodium should not be used by people on moderately restricted sodium diets.
4. Title 10, Chapter III, Part 170.4, New York State Codes, Rules and Regulations, Public and Sources of Water Supplies, Standards of Raw Water quality (10 NYCRR 170.4).
5. Title 40, Parts 141.11 and 143.3, Code of Federal Regulations, National Primary and Secondary Drinking Water Regulations, Maximum Contaminant Levels (40 CFR 141.11, 143.3).
6. Environmental Protection Agency Health Based Criteria, based on verified reference dose for systemic toxicants, nickel only.
7. NYSDEC, Technical and Administrative Guidance Memorandum Policy Regarding Alteration of Groundwater Samples Collected for Metals Analysis, TAGMs HWR-88-4015.

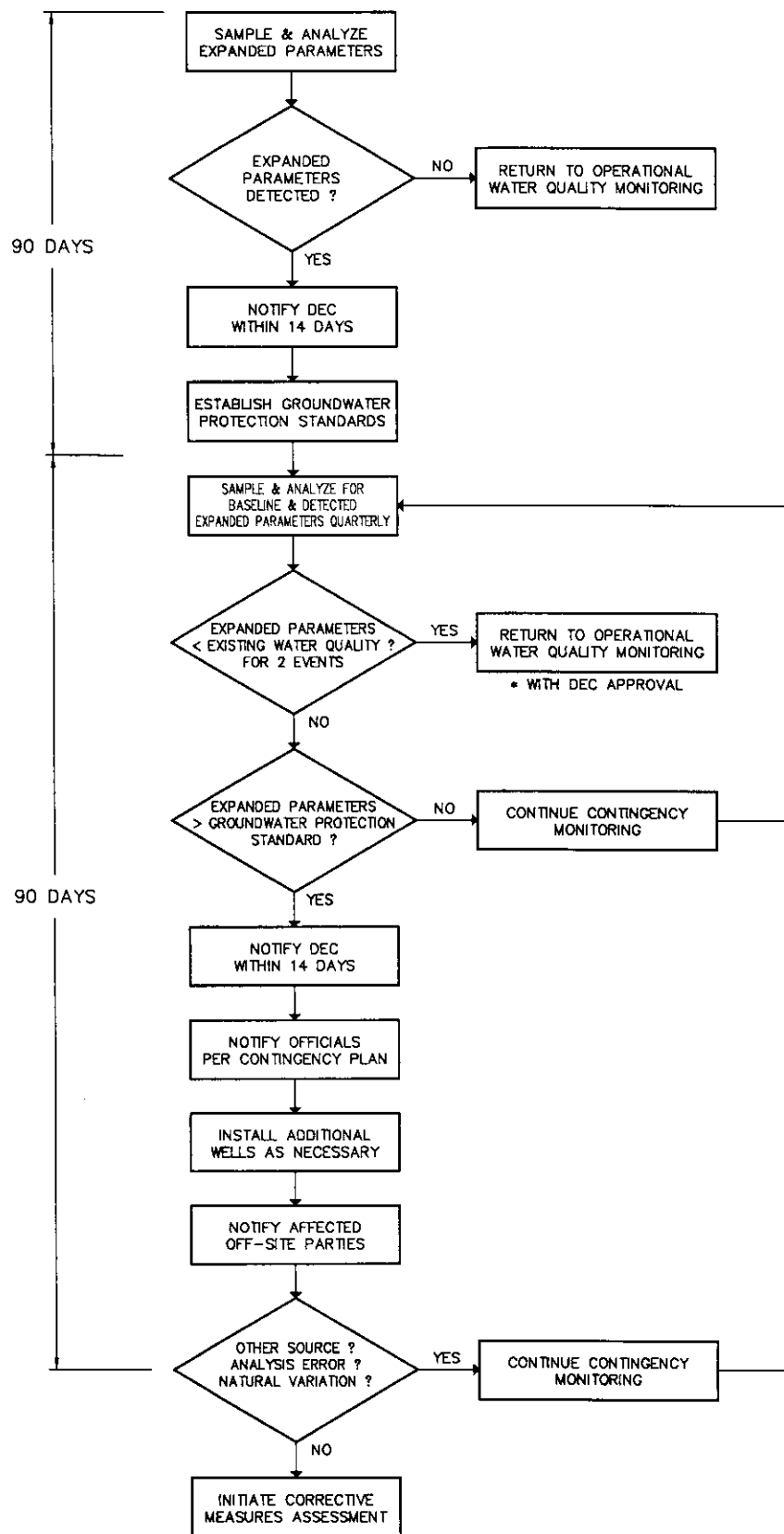
values, but all concentrations are below the groundwater protection standards established, contingency groundwater monitoring will continue.

If one or more expanded parameters are detected at significant levels above the groundwater protection standard during any sampling event, the NYSDEC and all appropriate local government officials will be notified within 14 days of the expanded parameters that have exceeded the groundwater protection standard. The following will be reviewed and if appropriate conducted:

- characterize the nature and extent of the release by installing additional monitoring wells as necessary;
- install at least one additional monitoring well at the facility boundary in the direction of contaminant migration. Sample this well and analyze the sample for expanded parameters;
- notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site if indicated by sampling of wells; and
- initiate an assessment of corrective measures as required by section 360-2.20 of the draft Part 360 regulations within 90 days; or
- demonstrate that a source other than the landfill caused the contamination, or that the significant increase resulted from error in sampling, analysis, or natural

variation in groundwater quality. This report will be submitted for approval by the NYSDEC. If approved, the facility will continue monitoring in accordance with the contingency water quality monitoring program and will return to post-closure monitoring if the expanded parameters are at or below existing water quality.

Figure 5 summarizes the above described program in a flow chart.



CLOUGH, HARBOUR & ASSOCIATES
 ENGINEERS, SURVEYORS, PLANNERS
 & LANDSCAPE ARCHITECTS
 III WINNERS CIRCLE ALBANY, NEW YORK, 12205

FLOW DIAGRAM
 CONTINGENCY WATER
 QUALITY MONITORING

FIGURE 5

7.0 DATA EVALUATION AND REPORTING

7.1 DATA QUALITY ASSESSMENT

The objective of performing a data quality assessment is to determine whether the data collected meets data quality objectives established for the sampling program as established in the site analytical plan. Specifically, this assessment is intended to identify whether significant increases in water quality parameters may be attributed to errors in sampling or analysis, as described above.

Once analytical data is received from the laboratory, the quality of the data will be determined by an independent validation of a representative portion (at least 20 %) of all data generated. The data usability analysis will be performed on all analytical data for the facility and will consist, at a minimum, of the following:

- an assessment to determine if the data quality objectives were met;
- evaluation of field duplicate results to indicate the representativeness of the samples;
- comparison of the results of all field blanks, trip blanks, and equipment rinsates with full data set to provide information concerning contaminants that may have been introduced during sampling or shipping;

- evaluation of matrix effects to assess the performance of the analytical method with respect to the sample matrix, and determine whether the data have been biased high or low due to matrix effects;
- comparison of precision, accuracy, comparability, bias, completeness, and representation.

All Quality Assurance/Quality Control (QA/QC) documentation will be submitted to the NYSDEC as described below.

7.2 DATA HANDLING

Once the data is validated, the useable data will be treated in the following manner:

- for parameters not detected above the method detection limit, one-half the value of the detection limit shall be used as the assigned value for that parameter in all calculations;
- in calculating the standard deviation for each parameter, the sample standard deviation, rather than the population standard deviation, shall be calculated until a sufficient amount of data exists (~30 points) to document that the population is normally distributed;
- the results will also be reviewed to identify data outliers. Data for parameters from the upgradient monitoring points that are greater than 3 times the

standard deviation of the existing mean for that parameter will identified as potential outliers.

7.3 DATA INTERPRETATION

The objective of data interpretation is to understand the causes that are associated with observed changes in water quality. Specifically, when observed changes in water quality occur, it is important to determine whether those changes are the result of natural variation, or the result of other causes. This objective may be met by careful integration of the field and laboratory data with geological and hydrogeological data with other appropriate data. Examples of this analysis include looking for changes in:

- groundwater flow direction;
- water table elevation;
- sources of contamination;
- water turbidity;

7.4 DATA REPORTING

Two types of reports summarizing the results of the environmental monitoring shall be submitted to NYSDEC; a quarterly report and an annual report. The quarterly report shall be submitted to the NYSDEC within 90 days of sample collection. The report will include an assessment of water quality, a data quality assessment, and a summary of the planned sampling and analysis for the next quarterly sampling event including any proposed modifications to the program.

The report will include the following tables:

- analytical results for all monitoring points for the current event and all previous events (including a designation of whether the monitoring point is upgradient or downgradient);
- the mean, standard deviation, and trigger value for each parameter at the upgradient monitoring points;
- applicable water quality and groundwater protection standards;
- the monitoring points and the parameters for which significant increases in water quality and exceedences of groundwater protection standards have occurred;

The report will also include a site map depicting the location and number of each environmental monitoring point sampled.

An annual report will be prepared and will contain a summary of water quality data collected throughout the year with a special note given to changes in water quality which occurred throughout the year.

**ULSTER COUNTY RESOURCE RECOVERY AGENCY
INTERIM CONSOLIDATION LANDFILL AT NEW PALTZ**

SITE ANALYTICAL PLAN

NYSDEC Facility No. 56S13

CHA Project No. 3581.07.02

July, 1993

(Revised February, 1995)

Prepared by:

**CLOUGH, HARBOUR & ASSOCIATES
ENGINEERS, SURVEYORS, PLANNERS &
LANDSCAPE ARCHITECTS
III Winners Circle
Albany, New York 12205**

(518) 453-4500

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 DATA QUALITY OBJECTIVES	1
3.0 ANALYTIC QUALITY ASSURANCE/ANALYTIC QUALITY CONTROL	2
4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES	2
5.0 FIELD SAMPLING PROCEDURES	3
6.0 LABORATORY PROCEDURES	4
7.0 DATA QUALITY ASSESSMENT	5
7.1 DATA VALIDATION	5
7.2 DATA USABILITY	
8.0 CORRECTIVE ACTIONS	7

1.0 INTRODUCTION

This Site Analytical Plan describes a quality assurance/quality control (QA/QC) program to collect and analyze environmental monitoring data for the operational, closure, and post-closure phases of the Interim Consolidation Landfill at New Paltz. The objective of the program is to collect data is of known and acceptable quality.

The regulatory standards and programs that are applicable to this project include the 6 NYCRR Part 360 regulations, applicable water quality standards referenced in 6 NYCRR 703, 10 NYCRR 5-1.52 and 170, TOGS 1.1.1, and 40 CFR 141 and 143, applicable sections of 40 CFR and SW-846 referencing laboratory methodologies, and applicable NYSDEC and EPA TAGMs for referencing proper sampling protocols.

The Site Analytical Plan is a companion document to the Environmental Monitoring Plan (EMP), which is submitted under separate cover. The EMP defines the monitoring network for the Landfill, the monitoring frequency, the sampling parameters to be analyzed, and discusses the use and interpretation of the data for both operational water quality monitoring and contingency water quality monitoring.

2.0 DATA QUALITY OBJECTIVES (DQOs)

The intent of this document is to define sampling and analysis methodologies that will result in precise, accurate, representative, comparable, and complete data. The data is

being collected to monitor groundwater and surface water quality in the vicinity of the Landfill over time and to specifically identify changes in water quality that may be attributed to the Landfill.

The use of blank samples, duplicate samples and/or spike samples ensures precision and accuracy in the laboratory data. Proper sampling protocols will ensure that the samples collected are representative of their original environment and that their integrity is maintained from the time of sampling through the time of analysis. The use of appropriate analytical methods and method detection limits ensures that the data is comparable between monitoring points and to applicable state and federal water quality standards. The use of standard parameter lists (routine, baseline, and expanded as defined in Part 360-2.11(d)(6)) further ensures that the data is comparable and also complete over time.

3.0 ANALYTIC QUALITY ASSURANCE/ANALYTIC QUALITY CONTROL

The general data quality objectives for the project have been stated above. The following sections describe the methods and the procedures by which these goals will be achieved. They include the use of appropriate, qualified personnel, well defined field sampling procedures, well defined laboratory procedures, procedures to validate the analytical data, and a corrective action plan to correct any problems encountered.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The success of a good QA/QC program requires qualified personnel to be involved with the project and for those personnel to have well defined roles and responsibilities. Project management and staff, such as field investigation teams and laboratory groups, all

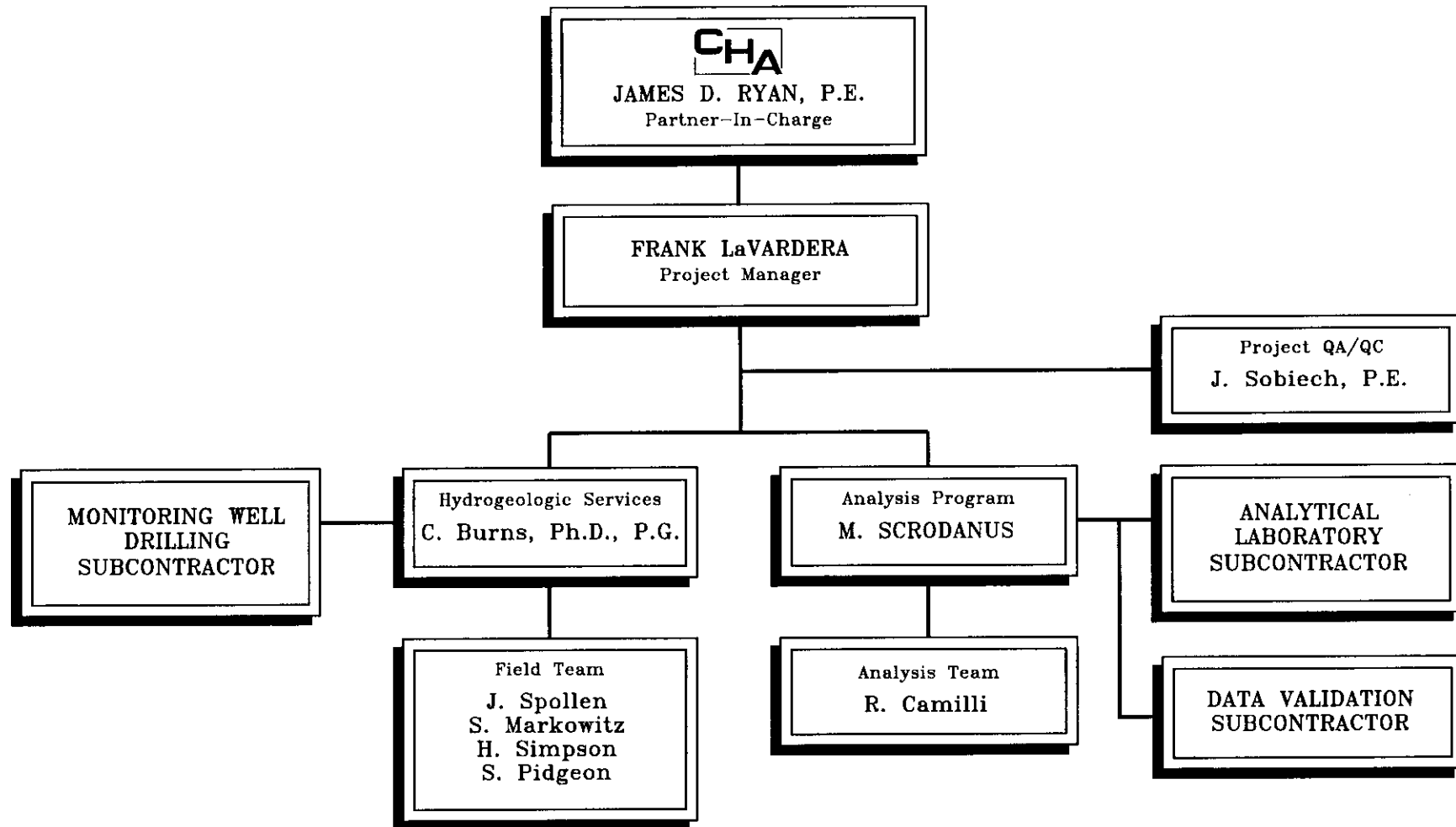
play a role in monitoring ongoing work performance in the normal course of daily responsibilities. The attached organization chart defines the key players in this project. Resumes for these individuals are included in Appendix 1.

5.0 FIELD SAMPLING PROCEDURES

Enclosed in Appendix 2 are Standard Operating Procedures describing collection of groundwater, surface water, and sediment samples. These SOPs also include information concerning the equipment decontamination, sample containers, preservation and filtration, chain-of-custody control, sample packaging, and sample shipping.

Field QA/QC for the Interim Consolidation Landfill at New Paltz site sampling events shall consist of duplicate and trip blank when samples are collected for analysis of baseline and expanded parameters. Dedicated sampling equipment will be utilized for sample collection eliminating the need to collect field blanks. Field duplicate samples are samples collected at the same point, at the same time, and in the same manner as a given sample. The duplicate samples is collected to provide statistical significance to the data generated. Field duplicate samples are collected in separate sample containers and submitted for the same analysis as the original sample. Trip blanks are reagent water which are used to determine whether contamination has resulted from sample bottle preparation, blank water quality, and/or sample handling procedures. For this project a minimum of one trip blank will be analyzed in conjunction with each Baseline round. Following ASP procedures a matrix spike/matrix spike duplicate (MS/MSD) sample is also procured, identified and analyses.

ULSTER COUNTY RESOURCE RECOVERY AGENCY INTERIM CONSOLIDATION LANDFILL AT NEW PALTZ SAMPLING AND ANALYSIS PROGRAM



**CLOUGH, HARBOUR
& ASSOCIATES**
ENGINEERS, SURVEYORS, PLANNERS
& LANDSCAPE ARCHITECTS
III WINNERS CIRCLE ALBANY, NEW YORK, 12205

6.0 LABORATORYPROCEDURES

Analytical analyses will be performed by Adirondack Environmental Services, Inc. (AES). AES holds current certification to perform the required analyses as per the NYSDOH Environmental Laboratory Approval Program (ELAP) and is certified to conduct ASP analyses.

Attached in Appendix 3 is the laboratory's Quality Assurance/Quality Control (QA/QC) Plan which outlines the laboratory's quality objectives, sampling procedures, sample custody, calibration procedures and frequency, analytical procedures, data collection, reduction, validation, and reporting, internal quality control checks, performance and system audits, preventative maintenance, data quality assessment, corrective action quality assurance reporting, and resumes of the laboratory's qualified personnel.

The QA/QC Plan also contains information concerning laboratory procedures involving receipt, storage, and handling of samples; sample scheduling to ensure holding time adherence; reagent/standard preparation; general laboratory techniques such as glassware cleaning procedures, operation of analytical balances, pipetting techniques, and use of volumetric glassware; and a description of how analytical methods are actually performed.

Minimum Method Detection Limits (MDLs) shall be sufficient to accomplish the Practical Quantitation Limits (PQLs) listed in the Water Quality Analysis Tables for the Baseline, Routing, and the Expanded Scans as referenced in the Part 360 regulations. The tables attached as Table 1 indicate the method to be used to analyze each parameter as well as the MDL of the test procedure.

7.0 DATA QUALITY ASSESSMENT

At the conclusion of each sampling and analysis event, data quality will be assessed. The assessment will consist of two phases.

7.1 DATA VALIDATION

The first phase will be independent data validation conducted by a third party. The independent data validation will be conducted on twenty percent (20%) of the data generated during the baseline rounds, at a minimum. The data validation review will consist of field records and analytic data reviewed for accuracy and defensibility as well as all AQA/AQC information including any corrective actions taken during the sampling event. In addition, all data summaries will clearly mark any data that are not representative of environmental conditions at the site or that were not generated in accordance with the SAP. Consistent with Part 360 regulations, routine round data will be validated by the analytical laboratory.

7.2 DATA USABILITY

The second phase deals with a data usability analysis for measurement of data completeness, representativeness, comparability, precision, and accuracy. The data usability analysis will be performed on all analytical data for the project to ensure DQOs are met.

Completeness of the analyses will be assessed by comparing the number of parameters intended to be analyzed with the number of parameters successfully determined and validated. The analytical data will be checked for compliance with acceptable quality control criteria.

Representativeness will be accomplished by adherence to proper sampling protocols including, but not limited to, use of dedicated sampling equipment, use of properly cleaned and preserved sample containers, purging efficiency, field data acquisition, chain-of-custody control, and adherence to proper holding times as well as evaluation of field duplicate and trip blank results and matrix affects.

Consistency in the acquisition, preparation, handling, and analysis of samples is necessary in order for the results to be compared to appropriate regulatory standards as well as results obtained in previous studies. To ensure that the comparability of analytical results with those obtained in previous for future testing existing, all samples will be analyzed according to ASP protocols and the field and laboratory data will also be integrated with geological, hydrogeological, meteorological data to provide information about the extent of contamination, if any.

Precision and accuracy of the analytical results will be the responsibility of the analytical laboratory. Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a measure of the variability of a group of measurements compared to their average value. Precision is evaluated by the analysis of laboratory

duplicates. Accuracy is a measure of the bias in a measurement system. For this project accuracy will be assessed by routine laboratory quality control samples and spiking in accordance with the appropriate analytical protocol.

8.0 CORRECTIVE ACTIONS

The following corrective action procedures have been established to assure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected to meet data quality objectives.

When a significant condition adverse to quality is noted at regional, site, laboratory, or subcontractor locations, the cause of the condition will be determined and corrective action taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the site investigation team leaders and project managers. Implementation of corrective action is verified by documented follow-up action. All project personnel have the responsibility, as part of their normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality.

Corrective actions are usually addressed on a case-by-case basis but may be initiated when:

- Predetermined acceptance standards are not attained;
- Procedure or data compiled are determined deficient;
- Equipment or instrumentation is found faulty;

- Samples or test results are questionably traceable;
- Quality assurance requirements have been violated;
- Designated approvals have been circumvented;
- System, performance, or management audits show deficiencies.

Work is audited at the main office, sites, laboratories, and subcontractor locations by the project manager and/or designated lead auditors, specifically the project's QA/QC officer. Items, activities, or documents ascertained to be in non-compliance with quality assurance requirements will be documented and corrective actions mandated. It is the project manager's responsibility to ensure that all recommended corrective actions are produced, accepted, and received in a timely manner. The project manager also approves all corrective action issues by the staff.

Corrective actions required by the laboratory for data assessment/validation reasons shall be coordinated by the project's QA/QC officer in a timely manner.

TABLE 1
Ulster County Resource Recovery Agency
Interim Consolidation Landfill at New Paltz
Environmental Monitoring Plan

Groundwater Protection Standards for Water Quality Parameters

PARAMETER	METHOD	MDL	MEAN CONC.	TRIGGER VALUE	REGULATORY STANDARD
pH	EPA-150.1	0.1 SU	7.2	6.9-8.2	6.5-8.5(1,4,5)
Turbidity	EPA-180.1	0.1 NTU	38	127	5(1,3,4,5),50(7)
Color	EPA-110.2	1.0 CPU	6	19	15(1,3,5)
Total Dissolved Solids	EPA-160.1	1.0 mg/l	153	304	500(1,4,5)
Chemical Oxygen Demand	EPA-410.4	5.0 mg/l	14.9	76	2(4)
Sulfate	EPA-375.4	2.0 mg/l	22	57	250(1,3,4,5)
Bromide	EPA-320.1	1.0 mg/l	0.7	1.6	2(2)
Chloride	EPA-325.3	1.0 mg/l	1	4	250(1,3,4,5)
Total Kjeldahl Nitrogen	EPA-351.3	1.0 mg/l	1.3	5.7	0.5(4)
Ammonia	EPA-350.1	0.1 mg/l	0.1	0.2	2(4)
Nitrate	EPA-353.1	0.02 mg/l	0.09	0.19	10(1,3,4,5)
Phenols	EPA-420.1	0.002 mg/l	0.002	0.008	0.001(1,4),0.05(3)
Cyanide	EPA-335.2	0.01 mg/l	0.01	0.01	0.1(1,4)
Aluminum	EPA-200.7	0.03 mg/l	1.36	6.59	0.2(5)
Antimony	EPA-200.7	0.05 mg/l	0.02	0.05	0.003(2)
Arsenic	EPA-206.2	0.005 mg/l	0.003	0.004	0.025(1),0.05(3,4,5)
Barium	EPA-200.7	0.01 mg/l	0.025	0.080	1(1,4,5),2(3)
Beryllium	EPA-200.7	0.0007 mg/l	0.0021	0.0086	0.003(2)
Boron	EPA-200.7	0.016 mg/l	0.048	0.190	0.125(2),1(1,4)
Cadmium	EPA-200.7	0.003 mg/l	0.002	0.004	0.01(1,4,5),0.05(3)
Chromium	EPA-218.2	0.004 mg/l	0.003	0.013	0.05(1,5),0.1(3)
Hexavalent Chromium	SM-312B	0.02 mg/l	0.01	0.02	0.05(1,3,4,5)
Copper	EPA-200.7	0.008 mg/l	0.076	0.286	1.0(3,5),0.2(1,4)
Iron	EPA-200.7	0.019 mg/l	1.135	5.261	0.3(1,3,5)
Lead	EPA-239.2	0.003 mg/l	0.004	0.015	0.025(1),0.05(3,4,5)
Magnesium	EPA-200.7	0.5 mg/l	11	30	35(2)
Manganese	EPA-200.7	0.003 mg/l	0.416	1.460	0.3(1,3),0.05(5)
Mercury	EPA-245.1	0.00003 mg/l	0.00006	0.0002	0.002(1,3,5),0.005(4)
Nickel	EPA-200.7	0.01 mg/l	0.01	0.04	0.7(6)
Selenium	EPA-270.2	0.002 mg/l	0.001	0.002	0.01(1,3,4,5)
Silver	EPA-200.7	0.003 mg/l	0.004	0.009	0.05(1,3,4),0.1(5)
Sodium	EPA-200.7	0.5 mg/l	5.3	19.1	20-170(3),20(1,4)
Thallium	EPA-279.2	0.004 mg/l	0.003	0.007	0.004(2)

TABLE 1
Ulster County Resource Recovery Agency
Interim Consolidation Landfill at New Paltz
Environmental Monitoring Plan

Groundwater Protection Standards for Water Quality Parameters

PARAMETER	METHOD	MDL	MEAN CONC.	TRIGGER VALUE	REGULATORY STANDARD
Zinc	EPA-200.7	0.002 mg/l	0.035	0.119	5(3,5),0.3(1,4)
Volatile Organic Compounds	91-1	10-25 ug/l			
Vinyl Chloride	91-1	10 ug/l	5	5	2.5(1),5(4)
Chloromethane	91-1	10 ug/l	5	5	5(4)
Toluene	91-1	10 ug/l	5	5	5(4)
Benzene	91-1	10 ug/l	5	5	0.7(1),5(4,5)
1,1,1-Trichloroethane	91-1	10 ug/l	5	5	5(4)
1,1-Dichloroethane	91-1	10 ug/l	5	5	5(4)
Chloroethane	91-1	10 ug/l	5	5	5(4)
Chlorobenzene	91-1	10 ug/l	5	5	5(4)
Semivolatile Organic Compounds	EPA-8270	10-25 ug/l			5,50(3)
Bis(2-ethylhexyl)phthalate	EPA-8270	10 ug/l	5	5	4200(1),50(3)
1,4-Dichlorobenzene	EPA-8270	10 ug/l	5	5	4.7(1),5(3),75(5)
Pesticides	EPA-8270	0.1-1 ug/l			5,50(3)
Pronamide	EPA-8270	0.1 ug/l	0.05	0.05	50(3)
Pesticides/PCBs	EPA-8080	0.05-2 ug/l	0.025-1	0.025-1	5,50(3)
Organophosphorous Pesticides	EPA-8140	0.5 ug/l	0.025	0.025	5,50(3)
Herbicides	EPA-8150	1-5 ug/l	0.5-2.5	0.5-2.5	5,50(3)
Dinoseb	EPA-8150	5 ug/l	2.5	2.5	50(3)

Notes:

1. Title 6, Chapter X, Part 703.3 and 703.5, New York State Codes, Rules and Regulations, Classes and Quality Standards for Groundwaters (6 NYCRR 703, 703.5). Combined concentration of iron and manganese shall not exceed 0.5 ppm.
2. NYSDEC, Ambient Water Quality Standards and Guidance Values. TOGS 1.1.1, October, 1993.
3. Title 10, Chapter I, Part 5-1.52, New York State Codes, Rules and Regulations, State Sanitary Code, Drinking Water Supplies (10 NYCRR 5-1.52). Water containing more than 20 mg/l of sodium should not be used by people on severely restricted sodium diets. Water containing more than 270 mg/l of sodium should not be used by people on moderately restricted sodium diets.
4. Title 10, Chapter III, Part 170.4, New York State Codes, Rules and Regulations, Public and Sources of Water Supplies, Standards of Raw Water quality (10 NYCRR 170.4).
5. Title 40, Parts 141.11 and 143.3, Code of Federal Regulations, National Primary and Secondary Drinking Water Regulations, Maximum Contaminant Levels (40 CFR 141.11, 143.3).
6. Environmental Protection Agency Health Based Criteria, based on verified reference dose for systemic toxicants, nickel only.
7. NYSDEC, Technical and Administrative Guidance Memorandum Policy Regarding Alteration of Groundwater Samples Collected for Metals Analysis, TAGMs IIWR-88-4015.

APPENDIX 1

RESUMES

(Previously Submitted)

APPENDIX 2
FIELD SAMPLING SOPs

STANDARD OPERATING PROCEDURES

TABLE OF CONTENTS

<u>SERIES</u>	<u>NUMBER</u>	<u>TITLE</u>
100-199		<u>FIELD DOCUMENTATION</u>
	101	Field Logbook and Photographs
200-299		<u>EQUIPMENT CALIBRATION, MAINTENANCE, AND USE</u>
	201	Foxboro Century OVA 128 Flame Ionization Detector
	203	Photovac Microtip III Photoionization Detector
	205	HNu Photoionization Detector
	207	Horiba U10 Water Quality Checker
	209	YSI 3500 Water Quality Meter
	211	Scott D-15 Combustible Gas Meter
	213	Hermit Data Logger
300-399		<u>SUBSURFACE INVESTIGATIONS</u>
	301	Field Description of Soils
	303	Standard Penetration Test Borings
	305	Hand Auger Sampling
	307	Excavation of Test Pits
	309	Monitoring Well Installation
	311	Well Development
	313	Ground-Water Sampling
	315	Measurement of Water Level/Free Product Thickness
	317	Aquifer Pump Tests
	319	Slug Tests
	321	Lysimeter Installation and Sampling
	323	Soil Gas Surveys
	325	Residential Well Sampling
	327	Geophysical Borehole Logging
	329	Packer Tests
	331	Remote Inspection by Television Camera
	333	Well Rehabilitation Using Sulfamic Acid
	335	Cone Penetration Test

STANDARD OPERATING PROCEDURES

TABLE OF CONTENTS

<u>SERIES</u>	<u>NUMBER</u>	<u>TITLE</u>
400-499		<u>SURFACE INVESTIGATIONS</u>
	401	Surface Water Sampling
	403	Sediment Sampling
	405	Surface Soil Sampling
	409	Wetlands Investigations
500-599		<u>DECONTAMINATION</u>
	501	Small Equipment Decontamination
	503	Large Equipment Decontamination
	505	Decontamination of Personnel
	507	Residuals Management
600-699		<u>SAMPLE MANAGEMENT</u>
	605	Sample Containers, Volumes, and Preservatives
	607	Sample Preservation Aqueous Samples
	608	QA/QC Check of Sample pH
	609	QA/QC Samples
	613	Chain-of-Custody Forms
	621	Sample Shipping
700-799		<u>DATA PROCESSING</u>
	701	Using AQTESOLV for Analysis of Slug Tests

FIELD LOGBOOK AND PHOTOGRAPHS

A. PURPOSE/SCOPE:

To produce an accurate and reliable record of all field activities, including field observations, sample collection activities, etc.

All pertinent field survey and sampling information shall be recorded in a logbook or on field logs during each day of the field effort.

In addition to keeping logs, photographs will be taken to provide a physical record to augment the field worker's written observations. They can be valuable to the field team during future inspections, informal meetings, and hearings. Photographs should be taken with a camera-lens system having a perspective similar to that afforded by the naked eye. A photograph must be documented if it is to be a valid representation of an existing situation.

B. EQUIPMENT/MATERIALS:

Bound Field Book (with waterproof paper), Field Logs, Chain-of-Custody, Other Appropriate Forms, Indelible Ink Pens, 35 mm Camera with 50 mm lens, 100 ASA 35 mm Film,

C. PROCEDURE:

1. At a minimum, entries in a logbook shall include:

- Date and time of starting work;
- Names of all personnel at site;
- Purpose of proposed work effort;
- Sampling equipment to be used and calibration of equipment;
- Description of work area
- Location of work area, including map reference;
- Details of work effort, particularly any deviation from the field operations plan or standard operating procedures;
- Field observations;
- Field measurements (e.g., pH);

- Field laboratory analytical results;
 - Personnel and equipment decontamination procedures; and
 - Daily health and safety entries, including levels of protection.
 - Type and number of samples;
 - Sampling method, particularly deviations from the standard operating procedures;
 - Sample location and number;
 - Sample handling, packaging, labeling, and shipping information (including destination).
2. For each photograph taken, several items shall be recorded in the field logbooks:
- Date and time;
 - Name of photographer;
 - General direction faced and description of the subject;
 - Sequential number of the photograph and roll number.
3. Each day's entries will be initialed and dated at the end by the author, and a line will be drawn through the remainder of the page.

D. QA/QC:

All entries in the logbook shall be made in indelible ink. All corrections shall consist of single line-out deletions that are initialed.

The field task leader shall be responsible for ensuring that sufficient detail is recorded in the logbooks, and shall review the site logbooks daily.

E. SPECIAL CONDITIONS:

Once a roll of film is developed, the slides or prints will be placed in task files in the office. Photographic information from the logbooks will be photocopied and placed in the file accompanying the slides or prints.

F. REFERENCES:

None.

HORIBA MODEL U-10 WATER QUALITY CHECKER

A. PURPOSE/SCOPE:

The HORIBA Model U-10 Water Quality Checker is used to measure **pH** (0-14), **Conductivity** (0-100 ms/cm), **Temperature** (0-50 °C), **Dissolved Oxygen** (0-19.9 mg/l), and **Salinity** (0-4%).

B. EQUIPMENT/MATERIALS:

HORIBA model U-10: main unit, probe, dissolved oxygen sensor and tool, sample beaker, pH calibration solution, reference solution.

Battery Replacement:

The unit uses one 9 volt battery. This can be replaced by removing the back plate of the main unit. (Page 9 of instruction manual).

C. PROCEDURE :

1. Fill up sample beaker to the reference line on the side. Under filling the cup can cause inaccurate readings.
2. Insert the probe into the cup and turn on the power at the main unit.
3. Move the probe up and down in the cup slowly to circulate the water over the sensors. Use the **SELECT** key of the main unit to view the readings from the sensors. It is best to measure: Temperature, pH, DO, conductivity, and Turbidity in that order. This is because the temperature is likely to be the most affected by the change in its environment.
4. Rinse the probe with distilled water in between samples.
5. Consult pages 11-18 of instruction manual for further discussion.

D. QA/QC REQUIREMENTS:

The Horiba U-10 should be calibrated before each sampling session.

1. The autocalibration described on pages 20-22 of the instruction manual is sufficient for most sampling events.

2. Manual calibration described on pages 23-34 of the instruction manual is necessary when using the expanded readout mode or if a new probe is used for the first time.

E. SPECIAL CONDITIONS

1. The pH sensor has a rubber protective cap that should be wet and placed on the pH sensor when not in use. Remember to remove the cap before using the pH sensor.
2. The reference sensor should be recharged with fresh reference solution every two months. (page 48 of instruction manual).
3. The main unit is not waterproof. It must not be submerged in water or left out in the rain.

F. REFERENCES:

HORIBA U-10 Instruction Manual located with the instrument.

GROUNDWATER SAMPLING

A. PURPOSE/SCOPE:

To obtain representative ground-water samples from an aquifer.

B. EQUIPMENT/MATERIALS:

Inertial pump, submersible pump, disposable bailers, generator, sample bottles, bailing twine and rope, field analyses meters, sampling gloves, water level meters, filtration system, 2-inch Grundfos Rediflow pump and controller, well sampling forms.

C. PROCEDURE:

1. The wells will be sampled from the least contaminated well to the most contaminated well.
2. Using a decontaminated measurement probe, determine the water level in the well; then calculate the fluid volume in the casing.
3. Using a decontaminated surface pump, submersible pump or disposable bailer, purge the well of a minimum of one well volume. Purging will be conducted at the lowest flow rate possible to purge the well within a reasonable time frame and to decrease the potential for elevating the turbidity of the well water. Conductivity, pH, Eh, turbidity, and temperature readings shall be taken and recorded during the well purging. The well will be considered properly purged when a minimum of one well volume has been purged and the conductivity, pH, Eh, turbidity and temperature have stabilized. Turbidity should be below 50 NTU, if possible. Record these readings on the well sampling log.

It is important that none of the sampling equipment (pump, bailer, pump tubing, electrical cords, rope, etc.) come into contact with the ground.

4. Sample collection will be performed utilizing either an inertial pump system, submersible pump or disposable bailer. If the inertial pump system or submersible pump is used, samples will be obtained through the dedicated polyethylene tubing. Should disposable bailers be utilized, the sampling will be performed as follows:

Attach a new bailer line to the disposable bailer equipped with a single check valve. Check the operation of the check valve assembly to confirm free operation. Lower the single check valve bailer slowly into the well until it contacts the water surface. Then lower the bailer just below the water surface

with a minimum of disturbance. When filled with groundwater, slowly raise the bailer to the surface. Discharge the first bailer to the ground. Tip the bailer to allow the water to slowly discharge from the top and to flow gently down the inside of the sample bottle with minimum entry turbulence and aeration.

5. The order in which samples are to be collected is as follows:

volatile organic compounds,
purgable organic carbon,
purgeable organic halogens
total organic halogens
total organic carbon
extractable organic
total metals
dissolved metals
phenols
cyanide
sulfate and chloride
turbidity
nitrate and ammonia
radionuclides.

6. When collecting aliquots for analysis of volatile organic compounds, make absolutely certain that there are no bubbles adhering to the walls or the top of the VOA container.
7. Add appropriate preservatives to samples as described in SOP #605.
8. Label the sample containers with all necessary information and complete all chain-of-custody documents and seals.
9. Place the properly labeled and sealed sample bottles in a cooler with ice and maintain at 4°C for the duration of the sampling and transportation period. Do not allow samples to freeze.

D. QA/QC REQUIREMENTS:

To the extent possible, all samples should be collected using the same type of equipment and in the same manner to ensure comparability of data.

E. SPECIAL CONDITIONS:

Under Step 3, if sample turbidity cannot be reduced below 50 NTU, then the samplers should collect all portions of the sample except for the metals. The samplers should then return within 24 hours and collect a sample for total metals analysis from the top of the water column.

Step 4 can be replaced if purging and sampling is being performed with a Grundfos Rediflow pump. In this case, after well purging was completed, the discharge rate for the pump would be reduced to approximately 40 ml/minute. Sampling can then proceed as described above.

E. REFERENCES:

None.

MEASUREMENT OF WATERLEVEL/FREE PRODUCT THICKNESS

A. PURPOSE/SCOPE:

The objective of measuring ground-water levels is to evaluate horizontal and vertical flow gradients in an aquifer. Additionally, water level measurements made over a period of time are used to assess the extent of seasonal fluctuation of the water table.

Free product thickness is measured to determine the lateral extent of free product contamination in an unconfined aquifer. It is needed to in the estimation of actual formation free product thickness.

B. EQUIPMENT/MATERIALS:

oil/water interface probe (e.g., Oil Recovery System probe), or an electric water level indicator and a clear teflon bailer.

C. PROCEDURE :

1. If it is known that free product is not present in the well, the electric water level indicator may be used to measure the depth to water. From an established measuring point on the well casing, measure the depth to water to the nearest 0.01 foot.
2. If it is unknown whether free product is present in a well, first lower the clear bailer into the well until liquid is encountered. Remove the bailer from the well and record the thickness of free product, if any is present, to the nearest 0.01 foot. Then measure the depth to water as described in #1 above.
3. If free product is known to exist in a well, the use of an oil/water interface probe is recommended. The probe typically emits two different types of signals or tones; one for free product and one for water. Lower the probe until the first signal indicates the interface between air and free product has been reached. Then continue to slowly lower the probe until the second signal indicates the interface between free product and water. Record all measurements to the nearest 0.01 foot.
4. Note the measuring point on the well casing (i.e., top of inner PVC casing, top of steel protective casing, etc.) on the Field Data Sheet.
5. Record the measured depths on the Field Data Sheet. Measurements will eventually be converted to a common datum (mean sea level) using the surveyed elevations of each well.

6. Decontaminate the probe (and bailer, if used) after each use.

D. QA/QC REQUIREMENTS:

Use of a clear bailer and an electric water level meter are not as accurate as use of an oil/water interface probe. If free product is known to exist in the well, the oil/water interface probe is recommended.

E. SPECIAL CONDITIONS

When measuring water levels in multiple wells on a site, all measurements should be collected in as short of time as possible to minimize the effects of daily fluctuations in water levels. This is particularly important in areas near where groundwater levels may be tidally-influenced.

F. REFERENCES:

None.

RESIDENTIAL WELL SAMPLING

A. PURPOSE/SCOPE:

Water samples are collected from residential wells to determine whether contaminants are present in the groundwater. Residential wells are often used in lieu of installing additional monitoring wells as monitoring points.

B. EQUIPMENT/MATERIALS:

pH meter, conductivity meter, temperature meter, turbidity meter, ORP meter, sampling bottles, Home Well Survey Form, Well Sampling Log

C. PROCEDURE:

1. Identify a sample point in the water system where water is not treated or filtered (e.g., example, an outside tap).
2. Flush the domestic water supply system by running one of the system's taps for several minutes.
3. Rinse a clean beaker with well water prior to filling it for field measurements. Measure temperature, pH, conductivity, turbidity, and ORP of the water in beaker. Record measurements on well sampling log.
4. Fill the appropriate sample containers directly from the tap or valve being sampled. Sample containers for volatile organic analysis (VOA) should be carefully filled using a low flow rate. VOA samples must be absolutely free of bubbles.
5. Add appropriate preservatives to samples as described in SOP #605.
6. Label the sample containers with all necessary information and complete all chain-of-custody documents and seals.
7. Place the properly labeled and sealed sample bottles in a cooler with ice and maintain at 4°C for the duration of the sampling and transportation period. Do not allow samples to freeze.
8. Complete the Home Well Survey Form, if not previously completed.

D. QA/QC REQUIREMENTS:

None.

E. SPECIAL CONDITIONS

In most cases, direct sampling of groundwater within a domestic well is not practical due to difficulty in gaining access to the interior of the well casing, and also due to the potential of inadvertently introducing contaminants to the well during sampling. Therefore, sampling of a domestic water supply system at the tap or purge valve nearest to the well head is recommended.

Depending upon the reason for conducting sampling of residential water wells, the State Department of Health should be notified prior to performing any sampling.

F. REFERENCES:

None.

Clough, Harbour & Associates Home Well Survey		Survey Tracking No.
Home Owner's Name		Date
Street Address	Mailing Address (if different)	
Daytime Phone	Evening Phone	
Well Use (please check all that apply) { } Drinking { } Watering Lawn or Garden { } Bathing or Showering { } Other (please explain)	Total Number of People Using Well { } people	
Please answer the following questions: 1. Do you notice color, taste, or odor problems with well water? { } No { } Yes. (If YES, please explain below)		
2. Do you treat your water? { } No { } Yes. If yes, check those that apply. { } Filtration { } Water Softner { } Chlorination { } Ultra Violet Light { } Other (please explain):		
3. If a treatment system is used on your well, is it possible to collect a sample prior to the treatment unit? { } No { } Yes		
4. Do you regularly or have you ever added chemicals directly to your well (like Chlorine, Clorox, etc.)? { } No { } Yes. If yes, please indicate: Date last added: Approximate amount added: Compound added(Brand Name):		
5. Do you notice water supply problems? { } No { } Yes. (If YES, When, How Often - please explain below.)		

6. Have you ever had your water tested? { } No { } Yes. If yes, please indicate: Date of Testing: Name and Phone Number of Company Responsible for Testing: Results:	
Please indicate the composition of the casing material in your well: { } Iron { } Galvanized { } PVC { } Terra-cotta { } Other: (Please specify if known)	Please indicate the composition of your water pipes inside your home: { } Iron { } Galvanized { } PVC { } Copper { } Lead { } Other: (Please specify if known)
Please indicate the type of well you have: { } Dug Well { } Driven Well { } Drilled Well { } Other (please describe)	Please complete the following: Year Well Installed: Name and Phone Number of Driller:
Please Complete the Following: Total Depth of Well: Diameter of Well: Total depth of Casing: Depth to Bedrock: Type of Pump (submersible, jet, etc): Depth of Pump Intake: Yield of Well (in gallons per minute): Depth to water in well:	Please indicate the type(s) of wastewater system used (check all that apply) { } Sewer Line { } Cesspool { } Septic Tank { } Drain Field Distance to Well:
In the space below, please draw a rough sketch of your property, including the location of your well and on-lot wastewater system (if applicable).	

Clough, Harbour & Associates Well Sampling Log					Sample Designation: _____				
Project Name: _____ Project Location: _____					Project No: _____ Date: _____ Screen Length: _____				
Purge Information:									
(1) Depth to Bottom of Well: _____ (from TOC)					(2) Depth to Water: _____ ft (from TOC)				
(3) Column of Water: _____ (#1 - #2)					(4) Casing Diameter: _____ in				
(5) Volume Conversion: _____ gal/ft					(6) 1 Vol. of Well: _____ gal				
Method of Purging: WaTerra/Bailer/Submersible/Other: _____									
Volume Conversion:									
2" = 0.163		4" = 0.653		6" = 1.469		8" = 2.611		10" = 4.08	
Field Analysis:									
Vol Purged (gal)									
Time									
ORP/EH (MV)									
pH									
Cond. (MS/CM)									
Turb. (NTU)									
D.O. (mg/l)									
Temp. (°C)									
Total Volume Purged: _____ gal					Total Purge Time: _____				
Sampling Info:									
Sample Method: _____					No. of Bottles: _____				
Sample Time: _____									
Sample Analyses: _____									
Comments: _____ _____ _____ _____									
Logged By: _____									

SURFACE WATERSAMPLING

A. PURPOSE/SCOPE:

The objective of sampling surface water in various streams, lakes, or ponds on or adjacent to a site is to determine the presence and extent of contamination emanating from the site and to determine the necessity for ecological studies.

B. EQUIPMENT/MATERIALS:

Dedicated sample bottles, glass and/or stainless steel collection vessel/pitcher, Water Quality Measurement Meter (including pH, Eh, dissolved oxygen (DO), temperature, specific conductance), tape measure, stopwatch, Surface Water/Sediment Sampling Log (attached).

C. PROCEDURE :

1. When collecting both water and sediment at the same location, the surface water sample will be collected first, followed by the collection of the sediment sample to agitation of sediments into the water column.
2. The samples will be collected from areas of stream bottom where there is predominantly fine-grained sediment. These areas should also be characterized by a steady, but non-turbulent, flow of water. These criteria are designed to maximize sample quality by maximizing the adsorption of metals and organics in the sediments and the retention of volatile constituents in the water column, respectively. Adjust the field sampling locations to accomodate the above considerations, making sure to measure and record relocation information (e.g., distance from proposed location in what direction), if any, in the field logbook.
3. Once the sampling location has been established, describe the location in terms of water flow rate and descriptive parameters as described below (refer to sampling log):

FLOW RATE - Measure, or estimate if too large to measure, the average stream width and depth. Measure flow velocity three times by measuring off a 10-foot stretch and timing how long is required for a floating object to traverse the 10-foot length. Average the three measurements of stream velocity (add the three and then divide by three) in units of ft/sec. Multiply the average velocity (in feet/sec) by the average stream width (in feet), then multiply by the stream average depth (in feet). The product will be the average flow volume in units of cubic feet/sec.

WATER QUALITY PARAMETERS - Using the collection vessel, transfer the necessary amount of surface water from the water body to a container for field measurements of Eh, pH, specific conductance, turbidity, dissolved oxygen, and temperature. Alternatively, some instruments are equipped with specially designed cups to hold the water or may have submersible probes that are placed into the actual water body itself, etc. Record the field parameter measurements on the log.

DESCRIPTIVE PARAMETERS - Describe the surface water/sediment sampling location by describing both the stream bed and the stream water. Describe the amount of organic material seen in the stream, from toppled trees and branches to fine particles on the bed. Estimate the texture of the stream sediment (% rocks, gravel, sand, silt/clay) and estimate the depth of sediment sample collection. Note the presence of odors, if any. Describe the stream at the sampling location in terms of the percentage of pool (deep, calm, pooled areas), % riffle (shallow, swift-flowing, with the surface broken e.g., tumbling over rocks), and % run (smoothly flowing). The sum of the three types should total 100%. Describe the adjacent banks and surrounding area in terms of amount and type of vegetation, steepness of the banks, rocky versus muddy banks, outcrops, sunny vs. shady, etc.

4. One team member will perform the actual sample collection; he will carefully adopt an optimal sampling position, and once in that position, will not move his feet until all sampling at that locality is concluded in order to minimize agitation of the sediment and water.
5. Stream sediments are to remain undisturbed by the water collection vessel. Should contact with the bottom and resuspension of sediment occur, the sampling team is to halt sampling until the water has cleared. If the water does not clear within a few minutes, the team is to proceed slightly upstream (about 1 meter or just above the disturbed area) and resume the sampling effort.
6. Submerge the open water collection vessel in water with mouth below the water surface. Take care not to collect any floating solids or materials disturbed from the bottom of the water body. In areas of active flow, point bottle mouth upstream. (A stainless steel pitcher may be used to facilitate collection of the portion of the sample for analysis of organics, but should not be used to collect the portion to be analyzed for inorganics).
7. Use the collection vessel to fill all designated sample bottles. Collect the volatile organic fraction first, if it is to be collected. Add appropriate preservatives to samples as given in SOP #605.
8. Label the sample bottles with all necessary information.

9. Place the properly labeled sample bottles in a cooler with ice and maintain at 4°C for the duration of the sampling and transportation period. Do not allow samples to freeze.
10. Record all sampling information on the log and complete all chain-of-custody documents.

D. QA/QC REQUIREMENTS:

None.

E. SPECIAL CONDITIONS

None.

F. REFERENCES:

Sediment samples are often collected at the same time surface water samples are collected. Refer to SOP #403 for more details regarding sediment sampling.

SEDIMENT SAMPLING

A. PURPOSE/SCOPE:

This procedure is applicable to collecting disturbed samples of bottom sediments in shallow water bodies that are less than 2 feet deep. Either a stainless-steel scoop with several 5 mm holes drilled in the upper portion of the back and rear sides, or a hard-driven corer may be used to collect the samples. In fine-grained sediment, deeper and less disturbed samples can be obtained with the corer.

B. EQUIPMENT/MATERIALS:

Stainless-steel scoop, plastic scoops, hand auger or corer, sample bottles, Surface Water/Sediment Sampling Log

C. PROCEDURE:

1. When collecting both water and sediment at the same location, the surface water sample will be collected first, followed by the collection of the sediment sample to avoid agitation of sediments into the water column.
2. The samples will be collected from areas of stream bottom where there is predominantly fine-grained sediment. These areas should also be characterized by a steady, but non-turbulent, flow of water. These criteria are designed to maximize sample quality by maximizing the adsorption of metals and organics in the sediments and the retention of volatile constituents in the water column, respectively.
3. Insert scoop or corer into sediment to be sampled. (Stainless steel should be used to collect organic portion and plastic should be used to collect inorganic portion). Slowly lift the sample from the water and allow excess water to drain slowly, being careful not to lose fine-grained particles. Depending on the area to be covered, up to five component samples should be collected to form a composite sample. Samples for volatile organics analysis should be placed directly in sample containers and not mixed or composited.
4. Place the component samples for each sediment composite in a clean, stainless-steel bowl for homogenization. Remove any objects larger than approximately 0.5 inches in diameter using clean, stainless-steel forceps.
5. Thoroughly mix the sediment in the bowl and separate into quarters. Place an aliquot from each quarter into an appropriate sample container. Fill the container completely, leaving no headspace.

6. Label the sample container with all necessary information. Record the information on the Surface Water/Sediment Sampling Log and complete all chain-of-custody documents and seals.
7. Place the properly labeled and sealed sample bottle in a cooler with ice and maintain at 4°C for the duration of the sampling and transportation period. Do not allow samples to freeze.

D. QA/QC REQUIREMENTS:

None

E. SPECIAL CONDITIONS:

None

F. REFERENCES:

Surface water samples are often collected at the same time sediment samples are collected. Refer to SOP #401 for more details regarding surface water sampling.

SMALL EQUIPMENT DECONTAMINATION

A. PURPOSE/SCOPE:

Decontamination will be performed between each sample collection point. (Waste products produced by the decontamination procedures such as waste liquids, solids, rags, gloves, etc., will be collected and disposed of properly based on the nature of contamination). See SOP #507 for specific details on the handling of decontamination wastes.

Decontamination of sampling equipment is performed to prevent cross contamination between samples.

B. EQUIPMENT/MATERIALS:

Alconox, tap water, distilled water, 20% methanol, 10% nitric acid, 1 gallon pressure spray bottles, long-handled brushes, 5 gallon plastic buckets

C. PROCEDURE:

1. Disassemble equipment, as required.
2. Remove gross contamination from the equipment by brushing and then rinsing with tap water.
3. Wash with Alconox and tap water.
4. Rinse with tap water.
5. Rinse with methanol when sampling for organics only.
6. Rinse with nitric acid when sampling for inorganics only.
7. Rinse with methanol and then with nitric acid when sampling for both organic and inorganic analytes.
8. Rinse with distilled water.
9. Air dry equipment.
10. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned.
11. If equipment is not to be used again immediately, it will be wrapped in aluminum foil.

D. QA/QC:

Field equipment rinsate blanks will be collected and used to assess the quality of equipment decontamination.

E. SPECIAL CONDITIONS:

Reusable PPE, such as respirators, chemical-resistant overboots, gloves shall also undergo the equipment decontamination sequence.

F. REFERENCES:

OSHA Health and Safety Manual for Hazardous Waste Site Activities.

SAMPLE PRESERVATION, HOLDING TIMES, AND CONTAINERS

A. PURPOSE/SCOPE:

To ensure sample integrity through use of proper sample preservation techniques, sample containers, and through observance of sample holding times.

B. EQUIPMENT/MATERIALS:

Sample containers and preservatives (see table).

C. PROCEDURE:

Refer to SOP #607 for procedure and to attached table.

D. QA/QC REQUIREMENTS:

Refer to SOP #608 for QA/QC check of sample pH.

E. SPECIAL CONDITIONS

None.

F. REFERENCES:

None.

PRESERVATION, HOLDING TIMES AND CONTAINERS
FOR WATER SAMPLES

LABORATORY ANALYSES	SAMPLE PRESERVATION	HOLDING TIME ^a	CONTAINER
Volatile Organic Compounds	HCl to pH < 2, Cool to 4°C	14 days	3 - 40 ml glass vials w/teflon-lined septum
Extractable Org. Compounds	Cool to 4°C, Store in dark	* 7 days	4 - 1 L amber glass bottles w/teflon-lined cap
Total Metals	HNO ₃ to pH < 2	6 months	1 - 1 L high density polyethylene bottle
Cyanide	NaOH to pH > 12, Cool to 4°C	6 months	1 - 1 L high density polyethylene bottle
Alkalinity	Cool to 4°C	14 days	1 - 1 L high density polyethylene bottle
Ammonia	H ₂ SO ₄ to pH < 2, Cool to 4°C	28 days	1 - 1 L high density polyethylene bottle
Tot. Kjeldahl Nitrogen	H ₂ SO ₄ to pH < 2, Cool to 4°C	28 days	1 - 1 L high density polyethylene bottle
Nitrate	Cool to 4°C	48 hours	1 - 1 L high density polyethylene bottle
Oil and Grease	HCl to pH < 2, Cool to 4°C	28 days	1 - 1 L amber glass bottles w/teflon-lined cap
BOD	Cool to 4°C	48 hours	1 - 1 L high density polyethylene bottle
COD	H ₂ SO ₄ to pH < 2, Cool to 4°C	28 days	1 - 50 ml high density polyethylene bottle
TOC	HCl to pH < 2, Cool to 4°C	28 days	1 - 125 ml glass bottle w/Teflon-lined cap
TDS	Cool to 4°C	7 days	1 - 500 ml high density polyethylene bottle
Sulfate	Cool to 4°C	28 days	1 - 1 L high density polyethylene bottle
Phenols	H ₂ SO ₄ to pH < 2, Cool to 4°C	28 days	1 - 500 ml glass bottle w/Teflon-lined cap
Hardness	HNO ₃ to pH < 2	6 months	1 - 1 L high density polyethylene bottle
Bromide	None	28 days	1 - 500 ml high density polyethylene bottle
Chloride	None	28 days	1 - 500 ml high density polyethylene bottle
Hexavalent Chromium	Cool to 4°C	24 hours	1 - 1 L high density polyethylene bottle

^a Holding times are from the time of collection.

* Extraction within 7 days of collection; then analysis within 40 days of extraction.

PRESERVATION, HOLDING TIMES AND CONTAINERS
FOR SOIL SAMPLES

LABORATORY ANALYSES	SAMPLE PRESERVATION	HOLDING TIME ^a	CONTAINER
Volatile Organic Compounds	Cool to 4°C	14 days	2 - 40 ml glass vials w/teflon-lined septum
Extractable Organic Compounds	Cool to 4°C, Store in dark	14 days	1 - 8 oz. wide mouth jar
Total Metals	Cool to 4°C	6 months	1 - 8 oz. wide mouth jar
Cyanide	Cool to 4°C	6 months	1 - 8 oz. wide mouth jar
Grain Size	N/A	N/A	1 - 8 oz. wide mouth jar
Moisture Content	Store in airtight jar 3-30°C	N/A	1 - 8 oz. side mouth jar
pH	Cool to 4°C	14 days	1 - 8 oz. wide mouth jar
TCLP	As per 40 CFR	As per 40 CFR	1 - 8 oz. wide mouth jar
TOC	Cool to 4°C	28 days	1 - 125 ml glass bottle w/teflon-lined cap

^a Holding times are from the time of collection.

* Extraction within 7 days of collection; then analysis within 40 days of extraction.

QA/QC SAMPLES

A. PURPOSE/SCOPE:

Quality control samples are used to trace routes of contamination. Each type of sample traces a different route of contamination.

B. EQUIPMENT/MATERIALS:

Analyte-free water, appropriate sample containers.

C. PROCEDURE:

1. Duplicate Samples

Duplicate samples will be collected for every twenty (20) routine samples collected per matrix, per analysis. The duplicates will be collected in the same manner as their corresponding routine samples.

2. Matrix Spike and Matrix Spike Duplicate Samples

Matrix spikes and matrix spike duplicates are laboratory required quality control samples. However, the laboratory must be provided with additional sample volume for each sample matrix to complete their analysis. One matrix spike/matrix spike duplicate (MS/MSD) pair will be collected per matrix per 20 samples. Again, the MS/MSD pairs will be collected in the same manner as their corresponding routine samples.

3. Field Blank Samples

Field blanks are blanks prepared prior to the sampling event from clean, analyte-free materials most closely resembling the sample matrices to be collected in the field. The blanks are transported to the field along with the containers in which the routine samples will be collected. Once in the field, the caps of the field blanks are removed so that the field blanks are exposed to the same conditions as the routine samples. At the end of each location sampling event, the caps to the field blanks are replaced, and the blanks are then subjected to the same protocol as the routine samples. Field blanks are collected for water only.

4. Equipment Rinse Samples

One equipment rinse sample will be collected per every 20 samples collected, per analysis, per matrix. The equipment rinse blank will be collected by pouring analyte-free water, directly over decontaminated sampling equipment into a prepared sample container. The equipment rinse blanks are then shipped to the laboratory with the other routine samples collected.

5. Trip Blank Samples

Trip blanks for volatile organic samples are prepared in the laboratory prior to the sampling event using analyte-free water. The trip blanks accompany the routine sample containers to the field, during collection of the samples in the field, and during transport of the routine volatile organic samples back to the laboratory. Trip blanks must remain un-opened until time of analysis. One trip blank sample will be used for each day of sampling for volatile organic compounds.

D. QA/QC REQUIREMENTS:

None.

E. SPECIAL CONDITIONS

None.

F. REFERENCES:

None.

CHAIN OF CUSTODY FORM

A. PURPOSE/SCOPE:

Sample custody is a necessary aspect to ensuring sample integrity. Sample custody is to be maintained during all sample handling activities. By definition, samples are in custody if they:

- are in the possession of an authorized individual;
- are in the field of vision of an authorized individual; and
- are in a secure area or a locked container.

In order to verify sample integrity, written conclusive proof is required that samples are collected, transferred, prepared, and analyzed in an unbroken chain. That written proof is a Chain-of-Custody form.

B. EQUIPMENT/MATERIALS:

Black ink pen, Chain-of-Custody forms (see attached example).

C. PROCEDURE:

To complete the form, the following information must be provided:

- The project number which is equivalent to the case number;
- An abbreviation for the project name; the contract lab is not to be given the full site name (note: the full site name is used for "in-house" analysis by CRL);
- The sampler's signature;
- The station number which may be equivalent to the station location;
- The date and time the sample was taken;
- Whether the sample is composite or grab;
- The number of containers in which the sample has been placed;
- The type of analyses requested;
- Under "Remarks" (in the upper right corner of the record), list the CLP sample number of the sample and the corresponding tag numbers;
- Under "Remarks" (in the lower right corner of the record), the airbill number of the container in which the samples will be shipped to the laboratory. (When samples are shipped to the laboratory via commercial carrier, the airbill serves as an

extension of the chain-of-custody.); and

- Under "Relinquished by" and "Received by", the signature of every authorized person who maintains custody of the samples.

D. QA/QC REQUIREMENTS:

A second person should review all entries before the form is sealed in the sample cooler.

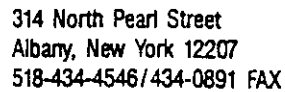
Mistakes should be corrected by crossing out the incorrect entry with a single line, initialing the line out, and entering the correct entry immediately adjacent to the incorrect entry.

E. SPECIAL CONDITIONS

None.

F. REFERENCES:

None.



CHAIN OF CUSTODY RECORD

Method of Shipment:	Send Report To:	Client Phone No.:
----------------------------	------------------------	--------------------------

Adirondack Environmental Services, Inc.

SAMPLE SHIPPING

A. PURPOSE/SCOPE:

This procedure describes proper packaging of samples for shipment to the laboratory.

B. EQUIPMENT/MATERIALS:

40-quart ice coolers, vermiculite, ziploc bags, lawn and leaf trash bags, ice or freezer packs, chain-of-custody seals, packing tape, 1-gallon paint cans with lids.

C. PROCEDURE:

Once the samples have been collected, properly labeled and tagged, these steps should be followed to properly pack and ship the samples:

1. Seal all containers in clear plastic bags.
2. Double line the sample cooler with 2 plastic trash bags.
3. Place all samples within the inner trash bags in the cooler.
4. Surround the samples with vermiculite and seal the inner trash bag.
5. Use freezer packs or ice to cool the organic low level water samples to 4°C. (Do not cool dioxin or organic high level water samples; cooling of inorganic water samples is optional). The freezer packs or ice should be placed between the inner and outer trash bags. Then the outer trash bag should be sealed.
6. Tape paperwork in plastic bag on inside of cooler lid (The paper work includes the chain-of-custody record, and the bottom two copies of the traffic report); and
7. Close cooler and seal with custody seals.

D. QA/QC REQUIREMENTS:

None.

E. SPECIAL CONDITIONS

Pack all high concentration samples in metal paint cans. The paint cans should be labelled with sample number of sample contained inside and the contents of the can should be surrounded with vermiculite.

F. REFERENCES:

None.

APPENDIX 3
LABORATORY QA/QC PLAN
(Previously Submitted)