SAMPLING AND ANALYSIS PLAN
Bethpage, New York

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Ave.
Norfolk, VA 23511-3095

Contract Number N62470-11-D-8013

CTO WE15

Prepared by:

Resolution Consultants
A Joint Venture of AECOM & EnSafe
1500 Wells Fargo Building
440 Monticello Avenue
Norfolk, VA 23510

April 30, 2013

SAP Worksheet #1: Title and Approval Page

SAMPLING AND ANALYSIS PLAN for Tier II

April 30, 2013

Naval Weapons Industrial Reserve Plant (NWIRP)
Bethpage, New York
Site 1 OU-2 Offsite TCE Groundwater Plume Investigation

Prepared for:
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Eleanor P Vivaudou

Review Signature: ______________________ 04-30-2013
Task Order Manager Eleanor Vivaudou Date

Other Approval Signature: (as required) ______________________ 04-30-2013
Project Chemist Richard Purdy Date

Other Approval Signature: (as required) ______________________ 05-01-2013
NAVY RPM Lora Fly Date

SAP Worksheet #1: Title and Approval Page

~~Internal~~ Draft

SAMPLING AND ANALYSIS PLAN for Tier II

August 7~~May 31~~, 2012

Naval Weapons Industrial Reserve Plant (NWIRP)
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Project Chemist Richard Purdy Date

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(as required)

NIELSEN.JANICE.L.1069943540
Digitally signed by NIELSEN.JANICE.L.1069943540
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=NIELSEN.JANICE.L.1069943540
Date: 2012.08.07 16:05:27 -04'00'

NAVY QAO Chemist Jan Nielsen Date

Other Approval Signature:
(as required)

NAVY RPM Lora Fly Date

NAVFAC LANT Chemist
UFP-SAP Review

Reviewer: Jan Nielsen
Document: SAP Bethpage NWIRP Site 1 OU2
Date: 04-Jun-12
7-Aug-12

Comment Number	Worksheet and/or Section	Rating (High or Low)	Statement or Issue	Comment	Response
1	WS1	High	Signatures	Signature line needs to be added for Navy QAO/Chemist. The typical SAP also includes a signature blocks for the Navy RPM and regulatory agencies. Your Navy RPM should be able to direct you on how this team handles this.	Signature blocks have been added for RPM and
2	Tiered Approach	High	Approval for Tier II	Please forward the approval from LANT to use the Tier II approach for this site.	Draft Letter attached as well as comment on WS9
3	WS#6	High	Suggest additional notification for laboratory problems.	Suggest adding a step where the Navy RPM is notified of any problems with the lab or analysis that could significantly effect the usability of the data or project failures that impact the ability to complete the scope of work. This also includes consideration by the Navy RPM on forwarding the problems to LANT so that we can share with our quality NAVSEA personnel (run the ELAP accreditation program)	Step has been added in WS #6 and under reporting Lab quality variance and notification of non usable data
4	WS#9	High	Regulatory involvement	If the regulatory agencies approved the location or any of the sampling information and process this should be included in this section. If it was done outside of the work Resolutions participated in, include where that agreement is documented.	Regulatory agencies did not approve locations. The sampling and process is similar to previous work performed for the Navy by Tetra tech.
5	WS#10	Low	Typo	Sentence does not make sense. A breakdown able found in Table 1	sentence has been corrected
6	Figure 3/4/5	High	Relation	Suggest showing where the blown up map is on the larger maps so the plumes can be easily understood. Also suggest adding ground water flow direction arrows.	Maps shoe general ground water flow direction and work area is outlined.
7	WS11	High	Section 11.1	What is the purpose of determining which plume is the source of the contamination? This should be expanded on.	Section 11.1 has been revised

Comment Number	Worksheet and/or Section	Rating (High or Low)	Statement or Issue	Comment	Response
8	WS#14	High	accreditation and responsibilities	The Navy may approve a lab but the lab must be ELAP accredited for the Analyze and the method for any definitive data. The consultant must ensure that the lab that is subcontracted meets this criteria. There may also be state requirements. If so that should be included.	Elap accreditation has been indicated.
9	WS#21	High	Missing information	The information on the SOPs should be included in this draft of the document unless there are mitigating circumstances.	SOPs included
10	incomplete	High	Missing information	The final review cannot be completed until the laboratory information is completed.	SOPs included
11	WS#15 and 11	High	Project Goals are higher than the action levels.	The information that is included will not answer the question are the levels of contamination above screening levels. Is there a driver to run the analysis for all the chemicals listed, or can the number of analytes be reduced based on the information already known about the plumes? If the decision is to run all of the analytes there needs to be discussion on how the results will be handled and what decisions can be made.	The analyte list has been reduced to contaminants that pertain to the plume. The only table that has Project goals higher than the action levels is for the area air sample. This is due to the fact for certain analytes action level is the method detection limit. The data can be reported to the detection limit which will not be in compliance with the DOD reporting or a SIM analysis can be run which may be more than necessary as that the area air sampling is a check on the real time monitoring that will be conducted during the investigation.
12	WS#23	High	Missing information	Need to add a column that identifies if the lab SOP has any variance from the QSM and if so the variance must be discussed.	Column had been added
13	Accreditation letter	High	Required information	The accreditation letter for the lab contracted must be included and analytes and methods to obtain definitive data must be included in the letter.	Accreditation letter attached.
14					

Note:

High Rating - Requires comment to be addressed prior to Government Chemist signature.

Low Rating - RPM may use their discretion. The change is advised but not required for the SAP to be signed by Government Chemist.

Vivaudou, Eleanor

From:	Fly, Lora B CIV NAVFAC MIDLANT, IPTNE [lora.fly@navy.mil]
Sent:	Tuesday, April 16, 2013 10:03 AM
To:	Brian Caldwell; Vivaudou, Eleanor
Subject:	FW: letter.hw130003A.2012-12-12.NWIRP_Bethpage_SAP_Comment_Responses.pdf- Adobe Acrobat Standard
Attachments:	letter.hw130003A.2012-12-12.NWIRP_Bethpage_SAP_Comment_Responses.pdf

-----Original Message-----
From: Steven Scharf [mailto:sxscharf@gw.dec.state.ny.us]
Sent: Tuesday, April 16, 2013 9:49 AM
To: Fly, Lora B CIV NAVFAC MIDLANT, IPTNE
Cc: John Swartwout; edward.hannon@ngc.com
Subject: letter.hw130003A.2012-12-12.NWIRP_Bethpage_SAP_Comment_Responses.pdf- Adobe Acrobat Standard

Lora,

I reviewed the NAVFAC Midlant's consultants response to comments on the 8-17-2012 Bethpage Sampling and Analysis Plan. The NAVFAC responses are acceptable and NAVFAC can finalize the work plan currently under implementation in the Bethpage area and submit it to the NYSDEC. If you have any questions, please contact me directly.

Thanks,

Steve

Steven M. Scharf, P.E.
Project Engineer
New York State Department of
Environmental Conservation
Division of Environmental Remediation
Remedial Action, Bureau A
625 Broadway
Albany, NY   12233-7015
(518)402-9620
Fax: (518)402-9022

Resolution Consultants
A Joint Venture of AECOM & EnSafe
1500 Wells Fargo Building
440 Monticello Avenue
Norfolk, Virginia 23510

December 12, 2012

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau 11th Floor
Attention: Steven Scharf
625 Broadway
Albany New York, 12233-7015

RE: Response to Comments
Navy Aug 17, 2012 Draft Sampling and Analysis Plan, Bethpage, NY

Dear Mr. Scharf:

A Draft Sampling and Analysis Plan (SAP) for Bethpage, New York (August 17, 2012) was prepared by Resolution Consultants for the Naval Facilities Engineering Command (NAVFAC). The United States Environmental Protection Agency (USEPA) reviewed the SAP and provided comments in a memorandum dated September 17, 2012. The following responses address NYSDEC's concern and editorial comments regarding the draft SAP.

Each of the requested editorial comments was addressed and these revisions are presented below. This includes clarification regarding the migration of dense non-aqueous phase liquids (DNAPL).

The New York State Department of Environmental Conservation (NYSDEC) identified the following items:

The plan names a variety of broad goals and objectives that are relevant to the overall project, but are not specifically addressed in the proposed workplan. Our [NYSDEC] comments are based on two of these objectives that the proposed work appears targeted at:

- Identify which of the groundwater plumes is the source of the contamination in the production wells at Bethpage Plant #6.
- Fill in data gaps on the western edge of the east plume and the eastern edge of the west plume.

With these goals in mind, the Department approves the workplan pending submittal of a revised workplan that addresses the following comments:

Section 1 of the NYSDEC comments:

The workplan names a variety of broad goals and objectives that are appropriate for the overall investigation of the plume, but are not specific targets of this investigation. These include:

Comment Page 2, Executive Summary, paragraph 1 - “address data gaps associated with the onsite groundwater recovery system and to define the source of chemicals of concern at down gradient water districts”

Response: The paragraph has been changed to the following:
This is a Tier II SAP, with an abbreviated set of worksheets. Resolution Consultants prepared this SAP for Vertical Profile Borings (VPB) and monitoring well installation at Naval Weapons Industrial Reserve Plant (NWIRP) at Bethpage, NY Operable Unit (OU) 2 Site 1 offsite plume under contract task order WE15 Contract N62470-11-S-8013. The objective of the VPB, monitoring well installation, groundwater sampling, and laboratory analysis is to address data gaps on the western edge of the east plume, and the eastern edge of the west plume and determine if these groundwater plumes are the source of contamination in the production wells at Bethpage Plant #6. This data will also help evaluate the effectiveness of the on-site groundwater treatment system (potential underflow) by the collection of data to the Raritan Confining Unit approximately 850 feet below ground surface (ft. bgs) at each of the proposed VPB locations. Additional borings and wells may be required to achieve these objectives

Comment Page 23 - Problem statement

i. “Determine which of the plumes ... affect the water district wells.”
ii. “delineate the vertical and horizontal contamination down gradient of the site in order to protect the water districts that have not been impacted and protect the water districts that have the potential to be impacted.”

Response: The paragraph has been changed to the following:
Past activities at NWIRP Bethpage Site 1 have impacted groundwater at the Site with concentrations of VOCs that may pose a risk to residents and employees if untreated groundwater is used as a potable water source. There are various water districts that have been impacted. The plumes and the flow paths of contamination have not been fully delineated. The downgradient monitoring wells and vertical profile borings will be used to determine which of the plumes, (deep western, deep eastern, or underflow of

the onsite containment system) may affect the downgradient water districts. Specifically targeted in this investigation is the collection of data to the Raritan confining unit by drilling VPB-137, VPB-138, and VPB-139.

<u>Comment Page 23 - Objective</u>

i. "Characterize the nature and extent of the groundwater contamination south of NWIRP Bethpage to determine placement of groundwater monitoring for plume delineation, sentry wells, water quality and potential effected [sic.] water districts.
ii. "Identify which of the groundwater plumes is the source of the contamination in the production wells at Bethpage Plant #6."
iii. "Fill in data gaps on the western edge of the east plume and the eastern edge of the west plume. "
iv. "Help ascertain the effectiveness of the onsite system remedy." --- this will be accomplished by determining which plume caused the contamination in Bethpage Plant #6.

Response: The paragraph has been changed to the following:
The objective of the groundwater investigation is to characterize the nature and extent of the groundwater contamination south of NWIRP Bethpage to determine placement of groundwater monitoring wells for plume delineation, water quality evaluation, and potential effects on the water districts. Specific targets of this investigation include vertical profiling at proposed locations of VPB-137, VPB-138, and VPB-139. This vertical profiling investigation will be undertaken to help identify which of the groundwater plumes is the source of the contamination in the production wells at Bethpage Plant #6. The vertical profile investigation objective is to fill in data gaps on the western edge of the east plume and the eastern edge of the west plume. The northwest proposed location, VPB-137, will help to evaluate a portion of the eastern edge of the west plume (50 ug/L TCE) and will help determine the effectiveness of the onsite system remedy (potential underflow) by the collection of data to the Raritan confining unit. The southern proposed location, VPB-139, will better define the shallow contamination (50 ug/L TCE) and the western edge of the eastern plume (5 ug/L TCE). The northeastern proposed location VPB-138 will better define the shallow contamination (50 ug/L TCE) and the western edge of the eastern plume (50-500 ug/L TCE). It will also help evaluate the effectiveness of the onsite system remedy (potential underflow) by the collection of data to the Raritan confining unit.

Section 2 of the NYSDEC comments:

Comment 1: The text on page 31, describing proposed wells on Figure 5, does not match the wells shown in the figure. This should be revised.

Response: The text has been corrected to reflect that there are three vertical profile borings on Figure 5.

Comment 2: The discussion of "Potential release mechanisms for soil," on page 17, appears to be out of place.

Response: The potential release mechanisms for soil have been removed.

Comment 3: On September 17, 2012 the Department sent you an email which forwarded comments from Mr. Robert Alvey of the USEPA. These should be addressed as appropriate. (These comments are also attached to this approval letter.)

Response. Responses to the EPA comments are attached to this letter and have been incorporated into the SAP.

Comment 4: In addition to these comments, the Department believes that this new data will be far more powerful if it can be correlated with recent data throughout the impacted area. Towards that end, the workplan should include a commitment to conduct a synoptic sampling effort that includes:

- Data from all VPB wells that were sampled in the past 2 years,
- Re-sampling of all relevant wells that have not been sampled in the past 2 years,
- Data from the next round of annual sampling conducted by Grumman, A report on this data that includes revised plume maps and cross sections based on the compiled data.

The details of this sampling effort should be described in a separate workplan.

Response: The NYSDEC has requested a synoptic sampling effort to include VPB data from 2011 and 2012, re-sampling of relevant monitoring wells that have not been sampled in 2011 and 2012, the current annual sampling conducted by Northrop Grumman Corporation (NGC) and a report with revised plume maps and cross section based on the compiled data. These items will not be covered under this SAP.

The following comments are from the Massapequa Water District:

Comment**:** Page 9 - Water Districts are not listed on the organization chart implying they will not have any input.

Response: The organization chart was developed to address the chain of command for field reporting from the Navy's environmental consultants to the Navy.

Comment: Page 9 - NYSDEC is not listed on the top "line of authority" but rather only on the "line of communication".

Response: The Navy is listed as the top line of authority for the investigation team because this chart depicts the lines of authority between the Navy, their environmental consultants, and contractors performing the work.

Comment: Page 10 - Water districts are not part of the communication pathway implying they will not have any input.

Response: This table was developed strictly to address the chain of command for potential issues that may occur during field operations by the consultants and contractors that are accountable to the Navy.

Comment: Page 19 - The plan does not mention the completion of VPB 133 and contamination documentation.

Response: The document has since been incorporated into the document.

Comment: Page 22 - The plan indicated that an FS for offsite residents for soil vapor has not been conducted. This statement is very troubling form a public health perspective. Will an FS be conducted if not why?

Response: The soil vapor issue will be addressed under a separate ROD.

Comment**:** Page 23 - The plan is attempting to segregate the plume rather that addressing the contamination holistically and in a comprehensive manner. The plume needs to be addressed completely rather than in a fragmented approach.

Response: The SAP was written with the intent to segregate the OU-2 plume from the overall site contamination. The purpose of this approach is to more accurately determine the source and migration potential of this particular plume. This will ultimately provide the Navy and the regulators the information to determine a specific and more appropriate remedial action to address this plume and its potential to affect the water district. Although the overall situation appears amenable to a holistic approach, this is not the case. The plumes emanate from different sources in different hydraulically conductive zones, at different depths and concentrations. Information obtained and evaluated during this investigation will be used to design the most effective path forward.

Comment**:** Page 25 - The NYS Drinking water MCL should not be used when defining whether a well has been impacted. The EPA MCL goal (MCLG) for PCE and TCE has been set at zero and must be used. This is important since the EPA is proposing to lower the MCL of PCE and TCE by 2014.

Response: USEPAs definition for the Maximum Contaminant Level Goal ("MCLG") is, "The level of a contaminant in drinking water below which there is no known or expected risk to health". MCLGs allow for a margin of safety and are non-enforceable public health goals. The USEPA generally defers to State screening levels where states have the authority under the National Primary Drinking Water Regulations to regulate their own drinking water supply. Therefore, the contaminant concentrations in the groundwater will be compared to the current NYSDEC standards.

Comment**:** Page 35 - Well development down to 50 NTU is well above the NYS turbidity MCL of 1 NTU. To perform proper analysis NYS certified laboratories require maximum turbidity of 5 NTU which is 10 times less that what is proposed in the plan. A turbidity goal of 1 NTU should be used with 5 NTU allowed as the maximum.

Response: USEPA protocol states that well development down to 5 NTU in interbedded sands and clays may not be possible. The Magothy aquifer under the Bethpage site is comprised of interbedded clays and sands. In these instances demonstration that the well has been constructed properly and all reasonable efforts have been expended to develop the well will suffice for groundwater monitoring wells. USEPA sampling protocols call for lower NTU where achievable; however, page 35 of the SAP deals with well development, not with sampling for chemical characterization.

Comment**:** Page 37 - The sampling plan must allow for a full casing turn over prior to taking the sample. The plan is not clear on this and the detention time should be better specified.

Response: The wells will be developed as required. The volumes are not specified in this section of the SAP because the development volumes cannot be determined at this time. The collection of groundwater samples for chemical analysis via low flow sampling techniques as per USEPA guidance, requires continuous low volume pumping to stabilize groundwater quality parameters (DO, pH, ORP, temperature conductivity, and turbidity) prior to sample collection. Stabilization of these parameters is the determining factor in sampling, not the removal of a set volume of water from the well. USEPA's low flow methodology no longer allows for bailing specified amounts of water when sampling for VOCs.

The following comments are from the United States Environmental Protection Agency (USEPA)

Comment 1: It may be helpful to initially spell out NWIRP in the text.

Response: Naval Weapons Industrial Reserve Plant NWIRP has been spelled out.

Comment 2: “Downgradient” is the correct English term (1 word)

Response: Down gradient has been replaced with Downgradient throughout the document.

Comment 3: “Couple of the sources” is misleading. I suggest changing this to “two of the organizations”

Response: “Couple of the sources” on page 2 paragraph 2 has been replaced with “two of the organizations”.

Comment 4: “southern state parkway” should be capitalized
Response: southern state parkway now reads Southern State Parkway throughout the plan.

Comment 5: “Wantagh parkway” should be capitalized

Response: Wantagh parkway now reads Wantagh Parkway throughout the plan.

Comment 6: The last line should be made into 2 sentences. I suggest clarifying: “At the NWIRP, the Raritan Clay is encountered at a depth of roughly 700-800 feet below ground surface (bgs), and is deeper at some downgradient locations.

Response: The sentence has been changed to the following: At the NWIRP, the Raritan Clay Layer is encountered at a depth of approximately 700 to 900 feet (ft) below ground surface (bgs). The Raritan Clay Layer is deeper than 900 ft bgs at some downgradient locations.

Comment 7: Add “and the force of gravity” at the end of the last line.

Response: The sentence now reads “Groundwater in the northern portion of the study area generally sinks as it flows as a result of precipitation infiltration, displacement and groundwater extraction.”

Comment 8: Change “approximately” to “initially anticipated to be roughly”

Response: The sentence now reads: ”Borings will be installed to the top of the Raritan Clay formation initially anticipated to be roughly 850 ft below ground surface.“

Comment 9: The text states 6 monitoring wells are planned to be installed at 3 vertical profile boring locations, and an additional 4th VPB, but no well anticipated. I strongly recommend that a monitoring point screened at the base of the Magothy be added to the VPB before grouting the holes.

Response: Given the design of the VPB program, the random installation of a monitoring well at the bottom of the boring is not practical. The VPBs will penetrate the

Raritan Clay Layer and terminate only after the clay layer is identified by split-spoon samples. Hydropunch sampling will be performed near the base of the Magothy aquifer.

Comment 10: The text states a task item to perform natural gamma logging of the VPBs. I suggest that a full suite of geophysical logs be conducted of each VPB and recommend the USGS be engaged for the logging task.

Response: Delta Well and Pump was chosen for its twenty years of experience conducting geophysical logging and they are expected to complete effective logging. An experienced geologist will be interpreting the geophysical logs. Delta was contracted to be continuously on-site as a cost effective approach since there will be no significant down time following completion of the VPB's and start-up for the geophysical logging.

Comment 11: Acronyms and Abbreviations. GW is listed as the abbreviation for groundwater and I note "groundwater" is referenced as a single word. I concur.

Response: GW remains defined as groundwater.

Comment 12: Refer to the comments regarding Page 2 for consistency.

Response: Please refer to responses for comments 2, 4, and 5.

Comment 13: Please clarify; "Construction completion is currently planned from winter 2013." Should this be "by"?

Response: The sentence has been changed to **"**Construction completion is tentatively planned for winter 2013."

Comment 14: I suggest that a brief description on DNAPL be added to clarify that migration of DNAPL in the groundwater aquifer is predominantly gravity based.

Response: The following has been added:" If dense Non Aqueous Phase Liquid (NAPL) is present it will sink through the water table."

Comment 15: Although the migration of the plumes is toward the ocean, I suggest this be clarified. The "Great South Bay" is the ultimate discharge of groundwater from this area.

Response: The sentence has been changed to the following: “The migration path of the plumes flows south southeast in the direction of groundwater flow, toward the Great South Bay and is ultimately discharged into the ocean.”

Comment 16: Delete “the” before Hempstead Turnpike.

Response: The sentence has been changed to the following: “The shallow plume encompasses the eastern and western plume and extends beyond Hempstead Turnpike.”

Comment 17: Is the referenced Northrop Grumman well GP-3 correctly named a “product” or a “production” well?

Response: The text has been changed to reflect that GP-3 is a production well.

Comment 18: The reference to the VOCs detected does not include the dates or years. It is uncertain whether the results are current or historic highs.

Response: The text has been adjusted to reflect the VOCs results are historic highs.

Comment 19: I suggest modifying the first sentence to clarify that the health concerns expressed for using the impacted water as a potable water source are for “untreated” water. There are no such significant concerns, to my knowledge, for potable water in which the contaminants have been removed prior to distribution.

Response: The sentence has be changed to the following: ”Past activities at NWIRP Bethpage Site 1 have impacted groundwater at the Site with concentrations of VOCs that may present a significant cancer risk to residents and employees if untreated groundwater is used as a potable water source.”

Comment 20: This is a reference to a term, “sentry” wells, that was not previously discussed. Sentry wells are monitoring wells installed at non-impacted areas and depths around a known plume to help monitor cleanup and migration. This is different than “outpost” monitoring wells whose purpose is a bit different. (refer to the Sole Source Aquifer designation for Nassau-Suffolk) The outpost monitoring wells are not located to be useful for monitoring cleanup, but to provide advance warning to the supply well owners that their well will become impacted so they can take appropriate action.

Response: Sentry has been replaced with outpost.

Comment 21: Consider changing “screening”, “chemical” and “physical” data to “laboratory analytical data” and “field data”. VOCs and TOCs may be derived from laboratory analyses while everything else is performed or conducted in the field. In some water horizons, the presence of chlorides in groundwater is a long term and growing concern. Selective inorganics should be considered for laboratory analyses.

Response: While we recognize the concern of others regarding chloride in the aquifer, the SAP specifically addresses the migration of the VOC plumes (primarily trichloroethene) as per the Record of Decision.

Comment 22: This section states selected soils samples will be analyzed for TOC. Are any geotechnical tests considered? Grain size analysis data is useful in screen slot size determination or as a line of evidence where the sample depth below ground surface indicates Raritan Clay should be encountered, but isn’t.

Response: While grains size analysis is useful when trying to develop efficient well screens, our goal is to establish a monitoring well which allows collection of a groundwater sample and prevents silting up of the well screen. As a result, a fine screen slot size and appropriate sand pack are sufficient.

A significant aspect of the Raritan is the lower portion of the confining layer, a clay layer, which limits the movement of groundwater. Visual field grain size identification will satisfactorily identify when the boring has reached the appropriate maximum depth for the VPB.

Comment 23: Collection of split spoon samples on 5 foot centers, if 850 feet boring bgs is reached without encountering Raritan Clay, seems a bit excessive. I’d recommend 20 foot intervals until confirmation is needed (and transitioning to the five foot interval for 3 split spoon soils samples.

Response: The sentence has been changed to read: ”If the Raritan Clay layer is not encountered at 850 ft, additional split spoon samples will be collected at twenty foot intervals centers below 850 ft until the top of the Raritan Clay layer is located.”

Comment 24: The data review for selection of screen intervals for the monitoring wells should also include the geophysical logs, lithology, and field data.

Response: The sentence has been changed to read: ”Based on the results from the grab groundwater samples, and the depth of the BWD plant six water supply well screened intervals, the geophysical logs lithology and field data, the screen intervals for the two monitoring wells will be selected.”

Comment 25: It is premature to specify slot size to be used for all monitoring well screens, particularly since the drilling has not initiated.

Response: See response to 22 above. Additionally, based on historical data well screens will have slot sizes of 0.010 inches, if conditions warrant slot size will change accordingly.

Comment 26: Please clarify what “gripper caps” are. I understand these to be inner well seals, but am not familiar with this term. I also suggest the inclusion of a tag identifying the well ID number and owner be located on each well.

Response: The sentence has been changed to read” Lockable J plugs are to be installed on well riser tops and the well will be labeled.”

Comment 27: It may be appropriate to add more details to the SOPs and level of detail required for geophysical logging of the boreholes and whether interpretation and delivery of the logs is required.

Response: The paragraph has been changed to read: Borehole geophysical logs will be recorded for each VPB boring. Following advancement to the total depth of each boring to be logged, the drilling tools will be withdrawn from the borehole. A Mount Sopris Instrument model 2PGA-100 poly gamma will be used. Logging will start at the top of the hole. The probe will be advanced to the bottom of the hole at a maximum rate of 15 feet per minute. A copy of the log will be printed in the field for review. Once the probe reaches the bottom of the bore hole logging will cease. Logging will resume when the probe is advanced upward. A second log will be generated and printed. VPB will be logged for natural gamma. The gamma logs will be interpreted by an experienced geologist and compared to physical and observable data collected.

Comment 28: Development of a newly installed monitoring well is not to merely remove “accumulated” silt and sediments from inside the well, but remove fines from and establish the filter pack so it has hydraulic connection between the well and surrounding aquifer.

Response: The sentence has been changed to read: "Following installation, all monitoring wells will be developed to evacuate silts and other fine-grained sediments which may have accumulated within the well during its installation and to establish the filter pack to promote a hydraulic connection between the well and the surrounding aquifer."

Comment 29: This is the first reference I observed regarding NAPL in wells. Are there any concerns regarding boring into NAPL zones as part of this investigation?

Response: NAPL is not expected to be present in the monitoring wells.

Comment 30: The use of summa canisters to collect air samples appears excessive. Have there been concerns raised as a result of summa results from previous VPBs?

Response: No concerns have been identified to date, but the Navy feels it is important to document the air quality at each of these locations.

Comment 31: Please clarify. The quantitation limits/ level of detection of hydropunch water samples submitted for analyses of VOCs may need reassessing. They appear to be lower than would be necessary for the purpose of collecting the water samples during the drilling process. A higher limit of detection may provide some cost saving without sacrificing the integrity of the sample results. The goal is to use the data to select appropriate screen zones and install permanent monitoring wells.

Response: Katahdin Laboratory has been contacted and there would be no difference in cost if a higher limit of detection is used.

The USEPA stated that it would be beneficial to know if there are other existing wells in the vicinity of the proposed wells.

The existing wells in the vicinity of the proposed wells are as follows:

- Monitoring wells GM-34D and GM-35D2 are in the vicinity of proposed VPB137.
- Monitoring wells GM-36D is near the vicinity of proposed VPB138
- There are no nearby monitoring wells in the vicinity of proposed VPB139.

If you have any questions on the content of the SAP or when you are ready to schedule a meeting or conference call to discuss your initial feedback, please contact Ms. Lora Fly, the Navy RPM, lora.fly@navy.mil.

Sincerely,

Eleanor C Vivaudou

Resolution Consultants
Eleanor Vivaudou, PE
Environmental Engineer
100 Red Schoolhouse Road, Suite B-1
Chestnut Ridge, NY 10977
eleanor.vivaudou@aecom.com
845.425.4980

Document Distribution:

Lora Fly, NAVFAC
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Steven Scharf, NYSDEC
Al Taormina, H&S Environmental
Glenn Wagner, TetraTech, Inc.
Eleanor Vivaudou, Resolution
Bill Spronz, Resolution
Mark Kauffman, Resolution

EXECUTIVE SUMMARY

This is a Tier II Sampling and Analysis Plan (SAP), with an abbreviated set of worksheets. Resolution Consultants has prepared this Sampling SAP for Vertical Profile boring and monitoring well installation at Naval Weapons Industrial Reserve Plant (NWIRP) at Bethpage NY Operable Unit (OU) 2 Site 1 offsite plume under contract task order WE15 Contract N62470-11-S-8013. The objective of the vertical profile boring (VPB) and monitoring well installation, groundwater sampling, and laboratory analysis is to address data gaps on the western edge of the east plume, and the eastern edge of the west plume and to identify which of the groundwater plumes is the source of contamination in the production wells at Bethpage Plant #6. This data will also help ascertain the effectiveness of the on-site groundwater treatment system (potential underflow) by the collection of data to approximately 850 feet (ft) below ground surface (bgs) at each of the proposed VPB locations. NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy's property totaled approximately 109 acres and was formerly a Government-Owned Contractor-Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. In 2002, approximately four acres (Plant No. 20) was transferred to Nassau County, and in April 2008, approximately 96-acres of property were transferred to Nassau County. NWIRP Bethpage is bordered on the north, west, and south by property owned or formerly owned by NGC that covered approximately 500 acres, and on the east by a residential neighborhood. NIWIRP and NGC are two of the organizations that contributed to the Site 1 OU-2 offsite Volatile Organic Compounds (VOC) plume. Site 1 OU-2 offsite plume begins south of the Northrop Grumman property, and extends just shy of the Southern State Parkway; it extends east of the property to approximately State Highway 135, and extends to the west to Wantagh Parkway in the south and Jerusalem Avenue in the north (see site Figure 1). The majority of the site consists of residential neighborhoods.

The Upper Glacial Formation and the Magothy Formation comprise the aquifer of concern at the NWIRP. Regionally, these formations are generally considered to form a common, interconnected aquifer as the coarse nature of each unit near their contact and the lack of any regionally confining clay unit allows for the unrestricted flow of groundwater between the formations. At the NWIRP, the Raritan Clay Layer is encountered at a depth of approximately 700 to 900 fbgs. The Raritan Clay Layer is deeper than 900 fbgs at some downgradient locations.

Groundwater is encountered at a depth of approximately 50 fbgs at the facility. Historically, because of pumping and recharge at the facility, groundwater depths have been measured to range from 40 to 60 fbgs. The regional groundwater flow in the area is to the south southeast.

Groundwater generally sinks as it flows as a result of precipitation infiltration, displacement and groundwater extraction.

Resolution Consultants will provide VPB and monitoring well installation oversight at four offsite locations, 1.4 to 1.75 miles to the south of the NWIRP site. Borings will be installed to the top of the Raritan Clay formation initially anticipated to be roughly 850 fbgs. Split-spoon samples will be collected during advancement to profile the stratigraphy and confirm the surface of the Raritan formation. Groundwater samples will be collected during boring advancement at 50 and 20 foot intervals. Six monitoring wells will be installed at three of the VPB locations, and the screen intervals will be based on the groundwater results. The fourth VPB will be held in contingency, and no wells will be installed. Once the completion depth is reached, a natural gamma geophysical log will be performed from the ground surface to the boring termination depth. Following well installation, wells will be developed (estimated purge volume per well is 15,000 gallons), and one round of groundwater samples will be collected by low-purge and sampling methods. Completed VPBs and monitoring well locations will be surveyed by a New York State licensed surveyor.

Prior to conducting field activities under this SAP, a site-specific Health and Safety Plan will be completed to provide the safety and health requirements, practices, and procedures for the Resolution Consultant personnel participating field activities at NWIRP Bethpage.

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Figures

Appendices

Appendix A	SOPs
Appendix B	Tier II Letter
Appendix C	Accreditation letters

LIST OF ACRONYMS AND ABBREVIATIONS

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,2-DCE	1,2-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
ANY	Aqua New York
bgs	below ground surface
BPOW	Bethpage Outpost Well
BWD	Bethpage Water District
COC	Contaminant of Concern
CSM	Conceptual Site Model
CTO	Contract Task Order
DDT	Dichlorodiphenyltrichloroethane
DL	Detection Limit
DoD	Department of Defense
DQI	Data Quality Indicator
DQO	Data Quality Objective
EICP	Extracted Ion Current Profile
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency, United States
fbgs	feet below ground surface
FS	Feasibility Study
ft	feet
FTMR	Field Task Modification Request
GC	Gas Chromatograph
GOCO	Government-Owned Contractor-Operated
GW	Groundwater
GWTP	Groundwater Treatment plant
HHRA	Human Health Risk Assessment
HNUS	Halliburton NUS
HCL	Hydrochloric Acid
ICAL	Initial Calibration
ICP	Inductively Coupled Plasma
IDW	Investigation Derived Waste
IS	Internal Standard
LCS	Laboratory Control Sample
LOD	Limit of Detection
LOQ	Limit of Quantification
MS	Mass Spectrometry
MCL	Maximum Contaminant Level
mg/L	Milligrams Per Liter
MPC	Measurement Performance Criteria

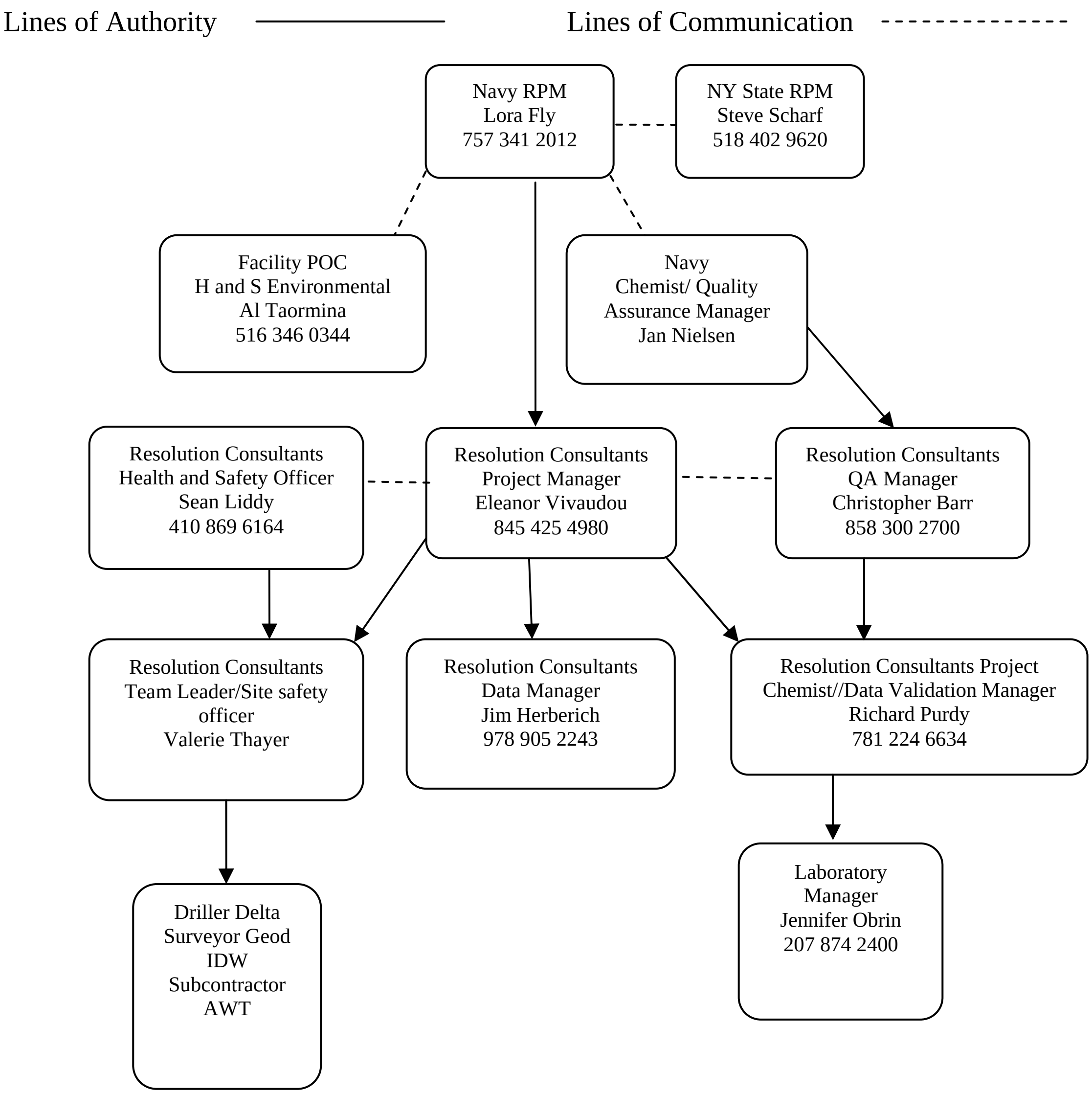
LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

MSA	Method of Standard Addition
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NA	Not Applicable
NAPL	Non Aqueous Phase Liquid
NAVD	North American Vertical Datum
NAVFAC	Naval Facilities Engineering Command
NGC	Northrop Grumman Corporation
NIRIS	Naval Installation Restoration Information Solution System
NTUs	Nephlometric Turbidity Units
NWIRP	Naval Weapons Industrial Reserve Plant
NYS AG-1	New York State Air Guide-1 Annual Guidance Concentration
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ONCT	Onsite Containment System
OU	Operable Unit
PAL	Project Action Limits
PCBs	Polychlorinated Biphenyls
PCE	Tertrachloroethene
PDF	Portable Document Format
PID	Photoionization Detector
PM	Project Manager
POC	Point of Contact
POTW	Publicly Owned Treatment Works
PVC	Polyvinylchloride
ProjChem	Project Chemist
QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
QSM	Quality Systems Manual
%R	Percent Recovery
ResCon	Resolution Consultants
RL	Reporting Limit
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RT	Retention Time
RW	Recovery Well
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SFWD	South Farmingdale Water District

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

SOP	Standard Operating Procedure
SMC	System Monitoring Compound
SQL	Structured Query Language
SRM	Standard Reference Material
SSO	Site Safety Officer
SVOC	Semivolatile Organic Compounds
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TBD	To Be Determined
TL	Team Lead
TOC	Total Organic Carbon
TVOC	Total Volatile Organic Compounds
USEPA	United States Environmental Protection Agency
UFP	Uniform Federal Policy
µg/L	Micrograms Per Liter
µg/m3	Micrograms Per Cubic Meter
µg/kg	Micrograms Per Kilogram
VOA	Volatile Organic Analytes
VOC	Volatile Organic Compounds
VPB	Vertical Profile Boring
ZHE	Zero Headspace Extractor

SAP Worksheet #5: Project Organizational Chart



SAP Worksheet #6: Communication Pathways

The communication pathways for the SAP are shown below.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Regulatory Agency Interface	NYSDEC Remedial Project Manager (RPM)			NAVY RPM will interface with NYSDEC RPM directly Via verbally or email as needed.
	NAVY RPM Resolution Consultant (ResCon) Project Manager (PM)	Lora Fly Eleanor Vivaudou	757 341 2012 845 425 4980	ResCon PM to interface with NAVY RPM and get approval via email or phone prior to mailing correspondence, reports, etc. to the Regulatory Agency on the Navy's behalf. Reports /correspondence will go out within 2 days of receipt of approval.
Field Progress Reports	ResCon Team Lead (TL)	Valerie Thayer	207 650 6572	ResCon TL will verbally inform Navy RPM and Facility Point of Contact (POC) on the day that schedule change is known and document via schedule impact letter within one business day of when impact is realized.
Stop Work due to Safety Issues	ResCon Site Safety Officer (SSO)	Valerie Thayer	207 650 6572	ResCon SSO will inform onsite personnel, subcontractor(s), the Navy RPM, the Facility POC, and the identified Project Team members within one hour (verbally or by e-mail). If a subcontractor is the responsible party, the subcontractor PM must inform the ResCon SSO within 15 minutes, who will then follow the procedure listed above. ResCon SSO will inform the ResCon PM when the condition has been resolved. The ResCon PM will inform the Navy RPM within 4 hours.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
SAP/WP Changes prior to Field/ Laboratory work	ResCon PM	Eleanor Vivaudou	845 425 4980	ResCon TL will verbally inform ResCon PM within 24 hours of realizing a need for an amendment.
	ResCon TL	Valerie Thayer	207 650 6572	ResCon PM will document the changes via a Field Task Modification Request (FTMR) form within five days and send the Navy RPM a concurrence letter within seven days of identifying the need for change. SAP Amendments submitted by ResCon to Naval Facility Engineering Command (NAVFAC) Mid-Atlantic Program Management Office for review and approval. ResCon PM will send scope changes to Project Team via e-mail within one business day.
SAP/WP Changes in the Field	ResCon PM	Eleanor Vivaudou	845 425 4980	ResCon TL will verbally inform ResCon PM within 4 hours of realizing a need for an amendment.
	ResCon TL	Valerie Thayer	207 650 6572	ResCon PM will verbally inform Navy RPM and Facility POC on the day that schedule change is known and document via schedule impact letter within two business day of when impact is realized.
Field Corrective Actions	ResCon PM	Eleanor Vivaudou	845 425 4980	ResCon QAM will notify ResCon Pm within one business that any required corrective actions have been completed. ResCon PM will inform ResCon SSO and Navy RPM within one business day.
	ResCon SSO	Valerie Thayer	207 650 6572	
	ResCon QAM	Christopher Barr	858 300 2700	
	Navy RPM	Lora Fly	757 341-2012	

Communication Drivers	**Responsible Entity**	**Name**	**Phone Number**	**Procedure (Timing, Pathway To/From, etc.)**
Sample Receipt Variances	Laboratory Project Manager (Lab PM) ResCon Project Chemist (ProjChem) ResCon TL ResCon PM	Jennifer Obrin Richard Purdy Valerie Thayer Eleanor Vivaudou	207 874 2400 781 224 6634 207 650 6572 845 425 4980	The Lab PM will notify the ResCon ProjChem of any issues with respect to sample receipt (Chain-of-custody, broken samples, etc.). The ResCon ProjChem will verbally notify the ResCon TL and ResCon PM of the issue, possible corrective actions, and impact to data. The LabPM will document any issues in the analytical report case narrative. ResCon TL to inform NAVY RPM at time of Field Progress Report. Resolution PM to document variance and resolution
Reporting Lab Quality Variances	Lab PM ResCon ProjChem ResCon PM Navy RPM	Jennifer Obrin Richard Purdy Eleanor Vivaudou Lora Fly	207 874 2400 781 224 6634 845 425 4980 757 341 2012	The Lab PM will notify the ResCon ProjChem of any issues in the analytical report case narrative. The ResCon ProjChem will notify the ResCon PM of any issues in the analytical report case narrative. The ResCon Pm will provide the Navy RPM with a report of any issues affecting the data quality in the laboratory.
Reporting Concerns Involving Lab	ResCon ProjChem ResCon PM	Richard Purdy Eleanor Vivaudou	781 224 6634 845 425 4980	The ResCon ProjChem will notify the ResCon PM of any concerns involving the laboratory with respect to its procedures or processes within one business day. The ResCon ProjChem will provide the ResCon PM with a report of any issues affecting data quality as identified during the validation process.
Notification of Non-Usable Data	Lab PM ResCon ProjChem ResCon PM Navy RPM	Jennifer Obrin Richard Purdy Eleanor Vivaudou Lora Fly	207 874 2400 781 224 6634 845 425 4980 757 341 2012	The ResCon ProjChem will notify the Lab PM, if appropriate, of any issues involving non-usable data due to laboratory procedures. The ResCon PM will provide the Navy RPM with a report of any issues affecting the data quality in the laboratory.
Analytical Corrective Actions	Lab PM ResCon ProjChem ResCon PM	Jennifer Obrin Eleanor Vivaudou Richard Purdy	207 874 2400 845 425 4980 781 224 6634	The ResCon Proj Chem will notify the Lab PM and ResCon PM, if appropriate, of any issues involving non-usable data due to laboratory procedures

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Reporting Data Validation Issues	ResCon PM ResCon ProjChem Navy RPM	Eleanor Vivaudou Richard Purdy Lora Fly	845 425 4980 781 224 6634 757 341 2012	The ResCon ProjChem will provide the ResCon PM with a report of any issues affecting data quality as identified during the validation process. The ResCon PM will provide the Navy RPM with a report of any issues affecting the data quality in the laboratory.
Data Validation Corrective Actions	ResCon PM ResCon ProjChem	Eleanor Vivaudou Richard Purdy	845 425 4980 781 224 6634	The ResCon ProjChem will notify the ResCon PM of any actions that may be required as a result of the data validation

Notes:

SAP Worksheet #9: Project Scoping Session Participants Sheet

Project Name:	Site 1 OU-2 Offsite TCE Groundwater Plume Investigation	**Site Name:**	Bethpage
Projected Date(s) of Sampling:	October 2012	**Site Location:**	Bethpage NY
Project Manager:	Eleanor Vivaudou		
Date of Session:	5/24/2012		
Scoping Session Purpose:	Narrow down the VPB locations		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Lora Fly	Navy RPM	Navy	757 341 2012	Lora.fly@navy.mil	RPM
Eleanor Vivaudou	Environmental Engineer	Resolution Consultants	845 425 4980	Eleanor.vivaudou@aecom.com	CTO Manager

Comments/Decisions: Lora provided clarification that the VPB locations would be at Lincoln Boulevard, Avoca Avenue, and Romscho Street. The contingency boring has not been located as of yet.

Action Items:

Consensus Decisions:

Project Name:	Site 1 OU-2 Offsite TCE Groundwater Plume Investigation	**Site Name:**	Bethpage
Projected Date(s) of Sampling:	October 2012	**Site Location:**	Bethpage NY
Project Manager:	Eleanor Vivaudou		
Date of Session:	5/1/2012		
Scoping Session Purpose:	Narrow down the VPB locations		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Lora Fly	Navy RPM	Navy	757 341 2012	Lora.fly@navy.mil	RPM
Eleanor Vivaudou	Environmental Engineer	Resolution Consultants	845 425 4980	Eleanor.vivaudou@aecom.com	CTO Manager

Comments/Decisions: Lora provided a map of the 5 possible locations for the VPBs.

Action Items:

Consensus Decisions:

Project Name:	Site 1 OU-2 Offsite TCE Groundwater Plume Investigation	**Site Name:**	Bethpage
Projected Date(s) of Sampling:	October 2012	**Site Location:**	Bethpage NY
Project Manager:	Eleanor Vivaudou		
Date of Session:	6/27/2012		
Scoping Session Purpose:	Address Comment 4 for worksheet 9 and address Comment 2 of UFP-SAP		

Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**	**Project Role**
Lora Fly	Navy RPM	Navy	757 341 2012	Lora.fly@navy.mil	RPM
Eleanor Vivaudou	Environmental Engineer	Resolution Consultants	845 425 4980	Eleanor.vivaudou@aecom.com	CTO Manager

Comments / Decisions:

Comment 4

The NYSDEC did not participate in sighting the location of the borings and monitoring wells. The Navy will hold a call with the NYSDEC and present the general layout of the work and then provide the locations as part of the workplan and SAP.

Comment 2

Lora Fly the Navy RPM discussed and received approval from LANT to use Tier II.

Action Items:

Consensus Decisions:

Lora Fly spoke with Jan Nielsen regarding the Tier II approval.

SAP Worksheet #10: Conceptual Site Model

This SAP addresses Operable Unit 2 which is comprised of the off-site shallow and deep groundwater plume.

10.1 Site Location and History

Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy's property totaled approximately 109 acres and was formerly a GOCO facility that was operated by the NGC until September 1998. In 2002, approximately four acres (Plant No. 20) was transferred to Nassau County and in April 2008, approximately 96-acres of property were transferred to Nassau County. NWIRP Bethpage is bordered on the north, west, and south by property owned or formerly owned by NGC that covered approximately 500 acres, and on the east by a residential neighborhood. NIWIRP and NGC are two of the organizations that contributed to the OU2, Site 1 off site plume. OU2, Site 1 begins to the south of the Northrop Grumman property and extends just shy of the Southern State Parkway, it extends east of the property to approximately State Highway 135 and extends to the west to Wantagh Parkway in the south and Jerusalem Parkway in the north (see Figure 1).

The NWIRP Bethpage was established in the early 1940's. The plant's primary mission was the research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The facilities at NWIRP Bethpage included four plants used for assembly and prototype testing; a group of quality control laboratories, two warehouse complexes (north and south), a salvage storage area, storm and non-contact cooling water recharge basins, the Industrial Wastewater Treatment Plant, and several smaller support buildings. In 1998, operations ended at the facilities. The NWIRP was located within the secure portion of the NGC complex, and between the Navy and NGC totaled approximately 605 acres

Figure 2 presents the conceptual model for the OU2 Site 1 off site plume area. Included on the Figure is information regarding the known or potential sources of VOC, the identified release mechanisms, and the affected source media. The potential migration pathways, the exposure media, and the potential exposure routes are identified. Note that the exposure routes are considered potential unless there is an on-going or documented exposure.

OU2 is the offsite groundwater VOC plume. The VOC-contaminated groundwater is an extensive (3,000 acres plus) area of VOC-contaminated groundwater that extends south of Hempstead Turnpike (Figures 3 and 4) and extends to a depth of approximately 750 ft. Other sources of the groundwater contamination are present, including Northrop Grumman and the Hooker Ruco

Superfund Sites. Three of the Bethpage Water Districts (BWD) well fields have been impacted by the plume and VOC treatment has been in place for over 10 years (Figure 4). Aqua New York (ANY) well field has recently been impacted and VOC (Trichloroethene [TCE]) concentrations are increasing in the well field. Construction of an offsite groundwater hot spot remediation system (GM-38 Area) was completed in December 2009 and is currently in operation. The Navy is negotiating with South Farmingdale Water District (SFWD) for treatment on one of its well fields. In 2009, six vertical profile borings (VPB) were installed to establish depth specific contamination. The borings were drilled to a depth of 750 to 841 fbgs. In October 2009, the GM-38 Area Groundwater Treatment Plant (GWTP) started partial operation with the operation of recovery well (RW)-1, and full operation in March 2010 with the addition of recovery well RW-3. The GM-38 GWTP is designed to treat a hotspot area of TCE-contaminated groundwater in the area. From 2010 to 2011, an additional 3 VPBs and 5 outpost monitoring wells were installed to further delineate TCE contamination. An additional 3 VPBs will be installed near SFWD Plant 3. A well-head treatment remedy for ANY water supply wells located at the Seaman's Neck Road Facility is currently being implemented. An interim emergency treatment system has been installed and will be operated until the full-scale final well head treatment system is constructed. Construction completion is tentatively planned for winter 2013.

There are three mechanisms by which constituents in groundwater can be transported to other media. These migration pathways include the following:

1) Adsorption. Constituents in groundwater may be sorbed onto subsurface soils.
2) Volatilization to Ambient Air. Volatile constituents in groundwater may potentially desorb into soil gas and be transported into ambient or indoor air.
3) Extraction. Constituents in groundwater may migrate to other media by extraction and use of impacted groundwater.

When VOCs are in contact with groundwater, they can readily migrate in groundwater in

dissolved form. This is done mainly through advection and difference in hydraulic gradients.

If dense non aqueous phase liquid (NAPL) is present it will sink through the water table. Although VOCs can desorb into soil gas and be transported into ambient indoor air, it is unlikely due to the depth of contamination and distance from the sources.

Potential release mechanisms for soil include the following:

1) Volatilization: Volatile constituents may potentially be transported from subsurface soil by volatilizing into soil-pore space and eventually emanate into ambient or indoor air.

2) Leaching: Constituents in surface or subsurface soil could potentially leach to groundwater.

Although VOCs can be transported from the subsurface by volatilizing into soil-pore space and eventually emanate into ambient indoor air, it is unlikely because of the depth of contamination and distance from the sources. Currently, the primary media at the site through which receptors can be exposed to VOCs include groundwater and subsurface soils. Exposure routes include dermal contact, and ingestion. Potential exposure pathways at OU2 Site 1 include the following:

- Dermal contact with subsurface soils and groundwater;

- Ingestion of groundwater.

10.2 Potential Receptors

The potential receptors that may be exposed to contaminated media at OU2 Site 1 include drillers and area residents via ingestion, inhalation, or dermal contact with contaminated soils or groundwater. A breakdown can be found in Table 6-1.

Future site use is anticipated to remain the same. Below is a list of work completed on site.

Date	Work Complete
1992	Phase 1 Remedial Investigation Report complete for site
2000	3 VPB (38, 76, 77)
	12 Monitoring wells were installed on site
2001	ROD for Northrop Grumman and NWIRPs
2002	5 VPB (44, 45, 46, 50)installed in southern area
	Seven (GM-18D GM21D,GM- 75D2,GM- 78S, GM-78I, GM- 791,and GM-79D) monitoring wells to support the On-site containment system effectiveness
	6 VPG installed in the GM 38 Area(40, 47, 48, 51, 42, 49C)
	Conceptual design report for GM-38 area
	GM-39 and GM 73 installation
2003	ROD for OU-2 for NAVY only,
	Remedy analysis report for the GM 38 Area completed
2004	Installed 9 outpost wells Bethpage Outpost Wells (BPOW) 1-1, 1-2, 1-3, 2-1, 2-2, 3-1. 3-2, 4-1, and 4-2 to provide advance warning

Date	Work Complete
	PDI for GM-38
2005	BODM and remedial design for GM-38
2006	Final Design for GM-38 area
2009	PDI for Offsite GM-75
2010	Final O and M plan for GW treatment plan GM-38
	SAP for O and M of GM-38
	PDI to delineate groundwater South of GM-75 and GM-34
	BOD Report for Well head at Aqua NY Seamans Neck Rd water plan
2011	BP OW2-1 and 2-2 repair and sampling
	Optimization of GM-38
	WP to VPB-130 N of S Farmingdale Water district Plant 3 VPB-131 NW of S Farmingdale Water district plant 3 VPB-132 N of S Farmingdale plant 6
	VPB133WP addendum
	Engineers report for wellhead treatment at Aqua NY Seamans Neck Road
2012	Study of alternatives for plume management
	Final Construction WP for installation of Emergency Treatment Liquid phase GAC units Aqua NY Inc Seamans Neck Road WP
	Letter Workplan Addendum for the Pre-Design Field Investigation at Operable Unit 2 (OU-2) Vertical Profile Boring 133 - Off Site Groundwater Investigation at NWIRP Bethpage, NY

10.3 Nature and Extent of Contamination

Possible Sources and General Extent of Potential Contamination: The offsite groundwater contamination consists of three general plumes:

- Shallow Plume
- Deep Eastern Plume
- Deep Western Plume

The shallow plume was likely formed by multiple sources on Navy and Northrop Grumman Property that was not directly influenced by the onsite production wells and from infiltration of contaminated recharge basin water. The shallow plume contains relatively low Total Volatile Organic Compounds (TVOC) concentrations (generally 50 µg/L or less) and is normally found at depths of 50 to 250 fbgs The deeper contaminant plumes containing higher concentrations of TVOC (100 to 10,000 µg/L) are typically found between 250 and 750 fbgs. The migration path of the plumes flows south southeast in the direction of groundwater flow, toward the Great South Bay, and is ultimately discharged into the ocean.

On NWIRP Bethpage, Site 1 was identified as a significant contributor to the offsite groundwater plume. Other potentially significant sources of the offsite groundwater contamination include the Bethpage Community Park, Northrop Grumman Plants 1 and 2, and the Hooker Ruco Superfund Site. Smaller sources of the offsite plume were likely present at NWIRP Bethpage, including the HN-24 Area, the Site 2 – Recharge Basins, and small spills at Site 3 – Salvage Storage Area. Current site groundwater data do not indicate the presence of a significant continuing source of VOC-contaminated groundwater on NWIRP Bethpage.

The shallow plume encompasses the eastern and western plume and extends beyond Hempstead Turnpike. Based on the width of this plume (approximately 8,000 ft), it is most likely associated with historic discharges from recharge basins in which deep groundwater, with variable concentrations of VOCs, were mixed, partially treated through volatilization, and discharged into the shallow groundwater. Recharge basins on both Northrop Grumman and NWIRP Bethpage were used to discharge this water. The shallow plume contains lower concentrations of VOCs (less than 50 µg/L) and is discontinuous both horizontally and vertically. The furthest downgradient groundwater samples (15,000 ft) contain VOCs, and therefore the shallow plume has not been defined to the south. The VOCs include TCE, Tetrachloroethene (PCE), 1,1-Dichloroethene (1,1-DCE), 1,1-Dichloroethane (1,1-DCA), 1,1,1-Trichloroethane (1,1,1-TCA), Dichlorodifluoromethane (Freon 12), and chloroform. Several VPBs located along the southern edge of the investigation area consist of VPB-43, -44, -45, -46, and -50.

The western plume which is predominantly TCE is directly south and southwest of NWIRP Bethpage. The plume starts near the southwest corner of NWIRP Bethpage, runs along the western boundary of the former Northrop Grumman Plant, including underneath Plant No. 2, continues offsite toward the ANY Well Field located 15,000 ft to the south of NWIRP Bethpage. Northrop Grumman Production Well GP-3, located on the western edge of the plume on Northrop Grumman property is screened at a depth of approximately 500 fbgs and contains historically TVOC concentrations of 2,920 Microgram per Liter (µg/L) and includes TCE at 2,400 µg/L and vinyl chloride at 210 µg/L. Vinyl chloride detections in this well are generally attributed to the Hooker Ruco Superfund Site located to the northwest of the well. Off-gas treatment for vinyl chloride is being addressed by Occidental. Production Well GP-3 is part of the Onsite Groundwater Containment system.

Monitoring wells GM-34D and -70D are located offsite and downgradient of GP-3 (5,200 ft) and are screened at depths of approximately 310 ft and 500 fbgs, respectively. These wells contained TCE at 840 µg/L and 350 µg/L, respectively. Except for Outpost Monitoring Wells BPOW 3-1 and 3-2 (just north of the ANY Well Field), wells GM-34D and -34D2 are the furthest downgradient permanent monitoring wells that evaluate the western plume. A portion of this plume is being intercepted by the western-most BWD Well Field (Plant No. 6). Northrop Grumman installed treatment on this well field.

Monitoring well GM-13D is located between the eastern and western plumes and is the only off-NWIRP Bethpage monitoring well directly linked to Site 1 and that is not likely to be influenced by non-Navy sources. This well is screened at a depth of approximately 210 fbgs, and contains TVOC concentrations of 289 µg/L including TCE at 55 µg/L, PCE at 200 µg/L, 1,2-DCE (1,2-dichloroethene) at 22 µg/L, and 1,2-DCE at 12 µg/L. Based on modeling efforts, contaminated groundwater in this area flows to the south and then southeast and is currently being intercepted by Onsite Containment System (ONCT) Wells 17, 18, and 19. Prior to the installation of the ONCT Wells, this groundwater flowed to the southeast toward the GM-38 Area and the eastern plume.

The ONCT wells are screened at depths of approximately 500 fbgs. Well 17 contained TVOC concentrations of 234 µg/L, which includes TCE at 210 µg/L and PCE at 24 µg/L. Well 18 contained TVOC concentrations of 101 µg/L, which includes TCE at 91 µg/L and PCE at 10 µg/L. Well 19 contained TVOC concentrations of 209 µg/L, which includes TCE at 180 µg/L, 1,2-DCE at 21 µg/L, and PCE at 8 µg/L. Operation of these three ONCT wells is critical to capturing groundwater associated with the NWIRP Bethpage.

The eastern plume is located southeast of NWIRP Bethpage. This plume starts in the area of NWIRP Bethpage Site 1 and the Bethpage Community Park, continues south through the GM-38 Area, impacts the eastern-most BWD Well Field (Plant No. 4), and then flows in the general direction of South Farmingdale Well Field No. 1, located 5,200 ft south of GM-38 Area.

VPB-109 (located north of the GM-38 Area) contained TVOC concentrations ranging up to 7,754 µg/L. Samples collected at 45 fbgs contained TVOC of 37.1 µg/L, which includes TCE at 18 µg/L, 1,2-DCE at 18 µg/L, and toluene at 1 µg/L. Samples collected at 285 fbgs contained TVOC of 7,754 µg/L, which includes TCE at 5,200 µg/L, 1,2-DCE at 2,500 µg/L, 1,2-dichloroethane (1,2-DCA) at 35 µg/L, and 1,2-DCE at 19 µg/L.

VPB-111, located 1,500 ft south of VPB-109, contained TVOC concentrations ranging up to 10,500 µg/L. VPB-111 samples collected at approximately 270 fbgs contained TVOC of 24.1 µg/L. VPB-111 samples collected at approximately 450 fbgs contained TVOC of 10,500 µg/L, which includes

TCE at 9,100 µg/L and 1,2-DCE at 1,400 µg/L. The eastern plume exhibits concentrations of TCE, PCE and degradation products on these chemicals.

Potential Risks: The 2000 Groundwater Feasibility Study (FS) for offsite groundwater did not contain a Human Health Risk Assessment HHRA (Arcadis, 2000). Contaminants found in offsite groundwater are similar to contaminants and concentrations found in OU 2 Site 1. The raw untreated groundwater at the NWIRP Bethpage, if used as an untreated potable water source, would be expected to result in significant carcinogenic risks (excess cancer risk greater than 1 x 10-4) and non-carcinogenic risks (hazard index greater 1.0) to residents and employees under the current and future groundwater scenarios. The one exception to this is that the hazard index to employees under the future groundwater exposure would be about 0.5 (HNUS, 1994). All public supplies in the area are monitored on a regular basis and treatment is utilized to protect consumers.

An updated FS has not been conducted for the offsite residents that have been impacted by soil gas vapors. The Navy conducted a Time Critical Removal Action to implement interim treatment followed by a final treatment system. The final treatment system has been demonstrated to be operating successfully. According to New York State Department of Health (NYSDOH) guidance, soil vapor concentrations exceed indoor air criteria for TCE of 5 micrograms/cubic meter (µg/m3) and sub slab indoor criteria of 250 µg/m3. An indoor air TCE concentration of 5 µg/m3 corresponds to a risk of approximately 4 x 10-6 for offsite residents. Indoor air TCE concentrations are less than this criterion.

The specific site in question is located in the middle of the shallow plume and between the east and western deep plumes.

SAP Worksheet #11: Project Quality Objectives/Systematic Planning Process Statements

11.1 Problem Statement

Past activities at NWIRP Bethpage Site 1 have impacted groundwater at the Site with concentrations of VOCs that may pose a risk to residents and employees if untreated groundwater is used as a potable water source. There are various water districts that have been impacted. The plumes and the flow paths of contamination have not been fully delineated. The downgradient monitoring wells and vertical profile borings will be used to determine which of the plumes, (deep western, deep eastern or underflow of the onsite containment system) may affect the downgradient water districts. Specifically targeted in this investigation is the collection of data by drilling proposed VPB-137, VPB-138, and VPB-139).

11.2 Identify the Goal of the Study

The objective of the groundwater investigation is to characterize the nature and extent of the groundwater contamination south of NWIRP Bethpage to determine placement of groundwater monitoring wells for plume delineation, water quality and potential effected water districts. Specific targets of this investigation include vertical profiling at proposed locations of VPB-137, VPB-138, VPB-139. This vertical profiling investigation will be undertaken to help identify which of the groundwater plumes is the source of the contamination in the production wells at Bethpage Plant # 6. The vertical profile investigation objective is to fill in data gaps on the western edge of the east plume and the eastern edge of the west plume. The northwest proposed location, VPB-137, will help to ascertain a portion of the eastern edge of the west plume (50 µg/L TCE) and will help determine the effectiveness of the onsite system remedy (potential underflow) by the collection of data to the Raritan confining unit. The southern proposed location, VPB-139, will better define the shallow contamination (50 µg/L TCE) and the western edge of the eastern plume (5 µg/L TCE). The northeastern proposed location VPB-138 will better define the shallow contamination (50 µg/L TCE) and the western edge of the eastern plume (50-500 µg/L TCE). It will also help ascertain the effectiveness of the onsite system remedy (potential underflow) by the collection of data to the Raritan confining unit.

The on-site containment system was set up as a remedy to address the deep west plume at its source. If it can be ascertained which plume caused the contamination for Bethpage Plant # 6 wells, it will give a better idea as to the effectiveness of the onsite system remedy. Figure 3 depicts known concentrations of TCE in the shallow plume (less than 300 fbgs). Figure 4 depicts the know concentrations of TCE in the deep plumes (greater than 300 fbgs). The black box indicates the area where the proposed borings are located. Figure 5 is a close up with actual locations of proposed borings. The vertical profile borings will be advanced to approximately 850 fbgs (until it is evident that the Raritan clay formation has been reached) thus it will encompass both the shallow and deep plumes.

11.3 Information Inputs

To resolve the problem statements above, the following information is needed:

Laboratory analytical Data -- Groundwater samples will be collected for VOC analysis. These analytical fractions are included on the basis of the Conceptual Site Model (CSM) to cover the known contaminants of concern that may have impacted soil and groundwater. Soil samples will be collected at select locations and analyzed for Total Organic Carbon (TOC). The analytical methods must be of sufficient sensitivity to meet the Project Action Limits (PAL) presented in Table 15. Sample collection procedures for various media are listed in Worksheet #14.

Field Data -- Visual observations and photoionization detector (PID) readings will be used at each vertical profile boring and soil interval to verify gamma logging.

Groundwater stabilization parameters will include pH, specific conductivity, turbidity, temperature, and dissolved oxygen and will be measured during groundwater sampling to facilitate the collection of representative samples. Groundwater levels will also be measured at site monitoring wells prior to the collection of samples from monitoring wells to determine groundwater depths and flow direction. The physical data will help characterize groundwater at the Site. Groundwater levels will not be measured for grab samples although physical parameters will be collected as volume permits.

Hazardous waste analyses will be conducted on Investigation derived waste (IDW) soils and waters in accordance with the Toxicity Characteristic Leaching Procedure (TCLP) requirements. The data will be used to determine proper disposal procedures for IDW.

11.4 Define the Study Boundaries

Spatial Boundaries: NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy’s property totaled approximately 109 acres. NWIRP Bethpage is bordered on the north, west, and south by property owned or formerly owned by NGC that covered approximately 500 acres, and on the east by a residential neighborhood. OU2, Site 1 begins to the south of the Northrop Grumman property and extends just shy of the Southern State Parkway; it extends east of the property to approximately State

Highway 135 and extends to the west to Wantagh Parkway in the south and Jerusalem Parkway in the north (see Figure 1).

Temporal Boundaries: The temporal boundaries for this study will be the period of the actual field investigation. Monitoring well sampling, VPB, and well installation will be performed over the course of 1 year. Seasonal variations are not anticipated to affect the study design. If there is a weather advisory for blizzard conditions or temperatures below that will endanger personnel or cause equipment to malfunction, work may be suspended for the day. Prior to work, suspension procedures outlined in worksheet 6 will be followed.

11.5 Analytical Approach

The data collected during this project must be of sufficient quality to determine the source of the contamination in the groundwater plumes. Analytical results from the groundwater samples collected from the vertical profiling borings will be used to determine the source of contamination in the groundwater plume.

If the chlorinated VOC results from a particular depth at a VPB exceed the New York Maxim Concentration Limits (New York Public Water Systems MCLs (NYSDOH Part 5; Subpart 5-1 Public Water Systems MCLs, updated May 2009), then that interval will be considered impacted and will be used to identify the screen locations for the monitoring wells.

If the chlorinated VOC results from a particular depth at a VPB exceed the New York Maxim Concentration Limits (New York Public Water Systems MCLs (NYSDOH Part 5; Subpart 5-1 Public Water Systems MCLs, updated May 2009), and coincide with the depth of an adjacent contaminated well, then that interval will be considered impacted and will be used to identify the screen locations for the monitoring wells.

If the chlorinated VOC results from a particular depth at a VPB do not exceed the New York MCL, then that interval will be considered not impacted and will not be used to identify the screen locations for the monitoring wells.

If all of the chlorinated VOC results from a VPB do not exceed the New York MCL, then screen depths of adjacent monitoring wells will be taken into consideration to identify the screen locations for the monitoring wells.

11.6 Performance Criteria

The objective of this section is to complete the following:

- Identify potential sources of study error (i.e., field error, analytical error).
- Establish and identify the methods used to reduce potential sources of error.
- Determine how decision errors will be managed during the project.

Data will be used to determine the source of the contamination in the groundwater plumes.

11.6.1 Sampling Strategy

The VPB and MW installation design was developed to characterize local lithology and delineate groundwater VOC concentrations in other areas within the plume emanating from the NGC and NWIRP.

11.6.2 Sources of Error

Sources of error in the sampling design may be divided into two main categories: sampling errors and measurement errors. A sampling error occurs when the sampling design, planning, and implementation do not provide for a representative range of heterogeneity at the site. A measurement error occurs because of performance variance from field/laboratory instrumentation, analytical methods, and operator error. The EPA identifies the combination of all these errors as a "total study error". One objective of the investigation is to reduce the total study error so that decision-makers can be confident that the data collected accurately represent the chemical characteristics of the site.

11.6.3 Managing Decision Error

The investigation will utilize decision-error minimization techniques in sampling design, sampling methodologies, and laboratory measurement of Contaminants of Concern (COC)s. Possible decision errors will be minimized during the field investigation by using the following methods:

- Use standard field sampling methodologies (as discussed in Worksheets #18, 19, 20, and #30).
- Use applicable analytical methods (as discussed in Worksheet #23) for sample analysis by a competent analytical laboratory certified by the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) to reduce measurement errors.
- Confirm analytical data to identify and control potential laboratory error and sampling error by using spikes, blanks, and replicated samples.

Decision errors associated with sampling are based on sample design and measurement errors. Assuming that the best possible professional judgment was used to develop the sampling plan (i.e., position sampling locations), the most important decision errors will be associated with field and laboratory techniques involved in the collection and analysis of the data.

11.6.3.1 Sampling Methodologies and Procedures

Possible decision errors generated by sampling errors will be minimized during the field investigation by applying standardized field sampling methodologies (as discussed in Worksheets #18, 19, 20, and #30, #21, and #22). Sampling activities will be performed in accordance with the SOPs specified in this SAP.

11.6.3.2 Laboratory Measurement of COCs

Possible decision errors generated by laboratory measurement errors will be minimized by using applicable analytical methods (discussed Worksheet #23) for sample analysis by a competent analytical laboratory evaluated and certified by the DoD ELAP.

11.6.4 Managing Laboratory Sampling Error

Control of potential laboratory error and sampling error will be minimized using spikes, blanks, and duplicates. Sampling error may be introduced when the laboratory chemist selects a single portion of the field sample for laboratory analysis. However, this issue is less relevant to the discrete sampling approach as sub-sampling is generally not implemented at the laboratory.

11.7 Optimize the Design for Obtaining Data

The sampling design for the site was developed to optimize resources and generate data to satisfy the data quality objectives is presented in Worksheet #17 and sample locations and analyses conducted on each well may be found on Worksheets #18, 19, 20, and #30.

11.7.1 Field Data Logs

All sample information will be transcribed into a field logbook and/or onto field data sheets. Field data sheets will be e-mailed to the project management team to track progress or the field team may update the project management team verbally.

11.7.2 Analytical Laboratory Sample Management

The sample matrix, number of samples, and number and type of laboratory quality assurance (QA)/quality control (QC) samples are summarized on Worksheets #18, 19, 20, and #30. Details on the analytical group, sample volumes, sample container specifications, preservation requirements, and maximum holding times are also identified in Worksheets #18, 19, 20, and #30.

The laboratory will provide full electronic data deliverable files, portable document format (PDF) files of the data deliverables for all project data, and a hard copy of data deliverables for all results including results from secondary subcontract laboratories. Designated samples will be used to obtain necessary subsamples for laboratory QC measurements (i.e., analytical sample duplicate and sample matrix spike/matrix spike duplicate [MS/MSD]). Tasks will be completed using the laboratory standard operating procedures (SOPs).

Resolution Consultants will provide data validation services and verify and evaluate the usability of the data as identified in Worksheets #34-36.

PDF copies of all analytical data packages will be stored on CD-ROM, archived in the NAVFAC LANT Administrative Record, and uploaded onto the Naval Installation Restoration Information Solution (NIRIS) system at the close of the project. All other data generated in the field and reports generated for the project will be stored as computer readable data files by Resolution Consultants

11.8 Data Usability

Data usability will be assessed by means of a validation process. Validation will be conducted for the VOC samples and the soil and air samples scheduled for analyses. Data will be reviewed and qualified in accordance with the requirements of the Environmental Protection Agency (EPA) National Functional Guidelines, modified as appropriate for the DoD Quality Systems Manual (QSM) v 4.2 and method-specific requirements. Limited validation will be performed on the analytical data for the groundwater samples collected for VOC analysis from the monitoring wells, the groundwater samples collected for VOC analysis from the VPBs, and the TO-15 air samples. The TOC data and data generated for waste characterization will not be validated or reviewed. Validation will consist of review of the associated Quality Assurance /Quality Control (QA/QC) samples and measurement performance indicators as presented on the summary forms provided in the laboratory deliverable, and will not include confirmation of calculations or review of raw data.

The results of the data validation will be documented in reports which will detail any issues impacting the data quality along with qualifications affecting data bias and usability. PDF copies of all analytical data packages will be stored on CD-ROM, archived in the NAVFAC LANT Administrative Record, and uploaded onto the Naval Installation Restoration Information Solution (NIRIS) system when complete. All other data generated in the field and reports generated for the project will be stored as computer readable data files by Resolution Consultants.

SAP Worksheet #12: Field Quality Control Samples

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Trip Blank	VOC Only	One sample per cooler of VOC samples shipped to laboratory	Accuracy/Bias/ Contamination	No analytes detected > ½ level of quantitation (LOQ) and >1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ
Field Blank [1]	VOC and TOC	One sample per source of rinse water or decontamination water	Accuracy/Bias/ Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ
Equipment Rinsate Blank [2]	VOC and TOC	One sample per 20 samples per sampling equipment	Accuracy/Bias/ Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ
Field Duplicate (groundwater)	All analytical groups	One per 20 field samples	Precision	Values > 5X Limit of Quantification (LOQ): Relative Percent Difference (RPD) ≤ 30%. Values < 5X LOQ: Absolute difference of two values ≤ 2X LOQ.
Field Duplicate (soil)	All analytical groups	One per 20 field samples	Precision	Values > 5X LOQ: RPD ≤ 50%. Values < 5X LOQ: Absolute difference of two values ≤ 4X LOQL.

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Field Duplicate (air)	TO-15	One per 20 field samples	Precision	Values > 5X LOQ: RPD ≤ 30%. Values < 5X LOQ: Absolute difference of two values ≤ 2X LOQ.
Cooler Temperature Indicator	All analytical groups	One per cooler	Representativeness	Temperature Cool to ≤ 6 degrees Celsius.

Notes:

1. Source water and storage tanks will be provided by the drilling subcontractor, therefore, field blanks are necessary to ensure that the decontamination water is free of target analytes.
2. Equipment rinsate blanks will be collected if non-dedicated or non-disposable equipment are used.

SAP Worksheet #17: Sampling Design and Rationale

The work will be split into three locations with a possible fourth location to be held in contingency. At three locations a VPB will be completed followed by installation of two monitoring wells. The contingency location will have only a vertical profile boring installed. Figure 5 shows the proposed locations of the VPBs. Monitoring wells will be placed within 40 feet of each of the VPB locations. Exact locations of the VPB and monitoring wells will depend on access agreements, location of utilities, and site conditions. There are 3 VPB proposed locations shown on Figure 5.

The purpose of the VPB and monitoring well installations are to fill in data gaps associated with the onsite recovery system and to better define the source of contamination at the BWD plant 6.

Locations were picked that will provide data along the shallow plume central 50 microgram per liter hot spot and along the eastern edge of the deep western plume.

Soil

The four vertical profile borings will be installed to the top of the Raritan Clay layer which is approximately 850 feet below ground surface (fbgs). For each vertical profile boring, up to 10 split spoon samples will be collected from ground surface to a depth of 800 ft when a change in geology is experienced in the field. If the Raritan Clay layer is not encountered at 850 ft, additional split spoon samples will be collected at twenty foot intervals centers below 850 ft until the top of the Raritan Clay layer is located. Confirmation of the Raritan Clay formation will be called when three consecutive 5 foot split spoon samples are indicative of clay. Samples will be logged by the field geologist, screened for VOCs utilizing a PID. These will be to confirm the gamma logging of each boring. One sample soil sample for TOC analysis will be collected per vertical profile boring.

Six monitoring wells will be installed to depths as determined by the results of the VPB at a maximum depth of 850 fbgs (two wells per VPB location). Split spoon samples will be collected on 5-foot intervals in the screen interval.

Investigation Derived Waste

It is estimated that one rolloff will be generated per VPB and well. A representative sample will be collected from each roll off and submitted to a DoD ELAP accredited laboratory for analysis of:

- TCLP Volatile Organic Compounds (VOCs) by United States Environmental Protection Agency United Stated Environmental Protection Agency (USEPA) SW 846/1311/8260B

- TCLP Semivolatile Organic Compounds (SVOCs) by USEPA SW 846/1311/8270D
- TCLP Metals by USEPA SW 846/various1311/6010C/6020A/7470A
- Polychlorinated Biphenyls (PCBs) by USEPA SW 846 /8082A
- TCLP Pesticides by USEPA SW 846 /1311/8081B
- Corrosivity by USEPA 9040C
- Ignitability by USEPA 1010A/1030
- Reactive Cyanide by USEPA 9012B
- Reactive Sulfide by USEPA 9034

Water

For each VPB, groundwater will be collected on 50-foot intervals from a depth of 50 to 200 ft. Groundwater will be collected on 20 foot intervals from a depth of 200 to 850 fbgs. Samples will be submitted to a DoD ELAP accredited laboratory for VOC analysis via method SW846 8260B on an expedited turnaround time (two business days). Based on the results from the grab groundwater samples, and the depth of the BWD Plant 6 water supply well screened intervals, the geophysical logs, lithology and field data the screening intervals for the two monitoring wells will be selected. The samples with the highest VOC concentrations will be evaluated as potential screened intervals. If there are two distinct levels of VOC contamination, wells will be screened at each interval. If there is one distance level of contamination, the second well will be installed at a "vertical clean" biased to the depth of intake at the Bethpage Plant 6. Ten percent of the groundwater samples will be submitted to a DoD approved Laboratory for VOC analysis to confirm the expedited results.

After the wells have been installed one round of groundwater sampling will be conducted on the newly installed wells in accordance to procedures laid out in Worksheet #14. Groundwater analytical samples will be collected when water quality parameters have stabilized. Groundwater samples will be analyzed for VOC using EPA Method 8260B. All development and purge water will be managed as IDW.

Investigation Derived Waste

A representative water sample will be collected from each frac tank and submitted to a DoD ELAP accredited laboratory for analysis of VOC via method SW846 8260B and pH.

Air

During each VPB one 8 hr TO-15 air sample will be collected to document ambient levels of VOC in the work area air and submitted to a DoD ELAP accredited laboratory for analysis of VOC via EPA method TO-15.

SAP Worksheet #14: Summary of Project Tasks

Tasks associated with the field sampling effort will consist of the following:

Utility Clearance

Prior to the initiation of intrusive field work, Resolution Consultants will contact Dig Safely New York to arrange for the location and marking of underground utilities in the vicinity of the proposed soil boring and monitoring well locations. Copies of available city sewer and water maps from the site vicinity will also be obtained and reviewed during underground utility clearance procedures. Following review of the utilities in the site area, Resolution Consultants will contract a private company to locate underground electric and gas utilities in the vicinity of each proposed subsurface sampling location using geophysical methods.

Outlying areas where information is required to confirm the location of suspected utilities that may act as preferential migration pathways may also be surveyed using geophysical methods. Lastly, boring/well locations will be hand or vacuum excavated to a depth of five feet to check for any utilities not located by Dig Safely or geophysical methods. The soil from each of the cleared locations will be field screened with a PID and visually described for textural composition and any contaminant characteristics.

Drilling and Well Installation

Three VPBs are proposed to help delineate the contaminant plumes and well contamination at Bethpage Plant 6. One additional VPB will be held in contingency. The proposed boring locations are shown on Figure 5.

Split spoon samples will be collected when the geology changes in the field as described in worksheet 17. Split spoon samples will be used for lithological description.

Groundwater samples will be collected every 50 ft for the first 200 ft of borehole depth. After the first 200 ft, soil samples will be collected every 20 ft until the boring terminates in a clay layer estimated to be 850 fbgs. Groundwater samples will be collected via hydropunch or similar method. During the collection of groundwater samples, typical field parameters will be measured (pH, temperature, specific conductivity, turbidity etc.) as volume permits.

Six monitoring wells will be installed to depths as determined by the results of the vertical profile borings at a maximum depth of 850 fbgs (two wells per VPB location). Split spoon samples will be collected on 5-foot intervals in the screen interval. One soil sample per monitoring well will be analyzed for TOC via USEPA series SW-846 method 9060A by a DoD ELAP accredited laboratory.

Well boreholes greater than 150 ft deep will be advanced using mud rotary drilling techniques. Well boreholes will be 8 inches in diameter. In the event of sloughing of the upper borehole areas, the wells will be reamed to 11 inches in diameter to allow for installation of temporary, polyvinyl chloride (PVC) surface casing to help support the borehole walls. Drilling mud will consist of potable water and polymer-free sodium bentonite or equivalent. Drilling mud will be contained and re-circulated in a baffled, high capacity mud pan.

Wells deeper than 150 ft will be constructed of 4-inch diameter, Schedule 80, National Sanitation Foundation-approved PVC well screen and riser pipe. Based on historical data well screens will have slot sizes of 0.010 inches, if conditions warrant slot size will change accordingly. Threaded bottom caps will be fitted to the bottom of each well. Pipe sections and bottom caps will be flush-jointed and flush-threaded. In wells deeper than 200 ft, well centralizers will be installed at an interval approximately 40 to 50 ft.

The filter packs will consist of #1 quartz sand installed using a tremie pipe. Filter packs will be installed to a minimum of 10 ft above the top of the screen. Secondary filter packs of finer sand than the primary filter pack (#0 quartz sand) will be installed in the annulus around the well riser above the primary filter pack. The secondary filter packs will be installed to a depth of a minimum of 10 ft above the top of the primary filter pack.

Finally, a 2- to 4-foot thick bentonite seal will be installed above the secondary filter pack. The annulus above the bentonite seal will be grouted with Volclay© (or similar) high-solids bentonite slurry. Both the bentonite seal and bentonite slurry will be installed using a tremie pipe. Wells are to be completed at the surface with an 8 or 9-inch diameter steel curb box, set in a 2-foot by 2-foot by 0.5-foot thick concrete pad. A layer of fine sand will be installed above the grout slurry and inside the curb box to allow for drainage of water from the curb box. The tops of well risers will be set approximately 8 inches below grade. Lockable J plugs are to be installed on well riser tops and the well will be labeled.

Borehole geophysical logs will be recorded for each VPB boring. Following advancement to the total depth of each boring to be logged, the drilling tools will be withdrawn from the borehole. A Mount Sopris Instrument model 2PGA-100 poly gamma will be used. Logging will start at the top of the hole. The probe will be advanced to the bottom of the hole at a maximum rate of 15 feet per minute. A copy of the log will be printed in the field for review. Once the probe reaches the bottom of the bore hole logging will cease. Logging will resume when the probe is advanced upward. A second log will be generated and printed. VPB will be logged for natural gamma. The gamma logs will be interpreted by an experienced geologist and compared to physical and observable data collected.

Well Development

Following installation, all monitoring wells will be developed to evacuate silts and other fine-grained sediments which may have accumulated within the well during its installation and to establish the filter pack to promote a hydraulic connection between the well and the surrounding aquifer. Well development will not commence until at least 24 hours after well installation. A number of techniques may be used, including surging using bailing, or pumping until the turbidity has stabilized (less than 50 nephlometric turbidity units [NTUs] if possible). Due to the depth of the wells, it is anticipated that the wells will be developed using air lift methods. Special care will be taken to develop the wells properly in order to ensure adequate hydraulic connection between the monitoring well and the aquifer.

Monitoring wells screened in deep zones will be developed using a combination of air lifting, mechanical surging, and pumping with a submersible pump. A threaded, 2-inch diameter steel eductor pipe with a dual surge block assembly (i.e., two rubber swabs set approximately 3 feet apart along a length of perforated steel pipe) will be installed in the wells with the surge block set at the base of the well screen.

A ¾-inch diameter polyethylene airline will be inserted in the eductor pipe to a depth above the top of the well screen. The deep well will be developed at 2- to 5-foot intervals in the screened interval using a combination of mechanical surging vertical movement of the surge block by a truck-mounted mechanical device) and air lifting. Once the screened interval is completely developed using this technique, the pipe will be removed from the well and development continued using a submersible pump. The submersible pump will be placed approximately 50 ft below the static water level in order to remove the stagnant water from above the well screen. When the water becomes clear, the inside of the well casing will be rinsed with water from the pump discharge, and the pump will be slowly raised through the water column (with the pump running) until it was at or near the static water level. Pumping ceases and development is considered complete when the water level stabilizes, all traces of drilling mud are removed, and the well produces clear, sediment-free water. The well cap is then cleaned and rinsed with deionized water and placed back onto the well riser. An alternate and equally effective method or variation may be used to develop the wells.

In compliance with New York State Department of Environmental Conservation (NYSDEC) policy, wells will be developed until turbidity was less than 50 NTUs if possible. Development fluids will be containerized and stored at the decontamination area for proper disposal to the Publicly Owned Treatment Works (POTW).

Environmental Sample Collection and Quality Control

Following development, newly installed monitoring wells will be allowed to stabilize for 2 weeks or more prior to groundwater gauging and sampling. The depth to water, total well depth, and NAPL thickness (if present) will be measured prior to groundwater sampling activities. Based on the distance from the site, it is not anticipated that NAPL will be present in the monitoring wells. Following gauging activities, newly installed monitoring wells will be sampled as described in the Specific Sampling Methods section below.

The samples will be subjected to the laboratory quality assurance program which includes method blanks, matrix spike samples, duplicates, and data reviews.

Specific Sampling Methods

Soil samples will be collected from representative portions of each boring using disposable plastic scoops. The selected soil interval will be homogenized and placed in an 8 ounce jar for laboratory analysis for TOC by EPA series SW-846 method 9060A by a DoD ELAP accredited laboratory.

Groundwater samples will be collected from VPB via hydropunch or similar method. During the collection of groundwater samples, typical field parameters will be measured (pH temperature specific conductivity, turbidity etc.) as volume permits. Groundwater samples will be analyzed for VOC via EPA method 8260B at a DoD ELAP accredited laboratory.

During the advancement of the soil borings, one air sample per vertical profile boring will be collected using SUMMA canisters equipped with an 8 hour flow regulator and submitted for laboratory analysis by EPA method TO-15. Sampling will be performed using batch certified SUMMA canisters and laboratory certified clean flow regulators. Air samples will be analyzed by EPA method TO-15 at a DoD ELAP accredited laboratory.

Groundwater Sampling

Following development, wells will be allowed to stabilize for 2 weeks or more prior to groundwater sampling.

The newly installed wells will be sampled in accordance with the lowflow sampling procedures or hydrasleeve setup if the well is not installed as an outpost well.

Wells will be sampled with a submersible pump using low-flow sampling methods with the tubing or pump placed at the approximate midpoint of the screened interval. At the ground surface, the water will pass through a sealed chamber containing probes that will measure the parameters to determine water quality. These include water temperature, pH, conductivity, and oxidationreduction potential. Samples of water discharging from the chamber will be collected at regular intervals and analyzed for turbidity using a hand-held field meter. After passing through this chamber, the water will be discharged to a calibrated 5-gallon bucket where the pumping rate will be calculated. When this bucket is full, the water will be transferred into a container where it will be stored for future disposal. Pumping rates will be set below the maximum sustainable flow rate so as not to significantly lower the water level in the well. Groundwater analytical samples will be collected when water quality parameters have stabilized. Samples will be analyzed for VOCs via method 8260B by a DoD ELAP accredited laboratory. All development and purge water will be managed as IDW.

The NYSDEC has requested a synoptic sampling effort to include data from VPB from 2011 and 2012, re-sampling of relevant monitoring wells that were not been sampled in 2011 and 2012, the current annual sampling conducted by NGC and a report with revised plume maps and cross section based on the compiled data. This will not be covered under this SAP. A separate workplan will be issued for groundwater sampling.

Equipment Decontamination

To the maximum extent possible, Resolution Consultants will utilize dedicated and disposable sampling equipment to avoid the potential for cross contamination of samples due to inadequate decontamination processes. The sampling equipment will include dedicated plastic scoops, disposable Teflon or polyethylene tubing, disposable gloves, and laboratory supplied sample bottles. Hand held equipment, split spoons and the hydro punch will be decontaminated using an alconox and water wash, a potable water rinse followed by a distilled water rinse. Water will be collected in 5 gallon pails or 55 gallon drums and transported to the frac tank.

Investigation-Derived Waste Management

The investigation waste (consisting of soil cuttings, PPE, and solid waste) generated during the borings and well installation will be collected in properly labeled roll-off containers and stored on the site for subsequent disposal. Subsequently, the containers will be characterized with laboratory analyses and properly disposed at a Navy approved disposal facility.

Purge water and well development will be containerized in frac tanks and stored on the site for characterization and ultimate disposal to the POTW in accordance with the facilities existing discharge permit.

Both water and soil may be transported from point of generation to the designated storage area in DOT approved 55 gallon drums or similarly appropriate containers. To the extent feasible soil and water shall not be mixed.

Land Surveying

A survey of the boring and well locations will be conducted at the end of the fieldwork by a New York State-licensed surveyor under the direct supervision of Resolution Consultants. The locations will be tied into the existing base map developed for the site. After the monitoring wells are installed, a notch or mark will be made at the top of each inner casing. The vertical location of this point will be surveyed to a reference point determined in the field with accuracy of 0.01 of a foot. All elevations will be referenced to the North American Vertical Datum (NAVD) 1988. The horizontal locations of each point will be established from directly measuring from Site features with an accuracy of 0.1 foot.

SAP Worksheet #21: Project Sampling SOP References Table

The following table will be completed with Final SOPs.

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
3-01	Utility Clearance	Resolution Consultants	Shovel, concrete saw, vactron,	N	
3-02	Logbooks	Resolution Consultants	NA	N	
3-03	Record keeping, Sample Labeling and chain of custody procedures	Resolution Consultants	NA	N	
3-04	Sample handling Storage and Shipping procedures	Resolution Consultants	NA	N	
3-12	Monitoring well installation	Resolution Consultants	Poly vinyl chloride (PVC)/Steel well riser, screen, sand bentonite	N	
3-21	Surface and subsurface soil sampling procedures	Resolution Consultants	Split spoon, trowel	N	

SAP Worksheet #18, 19, 20 and 30: Field Project Implementation (Field Project Instructions)

Waste characterization samples for soil and groundwater are not in need of QC samples. Air samples require QC sample and are shown in the table below. Grab groundwater and groundwater samples collected from the newly installed monitoring wells require QC samples as outlined in the following Sample Details Table.

(WE15 Bethpage Grab Groundwater, and Monitoring Well) (October 2012)						**Analysis Group**	**VOC**	**VOC**
						Preparation and Analytical Method	SW846 8260B	SW846 8260B
						Analytical Laboratory/Analytical SOP Reference3	Katahdin Analytical Services/ CA-202	Katahdin Analytical Services/ CA-202
Katahdin Analytical Services Jennifer Obrin 207 874 2400						**Data Package Turnaround Time**	2 Calendar days	28 calendar days
						Container Type/ Volume required (if different than container volume)	3 – 40ml VOA Vials	3 – 40ml VOA Vials
						Preservative	Hydrochloric acid (HCl) to pH <2; Cool to ≤ 6 °C; no headspace	HCl to pH <2; Cool to ≤ 6 °C; no headspace
						Holding Time (Preparation/ Analysis)[4]	14 days to analysis	14 days to analysis
Site	**Matrix**	**Station ID[2,5]**	**Sample ID[5]**	**Coordinates [5]** (optional)		**Depth/ Sampling Interval**		
				X	**Y**			
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			50-52	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			100-102	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			150-152	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			200-202	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			220-222	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			240-242	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			260-262	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			280-282	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			300-302	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			320-322	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			340-342	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			360-362	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			380-382	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			400-402	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			420-422	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			440-442	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			460-462	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			480-482	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			500-502	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			520-522	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			540-542	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			560-562	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			580-582	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			600-602	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			620-622	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			640-642	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			660-662	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			680-682	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			700-702	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			720-722	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			740-742	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			760-762	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			780-782	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			800-802	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			820-822	X	
Bethpage	Groundwater	VPB A	VBP A-GW-MMDDYY XX-XX			840-842	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			50-52	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			100-102	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			150-152	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			200-202	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			220-222	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			240-242	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			260-262	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			280-282	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			300-302	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			320-322	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			340-342	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			360-362	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			380-382	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			400-402	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			420-422	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			440-442	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			460-462	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			480-482	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			500-502	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			520-522	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			540-542	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			560-562	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			580-582	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			600-602	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			620-622	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			640-642	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			660-662	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			680-682	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			700-702	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			720-722	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			740-742	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			760-762	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			780-782	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			800-802	X	

(WE15 Bethpage Grab Groundwater, and Monitoring Well) **(October 2012)**						**Analysis Group**	**VOC**	**VOC**
						Preparation and Analytical Method	SW846 8260B	SW846 8260B
						Analytical Laboratory/Analytical SOP Reference3	Katahdin Analytical Services/ CA-202	Katahdin Analytical Services/ CA-202
Katahdin Analytical Services **Jennifer Obrin** **207 874 2400**						**Data Package Turnaround Time**	2 Calendar days	28 calendar days
						Container Type/ Volume required (if different than container volume)	3 – 40ml VOA Vials	3 – 40ml VOA Vials
						Preservative	Hydrochloric acid (HCl) to pH <2; Cool to ≤ 6 °C; no headspace	HCl to pH <2; Cool to ≤ 6 °C; no headspace
						Holding Time (Preparation/ Analysis)[4]	14 days to analysis	14 days to analysis
Site	**Matrix**	**Station ID**[2,5]	**Sample ID**[5]	**Coordinates** [5] (optional)		**Depth/ Sampling Interval**		
				X	**Y**			
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			820-822	X	
Bethpage	Groundwater	VPB-B	VBP B-GW-MMDDYY XX-XX			840-842	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			50-52	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			100-102	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			150-152	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			200-202	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			220-222	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			240-242	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			260-262	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			280-282	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			300-302	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			320-322	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			340-342	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			360-362	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			380-382	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			400-402	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			420-422	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			440-442	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			460-462	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			480-482	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			500-502	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			520-522	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			540-542	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			560-562	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			580-582	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			600-602	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			620-622	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			640-642	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			660-662	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			680-682	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			700-702	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			720-722	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			740-742	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			760-762	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			780-782	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			800-802	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			820-822	X	
Bethpage	Groundwater	VPB-C	VBP C-GW-MMDDYY XX-XX			840-842	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			50-52	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			100-102	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			150-152	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			200-202	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			220-222	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			240-242	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			260-262	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			280-282	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			300-302	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			320-322	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			340-342	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			360-362	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			380-382	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			400-402	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			420-422	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			440-442	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			460-462	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			480-482	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			500-502	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			520-522	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			540-542	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			560-562	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			580-582	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			600-602	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			620-622	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			640-642	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			660-662	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			680-682	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			700-702	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			720-722	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			740-742	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			760-762	X	

(WE15 Bethpage Grab Groundwater, and Monitoring Well) **(October 2012)**						**Analysis Group**	**VOC**	**VOC**
						Preparation and Analytical Method	SW846 8260B	SW846 8260B
						Analytical Laboratory/Analytical SOP Reference3	Katahdin Analytical Services/ CA-202	Katahdin Analytical Services/ CA-202
Katahdin Analytical Services **Jennifer Obrin** **207 874 2400**						**Data Package Turnaround Time**	2 Calendar days	28 calendar days
						Container Type/ Volume required (if different than container volume)	3 – 40ml VOA Vials	3 – 40ml VOA Vials
						Preservative	Hydrochloric acid (HCl) to pH <2; Cool to ≤ 6 °C; no headspace	HCl to pH <2; Cool to ≤ 6 °C; no headspace
						Holding Time (Preparation/ Analysis)[4]	14 days to analysis	14 days to analysis
Site	**Matrix**	**Station ID**[2,5]	**Sample ID**[5]	**Coordinates** [5] (optional)		**Depth/ Sampling Interval**		
				X	**Y**			
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			780-782	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			800-802	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			820-822	X	
Bethpage	Groundwater	VPB-D	VBP D-GW-MMDDYY XX-XX			840-842	X	
Bethpage	Groundwater	MW A	MWA-GW-MMDDYY					X
Bethpage	Groundwater	MW AA	MWA-GW-MMDDYY					X
Bethpage	Groundwater	MW B	MWB-GW-MMDDYY					X
Bethpage	Groundwater	MW BB	MWBB-GW-MMDDYY					X
Bethpage	Groundwater	MW C	MWC-GW-MMDDYY					X
Bethpage	Groundwater	MW CC	MWC-GW-MMDDYY					X
Field QC Samples[1]								
	Field Duplicate	VPB-A	VPB A GWD-MMDDYY XX-XX			520-522	X	
	Field Duplicate	VPB-B	VPB B GWD-MMDDYY XX-XX			200-202	X	
	Field Duplicate	VPB-B	VPB B GWD-MMDDYY XX-XX			600-602	X	
	Field Duplicate	VPB-C	VPB C GWD-MMDDYY XX-XX			280-282	X	
	Field Duplicate	VPB-C	VPB C GWD-MMDDYY XX-XX			680-682	X	
	Field Duplicate	VPB-D	VPB D GWD-MMDDYY XX-XX			360-362	X	
	Field Duplicate	VPB-D	VPB D GWD-MMDDYY XX-XX			760-762	X	
	Field Duplicate	MW A	MWA-GW-MMDDYY					x
	Matrix Spike		VPB A GWMS/MSD-MMDDYY XX-XX				X	
	Matrix Spike Duplicate		VPB A GWMS/MSD-MMDDYY XX-XX				X	
			VPB A GWMS/MSD-MMDDYY XX-XX				X	
			VPB B GWMS/MSD-MMDDYY XX-XX				X	
			VPB B GWMS/MSD-MMDDYY XX-XX				X	
			VPB B GWMS/MSD-MMDDYY XX-XX				X	
			VPB B GWMS/MSD-MMDDYY XX-XX				X	
			VPB C GWMS/MSD-MMDDYY XX-XX				X	
			VPB C GWMS/MSD-MMDDYY XX-XX				X	
			VPB C GWMS/MSD-MMDDYY XX-XX				X	
			VPB D GWMS/MSD-MMDDYY XX-XX				X	
			VPB D GWMS/MSD-MMDDYY XX-XX				X	
			VPB D GWMS/MSD-MMDDYY XX-XX				X	
			VPB D GWMS/MSD-MMDDYY XX-XX				X	
			VPB D GWMS/MSD-MMDDYY XX-XX				X	
			MWA-GWMD/MSD-MMDDYY					
	Equipment Blank		42			NA		
	Trip Blank		68			NA		
	Field Blank		42			NA		
						Total Number of Samples to the Laboratory	**332**	**9**

WE15 Bethpage soil **October 2012** **Katahdin Analytical Services** **Jennifer Obrin** **207 874 2400**						**Analysis Group**	**TOC**
						Preparation and Analytical Method	SW-846 Method 9060A
						Analytical Laboratory/ Analytical SOP Reference[3]	Katahdin Analytical Services / CA-763
						Data Package Turnaround Time	21 Calendar days
						Container Type/ Volume required (if different than container volume)	4 oz container/3-40 mL Vials for field blank
						Preservative	Soils: Cool <6º C Aqueous: Cool <6º C H_2SO_4 to pH<2
						Holding Time (Preparation/ Analysis)[4]	28 days to analysis
Site	**Matrix**	**Station ID**[2,5]	**Sample ID**[5]	**Coordinates** [5] (optional)		**Depth/ Sampling Interval**	
				X	**Y**		
Bethpage	Soil	IDW-s1	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s2	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s3	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s4	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s5	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s6	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s7	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s8	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s9	IDWS-MMDDYY			Composite	
Bethpage	Soil	IDW-s10	IDWS-MMDDYY			Composite	
Bethpage	Soil	VPB A	VPB A Soil-MMDDYY-XX-XX			TBD	**X**
Bethpage	Soil	VPB B	VPB B Soil-MMDDYY-XX-XX			TBD	**X**
Bethpage	Soil	VPB C	VPB C Soil-MMDDYY-XX-XX			TBD	**X**
Bethpage	Soil	VPB D	VPB D Soil-MMDDYY-XX-XX			TBD	**X**
Field QC Samples[1]							
	Field Duplicate		VPBX Soil-D MMDDYY			TBD	**X**
	Matrix Spike					NA	
	Matrix Spike Duplicate					NA	
	Equipment Blank					NA	
	Trip Blank					NA	
	Field Blank		VPBX Soil-FB MMDDYY			TBD	**X**
						Total Number of Samples to the Laboratory	**6**

[1] Include field QC samples (per site and media) including field duplicates, MS/MSDs, trip blanks, equipment blanks, and field blanks. Field QC counts may change depending upon duration of field event.

Frequency of QA/QC sample collection:
Field Duplicate- One per 20 field samples
MS/MSD- One pair per 20 field samples (including field QC samples)
Trip Blank- One per cooler to the laboratory containing volatiles
Equipment Blank- One per week of sampling
Field Blank- One per week of sampling

[2] If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location or station.

[3] List laboratory addresses and contacts in the upper left hand corner of table. If samples will be shipped to multiple laboratories then specify as well. If backup laboratory has been identified specify in upper left hand corner.

[4] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

[5] Sample locations may be unknown at start of project. Designate if this information will be determined in the field.

WE15 Bethpage Air Samples **October 2012** **Katahdin Analytical Services** **Jennifer Obrin** **207 874 2400**						**Analysis Group**	**TO-15**
						Preparation and Analytical Method	**TO-15**
						Analytical Laboratory/ Analytical SOP Reference[3]	Katahdin Analytical Services/ CA-228
						Data Package Turnaround Time	21 Calendar days
						Container Type/ Volume required (if different than container volume)	Summa Canister
						Preservative	none
						Holding Time (Preparation/ Analysis)[4]	30 days
Site	**Matrix**	**Station ID**[2,5]	**Sample ID**[5]	**Coordinates** [5] (optional)		**Depth/ Sampling Interval**	
				X	**Y**		
Bethpage	Air	VPB A	VPB A AIR-MMDDYY			Breathing Zone	**X**
Bethpage	Air	VPB B	VPB B AIR-MMDDYY			Breathing Zone	**X**
Bethpage	Air	VPB C	VPB C AIR-MMDDYY			Breathing Zone	**X**
Bethpage	Air	VPB D	VPB C AIR-MMDDYY			Breathing Zone	**X**
Field QC Samples[1]							
	Field Duplicate		VPB X AIRD MMDDYY			Breathing Zone	**X**
	Matrix Spike					NA	
	Matrix Spike Duplicate					NA	
	Equipment Blank					NA	
	Trip Blank					NA	
	Field Blank					NA	
						Total Number of Samples to the Laboratory	**5**

SAP Worksheet #15: Reference Limits and Evaluation Tables

(UFP-QAPP Manual Section 2.8.1 – Worksheet # 15)							
Matrix:	**Groundwater**						
Analytical Group:	**Volatile Organic Analysis**						
Analyte	**CAS No.**	**Project Action Limit (µg/L)**	**Project Action Limit Reference[1,6]**	**Project Quantitation Limit (PQL) (µg/L)**	**Laboratory Specific Limits [2, 3, 4] (µg/L)**		
					Limit of Quantitation (LOQ)	**Limit of Detection (LOD)**	**Detection Limit (DL)**
1,1-Dichloroethene	75-35-4	5	NYDOH MCL	0.5	1	0.5	0.35
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NA	NA	0.5	1	0.5	0.31
trans-1,2-Dichloroethene	156-60-5	5	NYDOH MCL	0.5	1	0.5	0.25
1,1-Dichloroethane	75-34-3	NA	NA	0.5	1	0.5	0.21
cis-1,2-Dichloroethene	156-59-2	5	NYDOH MCL	0.5	1	0.5	0.21
Chloroform	67-66-3	NA	NA	0.5	1	0.5	0.32
1,1,1-Trichloroethane	71-55-6	5	NYDOH MCL	0.5	1	0.5	0.20
Carbon tetrachloride	56-23-5	5	NYDOH MCL	0.5	1	0.5	0.22
1,2-Dichloroethane	107-06-2	NA	NA	0.5	1	0.5	0.20
Trichloroethene	79-01-6	5	NYDOH MCL	0.5	1	0.5	0.28
1,1,2-Trichloroethane	79-00-5	5	NYDOH MCL	0.5	1	0.5	0.33
Tetrachloroethene	127-18-4	5	NYDOH MCL	0.5	1	0.5	0.40
Chlorobenzene	108-90-7	5	NYDOH MCL	0.5	1	0.5	0.22
1,1,2,2-Tetrachloroethane	79-34-5	NA	NA	0.5	1	0.5	0.38

(UFP-QAPP Manual Section 2.8.1 – Worksheet # 15)							
Matrix:	**Soil**						
Analytical Group:	**Volatile Organic Analysis**						
					Laboratory Specific Limits $^{2, 3, 4}$ (µg/kg)		
Analyte	**CAS No.**	**Project Action Limit (µg/kg)**	**Project Action Limit Reference^{1,7}**	**Project Quantitation Limit (PQL) (µg/kg)**	**Limit of Quantitation (LOQ)**	**Limit of Detection (LOD)**	**Detection Limit (DL)**
1,1-Dichloroethene	75-35-4	330	NYSDEC URU	5.0	5.0	2.5	0.93
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NA	NA	5.0	5.0	2.5	0.90
trans-1,2-Dichloroethene	156-60-5	190	NYSDEC URU	5.0	5.0	2.5	0.71
1,1-Dichloroethane	75-34-3	270	NYSDEC URU	5.0	5.0	2.5	1.7
cis-1,2-Dichloroethene	156-59-2	250	NYSDEC URU	5.0	5.0	2.5	0.91
Chloroform	67-66-3	370	NYSDEC URU	5.0	5.0	2.5	0.35
1,1,1-Trichloroethane	71-55-6	680	NYSDEC URU	5.0	5.0	2.5	0.42
Carbon tetrachloride	56-23-5	760	NYSDEC URU	5.0	5.0	2.5	1.3
1,2-Dichloroethane	107-06-2	20	NYSDEC URU	5.0	5.0	2.5	1.0
Trichloroethene	79-01-6	470	NYSDEC URU	5.0	5.0	2.5	0.59
1,1,2-Trichloroethane	79-00-5	NA	NA	5.0	5.0	2.5	0.97
Tetrachloroethene	127-18-4	130	NYSDEC URU	5.0	5.0	2.5	1.2
Chlorobenzene	108-90-7	NA	NA	5.0	5.0	2.5	0.51
1,1,2,2-Tetrachloroethane	79-34-5	NA	NA	5.0	5.0	2.5	0.84
Total Organic Carbon	NA	NA	NA	0.5	0.04	0.02	0.0099

(UFP-QAPP Manual Section 2.8.1 – Worksheet # 15)							
Matrix:	**Air**						
Analytical Group:	**Volatile Organic Analysis (TO-15)**						
					Laboratory Specific Limits [2, 3, 4] ($\mu g/m^3$)		
Analyte	**CAS No.**	**Project Action Limit ($\mu g/m^3$)[5]**	**Project Action Limit Reference[1,]**	**Project Quantitation Limit (PQL) ($\mu g/m^3$)**	**Limit of Quantitation (LOQ)**	**Limit of Detection (LOD)**	**Detection Limit (DL)**
1,1-Dichloroethene	75-35-4	ND[8]	NYSDOH BIAV	2.0	2.0	1.0	0.10
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.8	NYSDOH BIAV	1.8	3.8	1.9	0.30
trans-1,2-Dichloroethene	156-60-5	Not Listed	NYSDOH BIAV	2.0	2.0	1.0	0.13
1,1-Dichloroethane	75-34-3	ND[8]	NYSDOH BIAV	2.0	2.0	1.0	0.10
cis-1,2-Dichloroethene	156-59-2	ND[8]	NYSDOH BIAV	2.0	2.0	1.0	0.17
Chloroform	67-66-3	1.4	NYSDOH BIAV	1.4	2.4	1.2	0.14
1,1,1-Trichloroethane	71-55-6	3.1	NYSDOH BIAV	3.1	2.7	1.4	0.16
Carbon tetrachloride	56-23-5	0.8	NYSDOH BIAV	0.8	3.1	1.6	0.12
1,2-Dichloroethane	107-06-2	ND[8]	NYSDOH BIAV	2.0	2.0	1.0	0.11
Trichloroethene	79-01-6	0.5	NYSDOH BIAV	0.5	2.0	1.3	0.09
1,1,2-Trichloroethane	79-00-5	ND[8]	NYSDOH BIAV	2.7	2.7	1.4	0.15
Tetrachloroethene	127-18-4	2.9	NYSDOH BIAV	2.9	3.4	1.7	0.26
Chlorobenzene	108-90-7	ND[8]	NYSDOH BIAV	2.3	2.3	1.2	0.14
1,1,2,2-Tetrachloroethane	79-34-5	ND[8]	NYSDOH BIAV	3.4	3.4	1.7	0.15

Notes:

1 List the type and source of the PAL used for each matrix specific analyte (e.g. Background, HH-MCL, HH-region III RBC, eco-WQC, eco-Region III BTAG, etc.)
2 Laboratory-specific DLs, LODs, and LOQs are limits that an individual laboratory can achieve when performing a specific analytical method.
3 If Laboratory-specific limits are not-known at time of Draft SAP, place to-be-determined, “TBD”, as a placeholder in the columns. However, these fields MUST be populated and approved in the Final SAP prior to the sampling event.
4 Laboratory specific limits may be presented in a different manner if necessary to comply with project or regulatory requirements.
5 90% Percentile Background Indoor Air Values, New York State Department of Health, November 14, 2005.
6 New York Public Water Systems MCLs (NYSDOH Part 5; Subpart 5-1 Public Water Systems MCLs (updated May 2009)
7 NYSDEC 6 NYCRR Part 375 Remedial Soil Cleanup Objectives for Unrestricted Residential Use Table 375-6.8(a) (December 2006)
8 ND – the analyte is not detected at a nominal method detection limit of 0.25 $\mu g/m^3$

SAP Worksheet #23: Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
CA-202	Analysis of VOAs by Purge and Trap GC/Mass Spectrometry (MS): SW846 Method 8260, 03/12, Revision 13.	Definitive	VOCs - Aqueous Analysis	GC/MS	None	N
CA-228	Analysis of VOCs in Air by GC/MS: USEPA Method TO-15, 10/11, Revision 0.	Definitive	VOCs – TO-15 Analysis	GC/MS	None	N
CA-763	Analysis of Total Organic Carbon in Solids Using the EPA Region II Lloyd Kahn Method, 05/12, Revision 7.	Definitive	Total Organic Carbon – Soil Analysis	TOC Analyzer	None	N
CA-708	pH Concentration Measurements in Aqueous Samples, 05/12, Revision 6.	Definitive	pH – SW846 9040A	pH Meter	None	N
CA-615	Digestion and Analysis of Aqueous Samples for Mercury By USEPA Method 7470, 04/12, Revision 7.	Definitive	Mercury – Aqueous Digestion	Hot Block	None	N
CA-615	Digestion and Analysis of Aqueous Samples for Mercury By USEPA Method 7470, 04/12, Revision 7.	Definitive	Mercury – Aqueous Analysis	CVAA	None	N
CA-510	Toxicity Characteristic Leaching Procedure (TCLP) For Inorganic and Non-Volatile Organic Analytes, 04/12, Revision 7.	Definitive	TCLP Extraction	Rotary Extractor	None	N

Lab SOP Number	**Title, Revision Date, and/or Number**	**Definitive or Screening Data**	**Matrix and Analytical Group**	**Instrument**	**Variance to QSM**	**Modified for Project Work? (Y/N)**
CA-209	Zero Headspace Extraction (ZHE) of Volatile Samples for Toxicity Characteristics Leaching Procedure (TCLP) Method 1311, 06/12, Revision 6.	Definitive	Zero Headspace Extraction (ZHE)	Rotary Extractor	None	N
CA-202	Analysis of VOAs by Purge and Trap GC/MS: SW846 Method 8260, 03/12, Revision 13.	Definitive	TCLP VOCs Analysis	GC/MS	None	N
CA-226	Analysis of SVOAs by Capillary Column GC/MS: SW846 Method 8270D, 01/12, Revision 3.	Definitive	TCLP SVOCs Analysis	GC/MS	None	N
CA-302	Analysis of Pesticides By Gas Chromatography / Electron Capture Detector (GC/ECD): SW846 8081, 02/12, Revision 7.	Definitive	TCLP Pesticides Analysis	GC/ECD	None	N
CA-329	Analysis of PCBs as Total Aroclors by Gas Chromatography / Electron Capture Detector (GC/ECD): SW846 Method 8082, 07/11, Revision 12.	Definitive	PCBs - Soil Analysis	GC/ECD	None	N
CA-604	Acid Digestion of Aqueous Samples by EPA Method 3010 for ICP Analysis of Total or Dissolved Metals, 02/12, Revision 5.	Definitive	Metals – Aqueous Digestion	Hot Block	None	N
CA-608 (see CA-615 for Hg)	Trace Metals Analysis by ICP-AES Using EPA Method 6010, 09/11, Revision 12.	Definitive	TCLP Metals Analysis	ICP-AES	None	N

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
CA-502	Preparation of Aqueous Samples for Extractable Semivolatile Analysis, 03/12, Revision 7.	Definitive	SVOCs – Aqueous Extraction	Sep Funnel / CLLE	None	N
CA-515	Preparation of Aqueous Samples for Pesticide/PCBs Analysis, 04/12, Revision 8.	Definitive	Pesticides - Aqueous Extraction	Sep Funnel / CLLE	None	N
CA-524	Preparation of Sediment/Soil Samples by Soxhlet Extraction Using Method 3540 for Pesticide/PCB analysis, 04/12, Revision 8.	Definitive	PCBs – Soil Preparation	Soxhlet Extractor	None	N
CA-733	Reactive Cyanide SW-846 Chapter Seven, 7.3.3.2	Definitive	Cyanide Reactivity – Preparation	NA	None	N
CA-773	Colorimetric Analysis of Total and Ammenable Cyanide using the Automated Konelab Multiwavelength Photometric Analyzer, 07/11, Revision 5.	Definitive	Cyanide Reactivity – Analysis	Konelab	None	N
CA-734	Reactive Sulfide SW-846 Chapter Seven, 7.3.4.2, 05/12, Revision 7.	Definitive	Sulfide Reactivity – Preparation	NA	None	N
CA-722	Titrimetric Determination of Sulfide using EPA Method 376.1, SM4500 S2 F, SW846 9034 and SW846 7.3.4, 05/12, Revision 5.	Definitive	Sulfide Reactivity – Analysis	Buret	None	N
CA-709	pH Concentration Measurements in Soil Matrices – SW846 Method 904, 05/12, Revision 9.	Definitive	Corrosivity – Soil	pH Meter	None	N

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
CA-736	Test Method for Flash Point by Pensky-Martens Closed Cup Tester, 05/12, Revision 5.	Definitive	Ignitability	Pensky-Marten Closed Cup Tester	None	N
CA-902	Sample Receipt and Internal Control, 09/10, Revision 9.	NA	Storage and Custody	NA	None	N
CA-902	Sample Receipt and Internal Control, 09/10, Revision 9.	NA	Login and Storage	NA	None	N
CA-903	Sample Disposal, 05/09, Revision 4.	NA	Waste Disposal	NA	None	N

Notes: Include the specific Lab Accreditation or Certification requirements for the work of this project, verification that these have been met and the expiration dates as appropriate.

SAP Worksheet #28: Laboratory QC Samples Table

Matrix: Groundwater/QC/IDW/Samples

Analytical Group: VOCs

Analytical Method/SOP Reference: SW-846 8260B

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or less.	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in Box D-1. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ (see Box D-1 in DoD QSM).
System Monitoring Compounds (SMC)/Surrogates	4 per sample. Recommended: Dibromofluoromethane 1,2-Dichloroethane Toluene-d8 4-Bromofluorobenzene	DoD Quality Systems Manual (QSM) limits for%Recovery (%R).	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD Quality Systems Manual (QSM) limits for %R.

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One per batch of 20 or less.	QC acceptance criteria specified by DoD, if available. Otherwise, use in-house control limits. In-house control limits may not be greater than ± 3 times the standard deviation of the mean LCS recovery. See Box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.
Internal Standards (IS)	3 per sample. Recommended: Fluorobenzene Chlorobenzene-d5 1,4-Dichlorobenene-d5	Retention time +/- 30 seconds from retention time (RT) of the Initial Calibration (ICAL) midpoint standard, and the Extracted Ion Current Profile (EICP) area within -50% to +100 % of ICAL midpoint standard.	Inspect mass spectrometer and gas chromatography (GC) for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	Retention time +/- 30 seconds from RT of the ICAL midpoint standard, and EICP area within -50% to +100 % of ICAL midpoint standard.
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per Sample Delivery Group (SDG) or every 20 samples.	For matrix evaluation, use LCS acceptance criteria specified by DoD, if available.	For matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. Check for errors in calculations and spike preparation. Check un-spiked sample results and surrogate recoveries for possible matrix effects.	Analyst, Laboratory Supervisor and Data Validator	Precision / Accuracy / Bias	DoD QSM limits for %R. MS/MSD RPD should be ≤ 30%.

Notes:
DQI data quality indicator

Matrix: Air

Analytical Group: VOCs

Analytical Method/SOP Reference: EPA TO-15

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank (Humid Zero Air Blank)	One per batch of 20 or less.	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ.
System Monitoring Compounds (SMC)/Surrogates	4 per sample: Dibromofluoromethane 1,2-Dichloroethane Toluene-d8 4-Bromofluorobenzene	%R limits specified in method TO-15.	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	%R limits specified in method TO-15.

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One per batch of 20 or less.	%R limits specified in method TO-15.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	%R limits specified in method TO-15.
Duplicate Sample	One per batch of 20 or less.	RPD ≤ 30 where concentration >5x the LOQ; RPD ≤ 40 when concentrations are <5x the LOQ	Reanalyze once if RPDs exceed criteria. If still out, flag associated data (*) and report all analyses	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	%R limits specified in method TO-15.
Internal Standards (IS)	3 per sample: Fluorobenzene Chlorobenzene-d5 1,4-Dichlorobenene-d5	Retention time +/- 20seconds from retention time (RT) of the ICAL midpoint standard, and the Extracted Ion Current Profile (EICP) area within +/-40%of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	Retention time +/- 20seconds from retention time (RT) of the ICAL midpoint standard, and the Extracted Ion Current Profile (EICP) area within +/-40%of ICAL midpoint standard.

Notes:
DQI data quality indicator

Matrix: Soil/Groundwater/QC/IDW samples

Analytical Group: PCBs

Analytical Method/SOP Reference: SW-846 8082

QC Sample:	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or less.	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results	Correct problem, then see criteria in Box D-1. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results (see Box D-1 in DoD QSM).
Surrogates	2 per sample: Tetra-chloro-m-xylene Decachlorobiphenyl	QC acceptance criteria specified by DoD, if available.	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.
Laboratory Control Sample (LCS)	One per batch of 20 or less.	QC acceptance criteria specified by DoD, if available.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per batch of 20 or less.	For matrix evaluation, use LCS acceptance criteria specified by DoD, if available. MS/MSD RPD should be ≤ 30%.	Examine the project-specific Data Quality Objectives (DQOs). Contact the client as to additional measures to be taken. Check for errors in calculations and spike preparation. Check un-spiked sample results and surrogate recoveries for possible matrix effects. If no errors are found and the associated LCS in control, matrix effects are the likely cause. Qualify failing analytes as estimated.	Analyst, Laboratory Supervisor and Data Validator	Precision / Accuracy / Bias	DoD QSM limits for %R. MS/MSD RPD should be ≤ 30%.
Second Column Confirmation	Used to confirm hit on primary column.	RPD must be ≤40%.	NA	Analyst, Laboratory Supervisor and Data Validator	Confirmation	RPD must be ≤40%.

Notes:
DQI data quality indicator

Matrix: IDW samples

Analytical Group: SVOCs

Analytical Method/SOP Reference: SW-846 8270C

QC Sample:	**Frequency & Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**DQI**	**Measurement Performance Criteria**
Method Blank	One per batch of 20 or less.	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results	Correct problem, then see criteria in Box D-1. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ (see Box D-1 in DoD QSM).
Breakdown check Dichlorodiphenyltrichloroethane (DDT)	At the beginning of each 12-hour period, prior to analysis of samples.	Degradation ≤ 20% for DDT. Benzidine and pentachlorophenol should be present at their normal responses, and should not exceed a tailing factor of 2.	Correct problem then repeat breakdown checks.	Analyst, Laboratory Supervisor	Accuracy / Bias	Degradation ≤ 20% for DDT. Benzidine and pentachlorophenol should be present at their normal responses, and should not exceed a tailing factor of 2.

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
System Monitoring Compounds (SMC)/Surrogates	6 per sample. Recommended: 2-Fluorophenol Phenol-d6 2,4,6-Tribromophenol Nitrobenzene-d5 2-Fluorobiphenyl ortho-Terphenyl	DoD QSM limits for %R.	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.
Laboratory Control Sample (LCS)	One per batch of 20 or less.	QC acceptance criteria specified by DoD, if available.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.
Internal Standards (IS)	6 per sample. Recommended: 1,4-Dichlorobenzene-d4 Naphthalene-d8 Acenaphthene-d10 Phenanthrene-d10 Chrysene-d12 Perylene-d12	Retention time +/- 30 seconds from RT of the ICAL midpoint standard, and the EICP area within -50% to +100 % of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst, Laboratory Supervisor and Data Validator.	Accuracy / Bias	Retention time +/- 30 seconds from RT of the ICAL midpoint standard, and the EICP area within -50% to +100 % of ICAL midpoint standard.

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per SDG or every 20 samples.	For matrix evaluation, use LCS acceptance criteria specified by DoD, if available.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken. Check for errors in calculations and spike preparation. Check un-spiked sample results and surrogate recoveries for possible matrix effects. If no errors are found and the associated LCS in control, matrix effects are the likely cause. Qualify failing analytes as estimated.	Analyst, Laboratory Supervisor and Data Validator.	Precision / Accuracy / Bias	DoD QSM limits for %R. MS/MSD RPD should be ≤ 30%.

Notes:
DQI data quality indicator

Matrix: Soil/Groundwater/QC/IDW samples

Analytical Group: Pesticides

Analytical Method/SOP Reference: SW-846 8081B

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or less.	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results.	Correct problem, then see criteria in Box D-1. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results (see Box D-1 in DoD QSM).
Surrogates	2 per sample: Tetrachloro-m-xylene and Decachlorobiphenyl	QC acceptance criteria specified by DoD, if available.	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.
Laboratory Control Sample (LCS)	One per batch of 20 or less.	QC acceptance criteria specified by DoD, if available; see Box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per batch of 20 or less.	For matrix evaluation, use LCS acceptance criteria specified by DoD, if available. MS/MSD RPD should be ≤ 30%.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken. Check for errors in calculations and spike preparation. Check un-spiked sample results and surrogate recoveries for possible matrix effects. If no errors are found and the associated LCS in control, matrix effects are the likely cause. Qualify failing analytes as estimated.	Analyst, Laboratory Supervisor and Data Validator	Precision / Accuracy / Bias	DoD QSM limits for %R. MS/MSD RPD should be ≤ 30%.
Breakdown check (Endrin / DDT)	At the beginning of each 12-hour period, prior to analysis of samples.	Degradation ≤ 15% for both DDT and Endrin.	Correct problem then repeat breakdown check.	Analyst, Laboratory Supervisor	Accuracy / Bias	No samples shall be run until degradation ≤ 15% for both DDT and Endrin.
Second Column Confirmation	Used to confirm hit on primary column.	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	NA	Analyst, Laboratory Supervisor and Data Validator	Confirmation	RPD must be ≤40%.

Notes:
DQI data quality indicator

Matrix: IDW samples

Analytical Group: Metals

Analytical Method/SOP Reference: SW-846 6010B

QC Sample:	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Calibration Blank	After the ICV and after every CCV.	No analytes detected > LOD.	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > LOD.
Method Blank	One per digestion batch of 20 or fewer samples.	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, then see criteria in Box D-1. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ (see Box D-1 in DoD QSM).
Low-Level Calibration Check sample	Daily, after one-point ICAL.	Within ± 20% of true value.	Correct problem, then reanalyze.	Analyst, Laboratory Supervisor	Accuracy / Bias	Within ± 20% of true value.

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One per digestion batch of 20 or fewer samples.	QC acceptance criteria specified by DoD, if available; see Box D-3 and Appendix G.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.
Matrix Spike (MS)	One per digestion batch of 20 or fewer samples.	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control tests are required to evaluate matrix effects.	Analyst, Laboratory Supervisor and Data Validator	Precision / Accuracy / Bias	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS.
Matrix Spike Duplicate or Duplicate Sample	One per preparatory batch of 20 or fewer samples per matrix.	The RPD should be ≤ 20% for duplicate samples for both water and soils.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Analyst, Laboratory Supervisor and Data Validator	Precision	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS. The RPD should be ≤ 20% for duplicate samples for both water and soils.
Inductively Coupled Plasma (ICP) Serial Dilution	One per digestion batch.	If original sample result is at least 50x the instrument detection limit, 5-fold dilution must be ≤10% RPD.	Analyze Post Digestion Spike and narrate the analytes that fail criteria.	Analyst, Laboratory Supervisor and Data Validator	Precision / Accuracy / Bias	If original sample result is at least 50x the LOQ, 5-fold dilution must agree within ± 10%.
Post-Digestion Spike	One per digestion batch of 20 or fewer samples.	%R must be within 75-125% of expected value.	Run all associated samples in the preparatory batch by method of standard additions (MSA) or see flagging criteria.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias in matrix	DoD QSM limits of 75-125 %R.

Notes:
DQI data quality indicator

Matrix: IDW samples

Analytical Group: Mercury

Analytical Method/SOP Reference: SW-846 7470A

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per digestion batch of 20 or fewer samples.	No analytes detected > ½ RL and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, if required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ (see Box D-1 in DoD QSM).
Laboratory Control Sample (LCS)	One per digestion batch of 20 or fewer samples.	QC acceptance criteria specified by DoD, if available.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.
Matrix Spike (MS)	One per digestion batch of 20 or fewer samples.	%R should be within QC acceptance criteria specified by DoD for LCS	Examine the project-specific DQOs. If the matrix spike falls outside of DoD criteria, additional quality control tests are required to evaluate matrix effects.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	DoD QSM limits for %R.

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Matrix Spike Duplicate or Duplicate Sample	One per preparatory batch of 20 or fewer samples per matrix.	The RPD should be ≤ 20% for duplicate samples for both water and soils.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Analyst, Laboratory Supervisor and Data Validator	Precision	For matrix evaluation, use QC acceptance criteria specified by DoD for LCS. The RPD should be ≤ 20% for duplicate samples for both water and soils.

Notes:
DQI data quality indicator

Matrix: Soil samples

Analytical Group: TOC

Analytical Method/SOP Reference: Walkley-Black Method

QC Sample:	**Frequency & Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**DQI**	**Measurement Performance Criteria**
Method Blank	One per batch of 20 or less.	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, if required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ (see Box D-1 in DoD QSM).
Laboratory Control Sample (LCS)	One per batch of 20 or less.	Lab internal limits for %R.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	Lab internal limits for %R.
Laboratory Duplicate	One per batch of 20 or less.	RPD must be ≤ 20%, if sample result is great than four times QL.	Correct problem and reanalyze sample and duplicate.	Analyst, Laboratory Supervisor and Data Validator	Precision	RPD must be ≤ 20%, if sample result is great than four times LOD.

Notes:
DQI data quality indicator

Matrix: IDW samples

Analytical Group: Ignitability

Analytical Method/SOP Reference: SW-846 1010A

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	NA	NA	NA	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	NA
Laboratory Duplicate	One per batch of 20 or less.	Duplicate result must be within ± 3 °F.	If sufficient sample is available, reanalyze. If not, or repeated attempt still fails, qualify results as estimated.	Analyst, Laboratory Supervisor and Data Validator	Bias / Precision	Duplicate result must be within ± 3 °F.

Notes:
DQI data quality indicator

Matrix: IDW samples

Analytical Group: Cyanide Reactivity

Analytical Method/SOP Reference: SW-846 9014

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or less.	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, if required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ.
Laboratory Control Sample (LCS)	One per batch of 20 or less.	QC acceptance criteria specified by DoD, if available.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	QC acceptance criteria specified by DoD, if available.
MS/MSD	One per batch of 20 or less.	QC acceptance criteria specified by DoD for LCS.	If the matrix spike falls outside of DoD criteria, the method of standard additions shall be used for the analysis.	Analyst, Laboratory Supervisor and Data Validator	Precision / Accuracy / Bias	QC acceptance criteria specified by DoD for LCS.

Notes:
DQI data quality indicator

Matrix: IDW samples

Analytical Group: Sulfide Reactivity

Analytical Method/SOP Reference: SW-846 9034

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 or less.	No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct problem, if required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	No analytes detected > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > LOQ.
Laboratory Control Sample (LCS)	One per batch of 20 or less.	Lab internal limits for %R.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	Lab internal limits for %R.
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per batch of 20 or less.	Lab internal limits for %R and RPD.	Check for errors in calculations and spike preparation. Check un-spiked sample results and surrogate recoveries for possible matrix effects. If no errors are found and the associated LCS in control, matrix effects are the likely cause. Qualify failing analytes as estimated.	Analyst, Laboratory Supervisor and Data Validator	Precision / Accuracy / Bias	Lab internal limits for %R and RPD.

Notes: DQI data quality indicator

Matrix: IDW samples

Analytical Group: Corrosivity

Analytical Method/SOP Reference: SW-846 9045C

QC Sample:	Frequency & Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Method Blank	NA	NA	NA	Analyst, Laboratory Supervisor and Data Validator	Bias / Contamination	NA
Standard Reference Materials (SRM)	Two per batch of 20 samples or less.	Must be within ± 0.05 pH units.	Repeat calibration and reanalyze all samples. If insufficient volume, qualify results as estimated.	Analyst, Laboratory Supervisor and Data Validator	Accuracy / Bias	Must be within ± 0.05 pH units.
Laboratory Duplicate	One per batch of 20 or less.	RPD must be ≤ 20%.	If sufficient sample is available, reanalyze. If not, or repeated attempt still fails, qualify results as estimated.	Analyst, Laboratory Supervisor and Data Validator	Bias / Precision	RPD must be ≤ 20%.

Notes:
DQI data quality indicator

SAP Worksheet #34, 35, 36 Data Verification and Validation (Steps I and IIa/IIb) Process Table

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Chain-of-Custody Forms	The ResCon TL or designee will review and sign each chain-of-custody form to verify that all samples listed are included in the shipment to the laboratory and the sample information is accurate. The chain-of-custody forms will be signed by the sampler and a copy will be retained for the project file, the ResCon PM, and the ResCon Data Validator. See SOP.	TL and Field Crew, ResCon	External
	The Laboratory Sample Custodian will review the sample shipment for completeness and integrity and will sign accepting the shipment.	Laboratory Sample Custodian	Internal
	The data validator will check that the chain-of-custody form was signed and dated by the ResCon SS or designee relinquishing the samples and also by the Laboratory Sample Custodian receiving the samples for analyses. The data validator will ensure that the custody and integrity of the samples were maintained from collection to analysis and that custody records are complete and any deviations are recorded.	Data Validator, ResCon	External
Field SOPs/Field Logs/Sample Collection	Ensure that all sampling SOPs were Followed. Verify that deviations have been documented and performance criteria have been achieved,: that samples were correctly identified, that sampling location coordinates are accurate, and that documentation establishes an unbroken chain of custody from sample collection to report generation. Verify that the correct sampling and analytical procedures were applied. Verify that the SAP was followed as written and that any deviations are documented.	PM, TL, or designee, ResCon	External
Sample Tables	Proposed samples verified to have been collected.	TL and Field Crew, ResCon	External
Sample Log Sheets	Log sheets completed as samples are collected in the field are verified for completeness and are maintained at the project office.	PM, TL, or designee, ResCon	External

SAP Worksheet #34, 35, 36 Data Verification and Validation (Steps I and IIa/IIb) Process Table (cont.)

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Field QC Samples	Verify that field QC samples listed in Worksheet #20 were collected as required.	TL or designee, ResCon	External
Sample Coordinates	Sample locations will be validated to be correct and in accordance with the SAP (compare map of proposed locations to map of actual locations).	PM, TL, or designee, ResCon	External
Analytical SOPs	Ensure that all laboratory SOPs were followed. Verify that the correct analytical methods/SOPs were applied.	Laboratory PM	Internal
Documentation of Method QC Results	Establish that all method QC samples were analyzed and in control as listed in the analytical SOPs. If method QA is not in control, the Laboratory QAM will contact ResCon for guidance prior to report preparation.	Laboratory PM	Internal
Analytical Data Packages	All analytical data packages will be verified internally for completeness by the laboratory performing the work. The Laboratory PM will sign the case narrative for each data package.	Laboratory PM	Internal
	Verify that the data package contains all the elements required by the functional guidelines and scope of work. Missing information will be requested from the laboratory, and validation will be suspended until missing data are received.	Data Validator, ResCon	External
Documentation of Analytical Reports for Completeness	Ensure that the required analytical samples have been collected, appropriate sample identifications have been used, and correct analytical methods have been applied. Data Validator will verify that elements of the data package required for validation are present, and if not, the laboratory will be contacted and the missing information will be requested. Validation will be performed as per Worksheet #36. Verify all data have been transferred correctly and completely to the final Structured Query Language (SQL) database.	Data Validator, ResCon	External
Electronic Data Deliverables	The electronic data will be compared to the chain-of-custody form and hard copy data package to verify accuracy and completeness.	Data Validator, ResCon	External

SAP Worksheet #34, 35, 36 Data Verification and Validation (Steps I and IIa/IIb) Process Table (cont.)

Data Review Input	**Description**	**Responsible for Verification (name, organization)**	**Internal/External**
Analytical Data Packages	Limited data validation will be performed using criteria for the VOC, TO-15, and TOC methods listed in Worksheet #12, 15, 24, and 28, and the QSM. If not addressed in the worksheets, the logic outlined in the National Functional Guidelines for Superfund Organic Methods Data Review (June 2008) will be used to apply qualifiers to data. IDW data will not be validated	Data Validator, ResCon	External
Analytical Data Packages (in addition to Limited Validation) IDW data will not be validated	<u>Data Results:</u> verify that the summary form results match the raw data. <u>Holding Times</u>: Verify that the samples were shipped and stored at the required temperature and that the sample pH values for chemically preserved samples meet the requirements listed in Worksheet #19. Verify that the analyses were performed within the holding times listed in Worksheet #19. <u>Laboratory Data Results for Accuracy:</u> Ensure that the laboratory QC samples listed in Worksheet #28 were analyzed and that the MPCs listed in Worksheet #12 were met for all field samples and QC analyses. Verify that specified field QC samples were collected and analyzed and that the analytical QC criteria set up for this project were met. <u>Field and Laboratory Duplicate Analyses for Precision:</u> Verify the field sampling precision by checking the RPD for field duplicate samples. Verify laboratory precision by checking RPDs or %D values from laboratory duplicate, MS/MSD, MS/Sample Duplicate, and LCS/LCSD analyses. Ensure compliance with the methods and project MPC accuracy goals listed in Worksheet #12 and 28. <u>Project Quantitation Limits for Sensitivity</u>: Verify that the QLs listed in Worksheet #15 were achieved. <u>Sample Results for Representativeness:</u> Verify that the laboratory recorded the temperature of each sample at sample receipt and the pH of chemically preserved samples to ensure sample integrity from sample collection to analysis.	Data Validator, ResCon	External

SAP Worksheet #34, 35, 36 Data Verification and Validation (Steps I and IIa/IIb) Process Table (cont.)

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/External
Data Validation Report	Summarize deviations from methods, procedures, or contracts. Qualify data results based on method or QC deviation and explain all data qualifications. Print a copy of the project database, qualified data depicting data qualifiers, and data qualifiers codes that summarize the reason for data qualifications. Determine if the data met the MPCs and determine the impact of any deviations on the technical usability of the data.	Data Validator, ResCon	External
Project Screening Levels	Discuss the impact of matrix interferences or sample dilutions performed, because of the high concentration of one or more contaminants, on the other target compounds reported as not detected. Document this usability issue and inform the ResCon PM.	Data Validator, ResCon	External
	Review and add PSLs to the laboratory electronic data deliverable. Flag samples and notify the ResCon PM of samples that exceed the PSLs as listed in Worksheet #15.	PM or designee, ResCon	External
SAP QC Sample Documentation	Verify that all QC samples specified in the SAP were collected and analyzed and that the associated results were within prescribed SAP acceptance limits. Verify that QC samples and standards prescribed in analytical SOPs were analyzed and within the prescribed control limits. If any significant QC deviations occur, the Laboratory QAM shall have contacted the ResCon Project Chemist or PM.	Data Validator, ResCon	External
Analytical Data Deviations	Determine the impact of any deviation from sampling or analytical methods, SOP requirements, and matrix interferences on the analytical results.	Data Validator, ResCon	External

Notes:

IDW = Investigated Derived Waste
PM = Project Manager
ResCon = Resolution Consultants
QA = Quality Assurance
QAM = Quality Assurance Manager
QC = Quality Control
SAP = Sampling and Analysis Plan
SOP = Standard Operating Procedures
SQL = Structured Query Language
TL = Team Lead
TOC = Total Organic Carbon

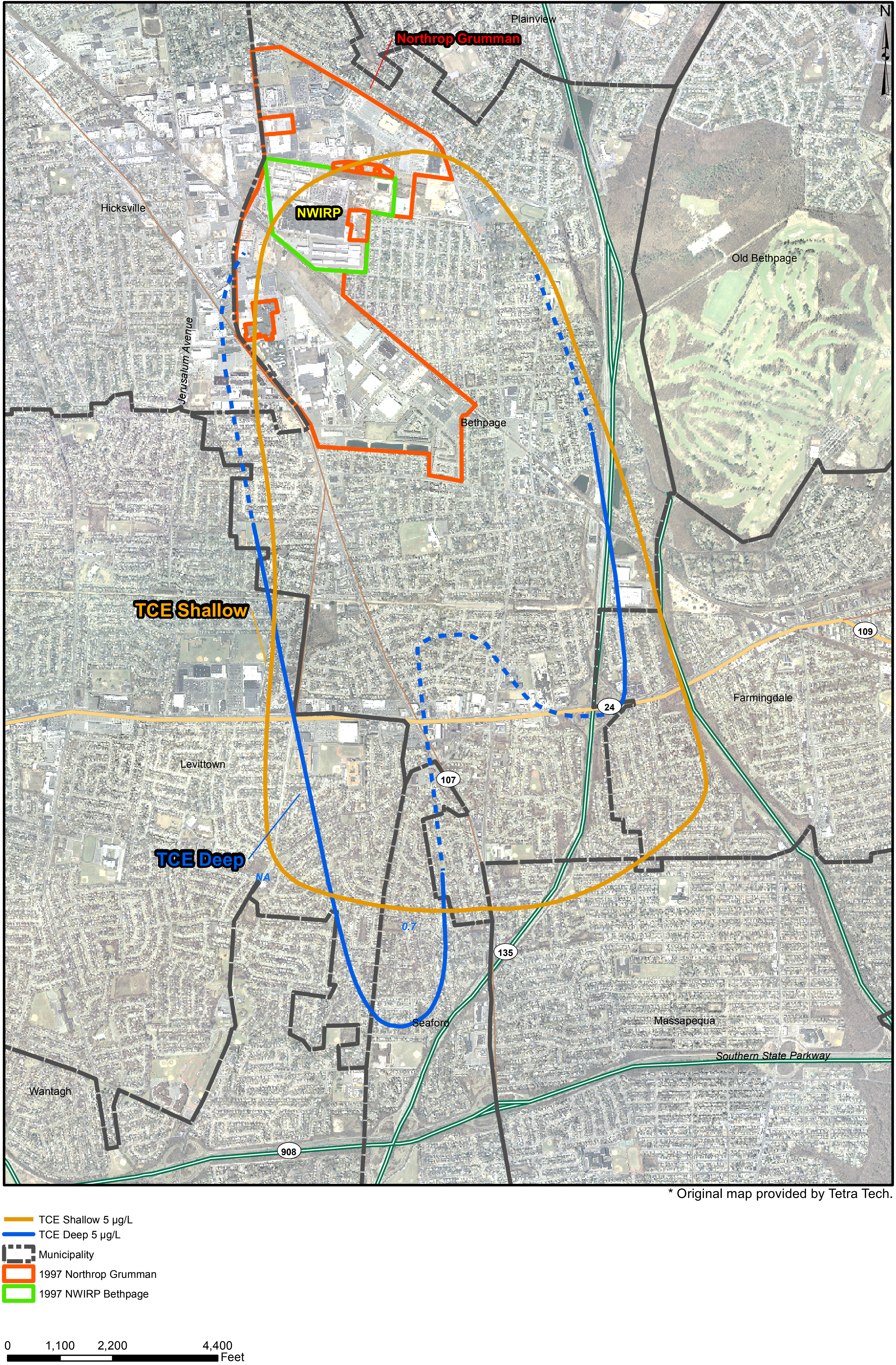
Tables

Table 1
Exposure Pathway Analysis - Potential Receptors
Bethpage OU-2, Site 1 Bethpage, NY

Receptor	Exposure Medium	Exposure Pathway	Pathway Not Considered Complete	Pathway Considered Potentially Complete, But Not Likely to Result in Exposure	Pathway Potentially Complete and Will Be Addressed in the HASP for the Site	Rationale for Inclusion or Exclusion
Outdoor Subsurface Maintenance or Utility Worker						
Outdoor Subsurface Maintenance or Utility Worker	**Subsurface Soil (>2 inches)**	Ingestion	---	X	---	Outdoor subsurface maintenance or utility workers may be exposed to NAPL or other residuals in subsurface soil, dust, or VOCs in ambient air while completing excavation work to repair or replace subsurface utilities or other equipment that is present at the Site.
		Dermal contact	---	---	X	
		Inhalation of Particulates	---	---	X	
		Inhalation of Volatiles in Ambient Air	---	---	X	
	Groundwater	Ingestion	---	X	---	Outdoor subsurface maintenance or utility workers may be exposed to residuals in groundwater and VOCs in ambient air while completing excavation work to repair or replace pipes or other equipment that is present at the Site.
		Dermal contact	---	---	X	
		Inhalation of Volatiles in Ambient Air	---	---	X	
Residential Dwelling Occupants						
Residential dwelling occupants	**Subsurface Soil (>2 inches)**	Ingestion	X	---	---	Residential Dwelling occupants are not likely to contact subsurface soils. However, if planned or emergency work involves cutting or drilling through the concrete slabs in the basements of site buildings, there is the possibility that VOCs could be released into the air, although it is unlikely due to the distance of VOCs from surface. Therefore, the inhalation of VOCs in indoor air pathway is considered potentially complete but not likely to result in exposure.
		Dermal Contact	X	---	---	
		Inhalation of Particulates	X	---	---	
		Inhalation of Volatiles in Ambient Air	X	---	---	
		Inhalation of Volatiles in Indoor Air	---	X	---	
	Groundwater	Ingestion	X	---	---	Residential Dwelling occupants are likely to contact groundwater via tap. There are wellhead treatment systems in place and two "hot spot" groundwater treatment systems in place as well as numerous outpost wells. However, if planned or emergency work involves cutting or drilling through the concrete slabs in the basements of site buildings, there is the possibility that VOCs could be released into the air, although it is unlikely due to the distance of VOCs from surface. Therefore, the inhalation of VOCs in indoor air pathway is considered potentially complete but not likely to result in exposure.
		Dermal contact	X	---	---	
		Inhalation of Volatiles in Ambient Air	X	---	---	
		Inhalation of Volatiles in Indoor Air	---	X	---	
Commercial Building Occupant						
	Subsurface Soil (>2 inches)	Ingestion	X	---	---	Commercial building occupants are not likely to contact subsurface soils. However, if planned or emergency work involves cutting or drilling through the concrete slabs in the basements of site buildings, there is the possibility that VOCs could be released into the air, although it is unlikely due to the distance of VOCs from surface. Therefore, the inhalation of VOCs in indoor air pathway is considered potentially complete but not likely to result in exposure.
Commercial Building Occupant		Dermal Contact	X	---	---	
		Inhalation of Particulates	X	---	---	
		Inhalation of Volatiles in Ambient Air	X	---	---	
		Inhalation of Volatiles in Indoor Air	---	X	---	
	Groundwater	Ingestion	X	---	---	Commercial Building occupants are likely to contact groundwater via tap. There are wellhead treatment systems in place and two "hot spot" groundwater treatment systems in place as well as numerous outpost wells. However, if planned or emergency work involves cutting or drilling through the concrete slabs in the basements of site buildings, there is the possibility that VOCs could be released into the air, although it is unlikely due to the distance of VOCs from surface. Therefore, the inhalation of VOCs in indoor air pathway is considered potentially complete but not likely to result in exposure.
		Dermal contact	X	---	---	
		Inhalation of Volatiles in Ambient Air	X	---	---	
		Inhalation of Volatiles in Indoor Air	---	X	---	

Figures

Path: F:\Projects\Navy\BethpageWX025\7.0 Deliverables\7.2 CADD\GIS\SAP2012\F01 Site Location 2012 12 12.mxd



* Original map provided by Tetra Tech.

- 🟧 TCE Shallow 5 µg/L
- 🟦 TCE Deep 5 µg/L
- ▭ Municipality
- 🟥 1997 Northrop Grumman
- 🟩 1997 NWIRP Bethpage

DRAWN BY MC	DATE 8/10/11	NAVFAC	APPROXIMATE LOCATION OF OU2 SITE 1 SHALLOW AND DEEP PLUMES BETHPAGE, NEW YORK	CONTRACT NUMBER N62470-11-D-8018	CTO NUMBER WE15
CHECKED BY DB	DATE 8/10/11			APPROVED BY —	DATE —
REVISED BY TT	DATE 2/1/12			APPROVED BY —	DATE —
SCALE AS SHOWN				FIGURE NO. 1	REV 1

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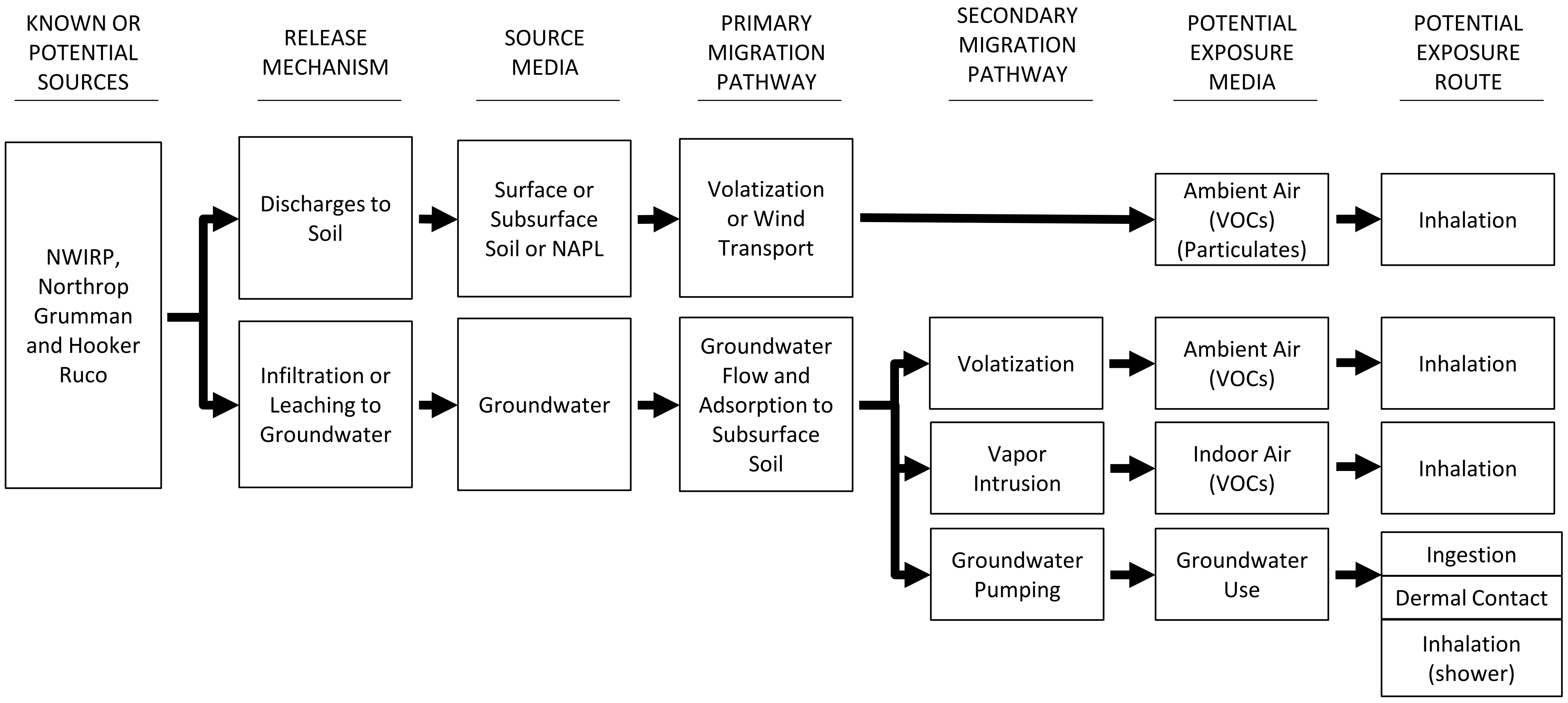
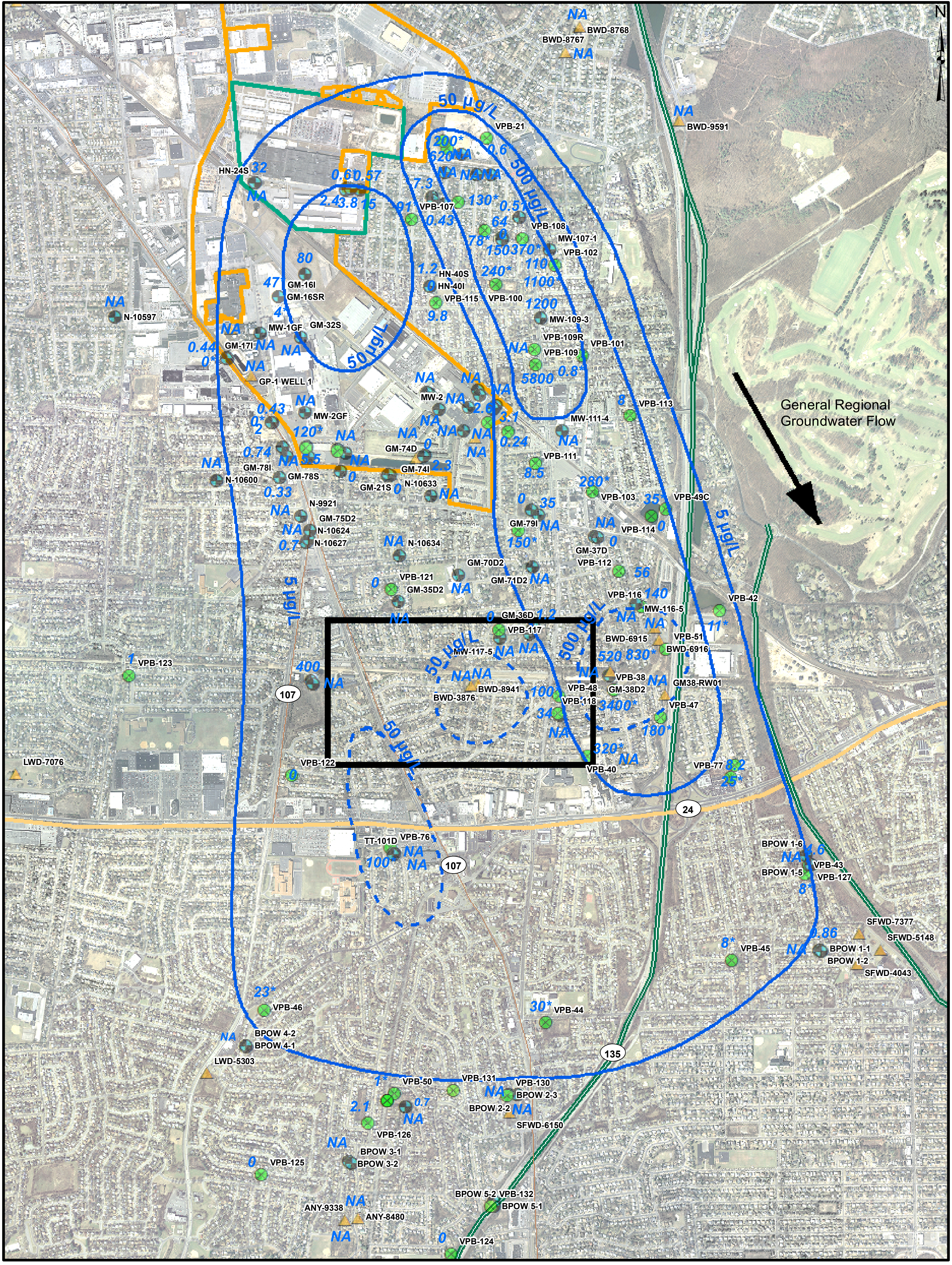


CONCEPTUAL SITE MODEL
OU2 SITE 1
BETHPAGE, NY

Contract Number N62470-11-D-8018	CTO Number WE15
Approved by: EV	Date 5/22/12
Figure Number 2	Rev 0

Path: F:\Projects\Navy\Bethpage WXE08\7.0 Deliverables\7.2 CADD\GIS_files\Bethpage\MAP DOCS\MXD\SMP_2011\F03 BP_TCE_SHALLOW_2012 06 28.mxd



● Monitoring Well

▲ Water Supply Well

⊗ Vertical Profile Boring

— TCE Contour µg/L

- - TCE Contour µg/L (inferred)

▭ Location of Potential Vertical Profile Borings

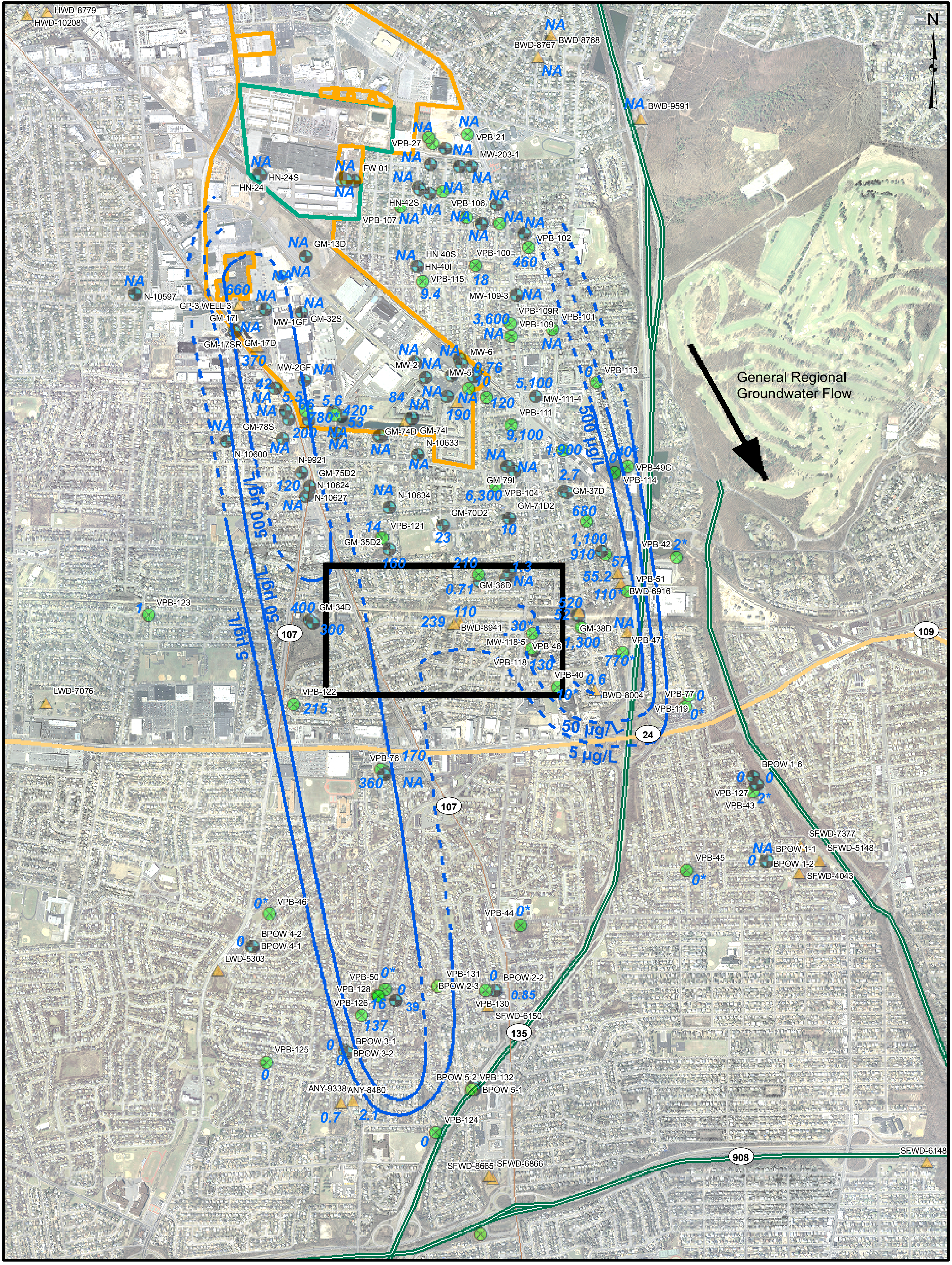
Notes:
NA-No Data Available
*** - Data is more than 5 years old**

0 875 1,750 3,500 Feet

DRAWN BY MC	DATE 8/10/11	TCE ISOCONCENTRATION CONTOUR MAP OU2 GROUNDWATER SHALLOW < 300 FEET BGS BETHPAGE, NEW YORK	CONTRACT NUMBER N62470-11-D-8018	CTO NUMBER WXE08
CHECKED BY DB	DATE 8/10/11		APPROVED BY	DATE
REVISED BY TT	DATE 2/1/12		APPROVED BY	DATE
SCALE AS SHOWN			FIGURE NO. 3	REV 1

NAVFAC

Path: F:\Projects\Navy\Bethpage WXE08\7.0 Deliverables\7.2 CADD\GIS_files\Bethpage\MAP DOCS\MXD\SMP_2011\F04 BP_TCE_DEEP_2012 07 12.mxd



Notes:
NA-No Data Available
*** - Data is more than 5 years old**

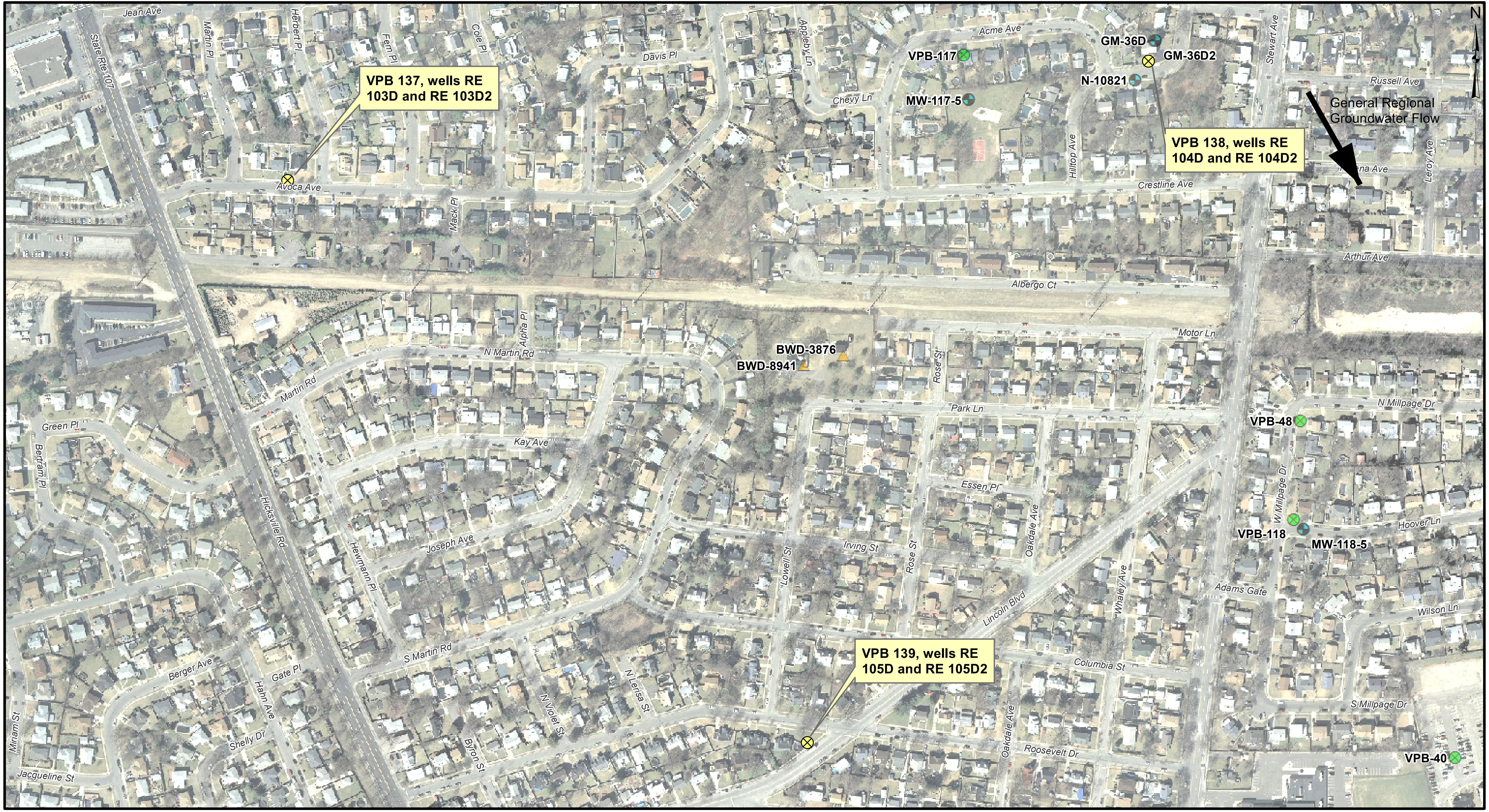
Legend

▭ Location of Potential Vertical Profile Borings

0 1,100 2,200 4,400
Feet

DRAWN BY MC	DATE 8/10/11	TCE ISOCONCENTRATION CONTOUR MAP OU2 GROUNDWATER DEEP > 300 FEET BGS BETHPAGE, NEW YORK	CONTRACT NUMBER N62470-11-D-8018	CTO NUMBER WXE08
CHECKED BY DB	DATE 8/10/11		APPROVED BY —	DATE —
REVISED BY TT	DATE 2/1/12		APPROVED BY —	DATE —
SCALE AS SHOWN			FIGURE NO. 4	REV 1

Path: F:\Projects\Navy\Bethpage WXE08\7.0 Deliverables\7.2 CADD\GIS_files\Bethpage\MAP DOCS\MXD\SMP_2011\F05 Proposed VPB 2012 12 03.mxd



⊗ Potential Vertical Profile Boring (VPB)

⊗ Vertical Profile Boring

● Monitoring Well

▲ Water Supply Well

0 90 180 360
Feet

NAVFAC

POTENTIAL VPB LOCATIONS
FOR BWD PLANT 6
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8018	WE15
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. 5	REV 1

Appendices

Appendix A

SOPs

Utility Clearance

Procedure 3-01

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the process for determining the presence of subsurface utilities and other cultural features at locations where planned site activities involve the physical disturbance of subsurface materials.

1.2 This procedure is the Program-approved professional guidance for work performed by Resolution Consultants under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract (Contract Number N62470-11-D-8013).

1.3 The procedure applies to the following activities: soil gas surveying, excavating, trenching, drilling of borings and installation of monitoring and extraction wells, use of soil recovery or slide-hammer hand augers, and all other intrusive sampling activities.

1.4 The primary purpose of the procedure is to minimize the potential for damage to underground utilities and other subsurface features, which could result in physical injury, disruption of utility service, or disturbance of other subsurface cultural features.

1.5 If there are procedures, whether it be from Resolution Consultants, state, and/or federal, that are not addressed in this SOP and are applicable to utility clearance, those procedures should be added as an appendix to the project specific SAP.

1.6 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 Field and subcontractor personnel shall adhere to a site-specific health and safety plan (HASP).

3.0 Terms and Definitions

3.1 Utility

For the proposes of this SOP, a utility is defined as a manmade underground line or conduit, cable, pipe, vault or tank that is, or was, used for the transmission of material or energy (e.g., gas, electrical, telephone, steam, water or sewage, product transfer lines, or underground storage tanks).

3.2 As-Built Plans

As-built plans are plans or blueprints depicting the locations of structures and associated utilities on a property.

3.3 One-Call

The Utility Notification Center is the one-call agency for nationwide call before you dig. The Utility Notification Center is open 24 hours a day, and accepts calls from anyone planning to dig. The phone number 811 is the designated call before you dig phone number that directly connects you to your local one-call center. Additional information can be found at www.call811.com.

Calling before you dig ensures that any publicly owned underground lines will be marked so that you can dig around them safely. Having the utility lines marked not only prevents accidental damage to the lines, but prevents property damage and personal injuries that could result in breaking a line.

The following information will need to be provided when a call is placed to One-Call:

- Your name, phone number, company name (if applicable), and mailing address.
- What type or work is being done.
- Who the work is being done for.
- The county and city the work is taking place in.
- The address or the street where the work is taking place.
- Marking instructions, (specific instructions as to where the work is taking place).

Under normal circumstances it takes between 2 to 5 days from the time you call (not counting weekends or holidays) to have the underground lines marked. Because these laws vary from state to state, exactly how long it will take depends on where your worksite is located. You will be given an exact start time and date when your locate request is completed, which will comply with the laws in your area.

In the event of an emergency (any situation causing damage to life or property, or a service outage), lines can be marked sooner than the original given time if requested.

3.4 Toning

Toning is the process of surveying an area utilizing one or more surface geophysical methods to determine the presence or absence of underground utilities. Typically, toning is conducted after identifying the general location of utilities and carefully examining all available site utility plans. Each location is marked according to the type of utility being identified. In addition, areas cleared by toning are flagged or staked to indicate that all identified utilities in a given area have been toned.

4.0 Training and Qualifications

4.1 The **Contract Task Order (CTO) Manager** is responsible for verifying that these utility locating procedures are performed prior to the initiation of active subsurface exploration.

4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.3 The **Field Manager** is responsible for ensuring that all utility locating activities are performed in accordance with this procedure.

4.4 All **Field Personnel** are responsible for the implementation of this procedure.

5.0 Equipment and Supplies

5.1 Equipment and supplies necessary for locating subsurface utilities will be provided by the subcontractor; however, the project **Field Manager/Field Personnel** will provide any additional equipment and supplies as needed as well as maintain information regarding the utility clearance activities in the field logbook.

6.0 Procedure

Proceed wtih the following steps where subsurface exploration will include excavations, drilling, or any other subsurface investigative method that could damage utilities at a site. In addition to the steps outlined below, always exercise caution while conducting subsurface exploratory work.

6.1 Prepare Preliminary Site Plan

- Prepare a preliminary, scaled site plan depicting the proposed exploratory locations as part of the project specific Sampling and Analysis Plan (SAP) or Work Plan. Include as many of the cultural and natural features as practical in this plan.

6.2 Review Background Information

- Search existing plan files to review the as-built plans to identify the known location of utilities at the site. Plot the locations of utilities identified onto a preliminary, scaled site plan. Inform the CTO Manager if utilities lie within close proximity to a proposed exploration or excavation location. The CTO Manager will determine if it is necessary to relocate proposed sampling or excavation locations.
- Include the utility location information gathered during previous investigations (e.g., remedial investigation or remedial site evaluation) in the project design documents for removal or remedial actions. In this manner, information regarding utility locations collected during implementation of a CTO can be shared with the subcontractor during implementation of a particular task order. In many instances, this will help to reduce the amount of additional geophysical surveying work the subcontractor may have to perform.
- Conduct interviews with onsite and facility personnel familiar with the site to obtain additional information regarding the known and suspected locations of underground utilities. In addition, if appropriate, contact shall be made with local utility companies to request their help in locating underground lines. Pencil in the dimensions, orientation, and depth of utilities, other than those identified on the as-built plans, at their approximate locations on the preliminary plans. Enter the type of utility, the personnel who provided the information, and the date the information was provided into the field log.
- During the pre-field work interviewing process, the interviewer will determine which site personnel should be notified in the event of an incident involving damage to existing utilities. Record this information in the field logbook with the corresponding telephone numbers and addresses.

6.3 Site Visit/Locate Utilities/Toning

- Prior to the initiation of field activities, the Field Task Manager or similarly qualified field personnel shall visit the site and note existing structures and evidence of associated utilities, such as fire hydrants, irrigation systems, manhole and vault box covers, standpipes, telephone switch boxes, free-standing light poles, gas or electric meters, pavement cuts, and linear depression. Compare notes of the actual site configuration to the preliminary site plan. Note deviations in the field logbook and on the preliminary site plan. Accurately locate or survey and clearly mark with stakes, pins, flags, paint, or other suitable devices all areas where subsurface exploration is proposed. These areas shall correspond with the locations drawn on the preliminary site plan.
- Following the initial site visit by the Field Task Manager, a trained utility locating subcontractor will locate, identify, and tone all utilities depicted on the preliminary site plan. The Field Task Manager or similarly qualified field personnel shall visit the site and identify the areas of subsurface disturbance with white spray paint, chalk, white pin flags or some other easily identifiable marking. The utility locator should utilize appropriate sensing equipment to attempt to locate utilities that might not have appeared on the as-built plans. At a minimum, the utility subcontractor should utilize a metal detector and/or magnetometer; however, it is important to consider the possibility that non-metallic utilities or tanks might be present at the site. Use other appropriate surface geophysical methods such as Ground Penetrating Radar, Radiodetection, etc. as appropriate. Clear proposed exploration areas of all utilities in the immediate area where subsurface exploration is proposed. Clearly tone all anomalous areas. Clearly identify all toned areas on the preliminary site plan. All utilities near the area of subsurface disturbance should also be marked out by the utility subcontractor using the universal colors for subsurface utilities (i.e., red – electric; blue – water; green – sewer; yellow – gas; etc.). After toning the site and plotting all known or suspected buried utilities on the preliminary site plan, the utility locator shall provide the Field Task Manager with a copy of the completed preliminary

site plan. Alternatively, the Field Task Manager or designee shall document the results of the survey on the preliminary site plan.

- Report to the Field Task Manager anomalous areas detected and toned that are in close proximity to the exploration or excavation areas. The Field Task Manager shall determine the safe distance to maintain from the known or suspected utility. It may be necessary to relocate the proposed exploration or excavation areas. If this is required, the Field Task Manager or designee shall relocate them and clearly mark them using the methods described above. Completely remove the markings at the prior location. Plot the new locations on the site plan and delete the prior locations from the plan. In some instances, such as in areas extremely congested with subsurface utilities, it may be necessary to dig by hand or use techniques such as air knife to determine the location of the utilities.

6.4 Prepare Site Plan

- Prior to the initiation of field activities, draft a final site plan that indicates the location of subsurface exploration areas and all known or suspected utilities present at the site. Provide copies of this site plan to the Navy Technical Representative (NTR), the CTO Manager, and the subcontractor who is to conduct the subsurface exploration/excavation work. Review the site plan with the NTR to verify its accuracy prior to initiating subsurface sampling activities.

7.0 Quality Control and Assurance

7.1 Utility locating must incorporate quality control measures to ensure conformance to these and the project requirements.

8.0 Records, Data Analysis, Calculations

8.1 A bound field logbook will be kept detailing all activities conducted during the utility locating procedure.

8.2 The logbook will describe any changes and modifications made to the original exploration plan. The trained utility locator shall prepare a report and keep it in the project file. Also, a copy of the final site plan will be kept in the project file.

9.0 Attachments or References

Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual.* Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf.

Author	Reviewer	Revisions (Technical or Editorial)
Caryn DeJesus Senior Scientist	Bob Shoemaker Senior Scientist	Rev 0 – Initial Issue (June 2012)

Logbooks

Procedure 3-02

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the activities and responsibilities pertaining to the identification, use, and control of logbooks and associated field data records.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 In order to keep the logbook clean, store it in a clean location and use it only when outer gloves used for PPE have been removed.

3.0 Terms and Definitions

3.1 Logbook

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person assigned responsibility for maintenance of the logbook, and the beginning and ending dates of the entries.

3.2 Data Form

A data form is a predetermined format utilized for recording field data that may become, by reference, a part of the logbook (e.g., soil boring logs, trenching logs, surface soil sampling logs, groundwater sample logs, and well construction logs are data forms).

4.0 Training and Qualifications

4.1 The **Contract Task Order (CTO) Manager** or **designee** is responsible for determining which team members shall record information in field logbooks and for obtaining and maintaining control of the required logbooks. The **CTO Manager** shall review the field logbook on at least a monthly basis. The **CTO Manager** or **designee** is responsible for reviewing logbook entries to determine compliance with this procedure and to ensure that the entries meet the project requirements.

4.2 A knowledgeable individual such as the **Field Manager**, **CTO Manager**, or **Program Quality Manager** shall perform a technical review of each logbook at a frequency commensurate with the level of activity (weekly is suggested, or, at a minimum, monthly). Document these reviews by the dated signature of the reviewer on the last page or page immediately following the material reviewed.

4.3 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.4 The **Field Manager** is responsible for ensuring that all **field personnel** follow these procedures and that the logbook is completed properly and daily. The **Field Manager** is also responsible for submitting copies to the **CTO Manager**, who is responsible for filing them and submitting a copy (if required by the CTO Statement of Work).

4.5 The **logbook user** is responsible for recording pertinent data into the logbook to satisfy project requirements and for attesting to the accuracy of the entries by dated signature. The **logbook user** is also responsible for safeguarding the logbook while having custody of it.

4.6 All **field personnel** are responsible for the implementation of this procedure.

5.0 Equipment and Supplies

5.1 Field logbooks shall be bound field notebooks with water-repellent pages.

5.2 Pens shall have indelible black ink.

6.0 Procedure

6.1 The field logbook serves as the primary record of field activities. Make entries chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct the applicable events. Store the logbook in a clean location and use it only when outer gloves used for personal protective equipment (PPE) have been removed.

6.2 Individual data forms may be generated to provide systematic data collection documentation. Entries on these forms shall meet the same requirements as entries in the logbook and shall be referenced in the applicable logbook entry. Individual data forms shall reference the applicable logbook and page number. At a minimum, include names of all samples collected in the logbook even if they are recorded elsewhere.

6.3 Enter field descriptions and observations into the logbook, as described in Attachment 1, using indelible black ink.

6.4 Typical information to be entered includes the following:

- Dates (month/day/year) and times (military) of all on-site activities and entries made in logbooks/forms;
- Site name and description;
- Site location by longitude and latitude, if known;
- Weather conditions, including temperature and relative humidity;
- Fieldwork documentation, including site entry and exit times;
- Descriptions of, and rationale for, approved deviations from the work plan (WP) or field sampling plan;
- Field instrumentation readings;
- Names, job functions, and organizational affiliations of on-site personnel;
- Photograph references;
- Site sketches and diagrams made on site;
- Identification and description of sample morphology, collection locations, and sample numbers;
- Sample collection information, including dates (month/day/year) and times (military) of sample collections, sample collection methods and devices, station location numbers, sample collection depths/heights, sample preservation information, sample pH (if applicable), analysis requested (analytical groups), etc., as well as chain-of-custody (COC) information such as sample identification numbers cross-referenced to COC sample numbers;
- Sample naming convention;
- Field quality control (QC) sample information;
- Site observations, field descriptions, equipment used, and field activities accomplished to reconstruct field operations;

- Meeting information;
- Important times and dates of telephone conversations, correspondence, or deliverables;
- Field calculations;
- PPE level;
- Calibration records;
- Contractor and subcontractor information (address, names of personnel, job functions, organizational affiliations, contract number, contract name, and work assignment number);
- Equipment decontamination procedures and effectiveness;
- Laboratories receiving samples and shipping information, such as carrier, shipment time, number of sample containers shipped, and analyses requested; and
- User signatures.

6.5 The logbook shall reference data maintained in other logs, forms, etc. Correct entry errors by drawing a single line through the incorrect entry, then initialing and dating this change. Enter an explanation for the correction if the correction is more than for a mistake.

6.6 At least at the end of each day, the person making the entry shall sign or initial each entry or group of entries.

6.7 Enter logbook page numbers on each page to facilitate identification of photocopies.

6.8 If a person's initials are used for identification, or if uncommon acronyms are used, identify these on a page at the beginning of the logbook.

6.9 At least weekly and preferably daily, the **preparer** shall photocopy and retain the pages completed during that session for backup. This will prevent loss of a large amount of information if the logbook is lost.

7.0 Quality Control and Assurance

7.1 Review per Section 4.2 shall be recorded.

8.0 Records, Data Analysis, Calculations

8.1 Retain the field logbook as a permanent project record. If a particular CTO requires submittal of photocopies of logbooks, perform this as required.

8.2 Deviations from this procedure shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

9.0 Attachments or References

9.1 Attachment 1 – Description of Logbook Entries

9.2 Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf.

Author	Reviewer	Revisions (Technical or Editorial)
Mark Kromis Program Chemist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue

Attachment 1
Description of Logbook Entries

Logbook entries shall be consistent with Section A.1.4 *Field Documentation SOPs* of the UFP-QAPP Manual (DoD 2005) and contain the following information, as applicable, for each activity recorded. Some of these details may be entered on data forms, as described previously.

Name of Activity	**For example, Asbestos Bulk Sampling, Charcoal Canister Sampling, Aquifer Testing.**
Task Team Members and Equipment	Name all members on the field team involved in the specified activity. List equipment used by serial number or other unique identification, including calibration information.
Activity Location	Indicate location of sampling area as indicated in the field sampling plan.
Weather	Indicate general weather and precipitation conditions.
Level of PPE	Record the level of PPE (e.g., Level D).
Methods	Indicate method or procedure number employed for the activity.
Sample Numbers	Indicate the unique numbers associated with the physical samples. Identify QC samples.
Sample Type and Volume	Indicate the medium, container type, preservative, and the volume for each sample.
Time and Date	Record the time and date when the activity was performed (e.g., 0830/08/OCT/89). Use the 24-hour clock for recording the time and two digits for recording the day of the month and the year.
Analyses	Indicate the appropriate code for analyses to be performed on each sample, as specified in the WP.
Field Measurements	Indicate measurements and field instrument readings taken during the activity.
Chain of Custody and Distribution	Indicate chain-of-custody for each sample collected and indicate to whom the samples are transferred and the destination.
References	If appropriate, indicate references to other logs or forms, drawings, or photographs employed in the activity.
Narrative (including time and location)	Create a factual, chronological record of the team's activities throughout the day including the time and location of each activity. Include descriptions of general problems encountered and their resolution. Provide the names and affiliations of non-field team personnel who visit the site, request changes in activity, impact the work schedule, request information, or observe team activities. Record any visual or other observations relevant to the activity, the contamination source, or the sample itself. It should be emphasized that logbook entries are for recording data and chronologies of events. The logbook author must include observations and descriptive notations, taking care to be objective and recording no opinions or subjective comments unless appropriate.
Recorded by	Include the signature of the individual responsible for the entries contained in the logbook and referenced forms.
Checked by	Include the signature of the individual who performs the review of the completed entries.

Recordkeeping, Sample Labeling, and Chain-of-Custody

Procedure 3-03

1.0 Purpose and Scope

1.1 The purpose of this standard operating procedure is to establish standard protocols for all field personnel for use in maintaining field and sampling activity records, writing sample logs, labeling samples, ensuring that proper sample custody procedures are utilized, and completing chain-of-custody/analytical request forms.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

Not applicable.

3.0 Terms and Definitions

3.1 Logbook

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person responsible for maintenance of the logbook, and the beginning and ending dates of the entries.

3.2 Chain-of-Custody

Chain-of-custody (COC) is documentation of the process of custody control. Custody control includes possession of a sample from the time of its collection in the field to its receipt by the analytical laboratory, and through analysis and storage prior to disposal.

4.0 Training and Qualifications

4.1 The **CTO Manager** is responsible for determining which team members shall record information in the field logbook and for checking sample logbooks and COC forms to ensure compliance with these procedures. The **CTO Manager** shall review COC forms on a monthly basis at a minimum.

4.2 The **CTO Manager** and **Program Quality Manager** are responsible for evaluating project compliance with the Project Procedures Manual.

4.3 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.4 The **Laboratory Project Manager** or **Sample Control Department Manager** is responsible for reporting any sample documentation or COC problems to the **CTO Manager** or **CTO Laboratory Coordinator** within 24 hours of sample receipt.

4.5 The **Field Manager** is responsible for ensuring that all **field personnel** follow these procedures. The **CTO Laboratory Coordinator** is responsible for verifying that the COC/analytical request forms have been completed properly and match the sampling and analysis plan. The **CTO Manager** or **CTO Laboratory Coordinator** is responsible for notifying the **laboratory**, **data managers**, and **data validators** in writing if analytical request changes are required as a corrective action. These small changes are different from change orders, which involve changes to the scope of the subcontract with the laboratory and must be made in accordance with a respective contract (e.g., CLEAN remedial action contract).

4.6 All **field personnel** are responsible for following these procedures while conducting sampling activities. **Field personnel** are responsible for recording pertinent data into the logbook to satisfy project requirements and for attesting to the accuracy of the entries by dated signature.

5.0 Procedure

This procedure provides standards for documenting field activities, labeling the samples, documenting sample custody, and completing COC/analytical request forms. The standards presented in this section shall be followed to ensure that samples collected are maintained for their intended purpose and that the conditions encountered during field activities are documented.

5.1 Recordkeeping

The field logbook serves as the primary record of field activities. Make entries chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct each day's events. Field logs such as soil boring logs and ground-water sampling logs will also be used. These procedures are described in Procedure 3-02, *Logbooks*.

5.2 Sample Labeling

Affix a sample label with adhesive backing to each individual sample container. Place clear tape over each label (preferably prior to sampling) to prevent the labels from tearing off, falling off, being smeared, and to prevent loss of information on the label. Record the following information with a waterproof marker on each label:

- Project name or number (optional);
- COC sample number;
- Date and time of collection;
- Sampler's initials;
- Matrix (optional);
- Sample preservatives (if applicable); and
- Analysis to be performed on sample (this shall be identified by the method number or name identified in the subcontract with the laboratory).

These labels may be obtained from the analytical laboratory or printed from a computer file onto adhesive labels.

5.3 Custody Procedures

For samples intended for chemical analysis, sample custody procedures shall be followed through collection, transfer, analysis, and disposal to ensure that the integrity of the samples is maintained. Maintain custody of samples in accordance with the U.S. Environmental Protection Agency (EPA) COC guidelines prescribed in EPA *NEIC Policies and Procedures*, National Enforcement Investigations Center, Denver, Colorado, revised May 1986; EPA *RCRA Ground Water Monitoring Technical Enforcement Guidance Document* (TEGD); *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA OSWER Directive 9355 3-01); Appendix 2 of the *Technical Guidance Manual for Solid Waste Water Quality Assessment Test (SWAT) Proposals and Reports*; and *Test Methods for Evaluating Solid Waste* (EPA SW-846)

A description of sample custody procedures is provided below.

5.3.1 Sample Collection Custody Procedures

According to the U.S. EPA guidelines, a sample is considered to be in custody if one of the following conditions is met:

- It is in one's actual physical possession or view;
- It is in one's physical possession and has not been tampered with (i.e., it is under lock or official seal);
- It is retained in a secured area with restricted access; and
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Place custody seals on sample containers immediately after sample collection and on shipping coolers if the cooler is to be removed from the sampler's custody. Place custody seals in such a manner that they must be broken to open the containers or coolers. Label the custody seals with the following information:

- Sampler's name or initials; and
- Date and time that the sample/cooler was sealed.

These seals are designed to enable detection of sample tampering. An example of a custody seal is shown in Attachment 1.

Field personnel shall also log individual samples onto COC forms (carbon copy or computer generated) when a sample is collected. These forms may also serve as the request for analyses. Procedures for completing these forms are discussed in Section 7.4, indicating sample identification number, matrix, date and time of collection, number of containers, analytical methods to be performed on the sample, and preservatives added (if any). The **samplers** will also sign the COC form signifying that they were the personnel who collected the samples. The COC form shall accompany the samples from the field to the laboratory. When a cooler is ready for shipment to the analytical laboratory, the **person delivering the samples for transport** will sign and indicate the date and time on the accompanying COC form. One copy of the COC form will be retained by the **sampler** and the remaining copies of the COC form shall be placed inside a self-sealing bag and taped to the inside of the cooler. Each cooler must be associated with a unique COC form. Whenever a transfer of custody takes place, **both parties** shall sign and date the accompanying carbon copy COC forms, and the **individual relinquishing the samples** shall retain a copy of each form. One exception is when the samples are shipped; the **delivery service personnel** will not sign or receive a copy because they do not open the coolers. The **laboratory** shall attach copies of the completed COC forms to the reports containing the results of the analytical tests. An example COC form is provided in Attachment 2.

5.3.2 Laboratory Custody Procedures

The following custody procedures are to be followed by an **independent laboratory** receiving samples for chemical analysis; the procedures in their Naval Facilities Engineering Service Center-evaluated Laboratory Quality Assurance Plan must follow these same procedures. A **designated sample custodian** shall take custody of all samples upon their arrival at the analytical laboratory. The **custodian** shall inspect all sample labels and COC forms to ensure that the information is consistent, and that each is properly completed. The **custodian** will also measure the temperature of the temperature blank in the coolers upon arrival using either a National Institute for Standards and Technology calibrated thermometer or an infra-red temperature gun. The **custodian** shall note the condition of the samples including:

- If the samples show signs of damage or tampering;
- If the containers are broken or leaking;
- If headspace is present in sample vials;
- If proper preservation of samples has occurred (made by pH measurement, except volatile organic compounds [VOCs] and purgeable total petroleum hydrocarbons [TPH] and temperature). The pH of VOC and purgeable TPH samples will be checked by the **laboratory analyst** after the sample aliquot has been removed from the vial for analysis; and
- If any sample holding times have been exceeded.

All of the above information shall be documented on a sample receipt sheet by the **custodian**.

Discrepancies or improper preservation shall be noted by the **laboratory** as an out-of-control event and shall be documented on an out-of-control form with corrective action taken. The out-of-control form shall be signed and dated by the **sample control custodian** and **any other persons** responsible for corrective action. An example of an out-of-control form is included as Attachment 4.

The **custodian** shall then assign a unique laboratory number to each sample and distribute the samples to secured storage areas maintained at 4 degrees Celsius (soil samples for VOC analysis are to be stored in a frozen state until analysis). The unique laboratory number for each sample, COC sample number, client name, date and time received, analysis due date, and storage shall also be manually logged onto a sample receipt record and later entered into the laboratory's computerized data management system. The **custodian** shall sign the shipping bill and maintain a copy.

Laboratory personnel shall be responsible for the care and custody of samples from the time of their receipt at the laboratory through their exhaustion or disposal. Samples should be logged in and out on internal laboratory COC forms each time they are removed from storage for extraction or analysis.

5.4 Completing COC/Analytical Request Forms

COC form/analytical request form completion procedures are crucial in properly transferring the custody and responsibility of samples from field personnel to the laboratory. This form is important for accurately and concisely requesting analyses for each sample; it is essentially a release order from the analysis subcontract.

Attachment 2 is an example of a generic COC/analytical request form that may be used by **field personnel**. Multiple copies may be tailored to each project so that much of the information described below need not be handwritten each time. Attachment 3 is an example of a completed site-specific COC/analytical request form, with box numbers identified and discussed in text below.

COC forms tailored to each CTO can be drafted and printed onto multi-ply forms. This eliminates the need to rewrite the analytical methods column headers each time. It also eliminates the need to write the project manager, name, and number; QC Level; TAT; and the same general comments each time.

Complete one COC form per cooler. Whenever possible, place all VOC analyte vials into one cooler in order to reduce the number of trip blanks. Complete all sections and be sure to sign and date the COC form. One copy of the COC form must remain with the field personnel.

Box 2 **Bill To:** List the name and address of the person/company to bill only if it is not in the subcontract with the laboratory.

Box 3 **Sample Disposal Instructions:** These instructions will be stated in the Master Service Agreement or each CTO statement of work with each laboratory.

Shipment Method: State the method of shipment (e.g., hand carry or air courier via FedEx or DHL).

Comments: This area shall be used by the field team to communicate observations, potential hazards, or limitations that may have occurred in the field or additional information regarding analysis (e.g., a specific metals list, samples expected to contain high analyte concentrations).

Box 4 **Cooler No.:** This will be written on the inside or outside of the cooler and shall be included on the COC. Some laboratories attach this number to the trip blank identification, which helps track samples for VOC analysis. If a number is not on the cooler, field personnel shall assign a number, write it on the cooler, and write it on the COC.

QC Level: Enter the reporting quality control (QC) requirements (e.g., Full Data Package, Summary Data Package).

Turnaround time (TAT): TAT will be determined by a sample delivery group (SDG), which may be formed over a 14-day period, not to exceed 20 samples. Once the SDG has been completed, standard TAT is 21 calendar days from receipt of the last sample in the SDG. Entering NORMAL or STANDARD in this field will be acceptable. If quicker TAT is required, it shall be in the subcontract with the laboratory and reiterated on each COC to remind the laboratory.

Box 5 **Type of Containers:** Write the type of container used (e.g., 1-liter glass amber, for a given parameter in that column).

Preservatives: Field personnel must indicate on the COC the correct preservative used for the analysis requested. Indicate the pH of the sample (if tested) in case there are buffering conditions found in the sample matrix.

Box 6 **Sample Identification (ID) Number:** This is typically a five-character alphanumeric identifier used by the contractor to identify samples. The use of this identifier is important since the laboratories are restricted to the number of characters they are able to use. Sample numbering shall be in accordance with the project-specific sampling and analysis plan.

Description (Sample ID): This name will be determined by the location and description of the sample, as described in the project-specific sampling and analysis plan. This sample identification should not be submitted to the laboratory, but should be left blank. If a computer COC version is used, the sample identification can be input, but printed with this block black. A cross-referenced list of the COC Sample Number and sample identification must be maintained separately.

Date Collected: Record the collection date in order to track the holding time of the sample. Note: For trip blanks, record the date it was placed in company with samples.

Time Collected: When collecting samples, record the time the sample is first collected. Use of the 24-hour military clock will avoid a.m. or p.m. designations (e.g., 1815 instead of 6:15 p.m.). Record local time; the laboratory is responsible for calculating holding times to local time.

Lab ID: This is for laboratory use only.

Box 7 **Matrix/QC:** Identify the matrix (e.g., water, soil, air, tissue, fresh water sediment, marine sediment, or product). If a sample is expected to contain high analyte concentrations (e.g., a tank bottom sludge or distinct product layer), notify the laboratory in the comment section. Mark an "X" for the sample(s) that have extra volume for laboratory QC matrix spike/matrix spike duplicate (MS/MSD) purposes. The sample provided for MS/MSD purposes is usually a field duplicate.

Box 8 **Analytical Parameters:** Enter the parameter by descriptor and the method number desired (e.g., BTEX 8260B, PAHs 8270C, etc.). Whenever practicable, list the parameters as they appear in the laboratory subcontract to maintain consistency and avoid confusion.

If the COC does not have a specific box for number of sample containers, use the boxes below the analytical parameter, to indicate the number of containers collected for each parameter.

Box 9 **Sampler's Signature:** The person who collected samples must sign here.

Relinquished By: The person who turned over the custody of the samples to a second party other than an express mail carrier, such as FedEx or DHL, must sign and date here.

Received By: Typically, a representative of the receiving laboratory signs and dates here. Or, a field crew member who delivered the samples in person from the field to the laboratory might sign here. A courier, such as FedEx or DHL, does not sign here because they do not open the coolers. It must also be used by the prime contracting laboratory when samples are to be sent to a subcontractor.

Relinquished By: In the case of subcontracting, the primary laboratory will sign and date the Relinquished By space and fill out an additional COC to accompany the samples being subcontracted.

Received By (Laboratory): This space is for the final destination (e.g., at a subcontracted laboratory). A representative of the final destination (e.g., subcontracted laboratory) must sign and date here.

Box 10 **Lab No. and Questions:** This box is to be filled in by the laboratory only.

Box 11 **Control Number:** This number is the "COC" followed by the first contractor identification number in that cooler, or contained on that COC. This control number must be unique (i.e., never used twice). Record the date the COC is completed. It should be the same date the samples are collected.

Box 12 **Total # of Containers:** Sum the number of containers in that row.

Box 13 **Totals:** Sum the number of containers in each column. Because COC forms contain different formats depending on who produced the form, not all of the information listed in items 1 to 13 may be recorded; however, as much of this information as possible shall be included.

6.0 Quality Control and Assurance

6.1 Recordkeeping, sample labeling, and chain-of-custody activities must incorporate quality control measures to ensure accuracy and completeness.

6.2 Deviations from this procedure or the project-specific CTO work plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

7.0 Records, Data Analysis, Calculations

7.1 The COC/analytical request form shall be faxed approximately daily to the **CTO Laboratory Coordinator** for verification of accuracy. Following the completion of sampling activities, the sample logbook and COC forms will be transmitted to the **CTO Manager** for storage in project files. The **data validators** shall receive a copy also. The original COC/analytical request form shall be submitted by the **laboratory** along with the data delivered. Any changes to the analytical requests that are required shall be made in writing to the laboratory. A copy of this written change shall be sent to the data validators and placed in the project files. The reason for the change shall be included in the project files so that recurring problems can be easily identified.

7.2 Deviations from this procedure or the project-specific sampling and analysis plan shall be documented in the records. Significant changes shall be approved by the **Program Quality Manager**.

8.0 Attachments or References

8.1 Attachment 1 – Chain-of-Custody Seal

8.2 Attachment 2 – Generic Chain-of-Custody/Analytical Request Form

8.3 Attachment 3 – Sample Completed Chain-of-Custody

8.4 Attachment 4 – Sample Out-of-Control Form

8.5 Environmental Protection Agency, United States (EPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* Interim Final. EPA/540/G-89/004. Office of Emergency and Remedial Response. October.

8.6 EPA. 1992. *RCRA Groundwater Monitoring Draft Technical Guidance*. EPA/530/R-93/001. Office of Solid Waste. November.

8.7 EPA. 1997. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846. 3rd ed., Final Update IIIA. Office of Solid Waste.

8.8 Water Resources Control Board, State of California. 1988. *Technical Guidance Manual for Solid Waste Water Quality Assessment Test (SWAT) Proposals and Reports*. August.

8.9 Procedure 3-02, *Logbooks.*

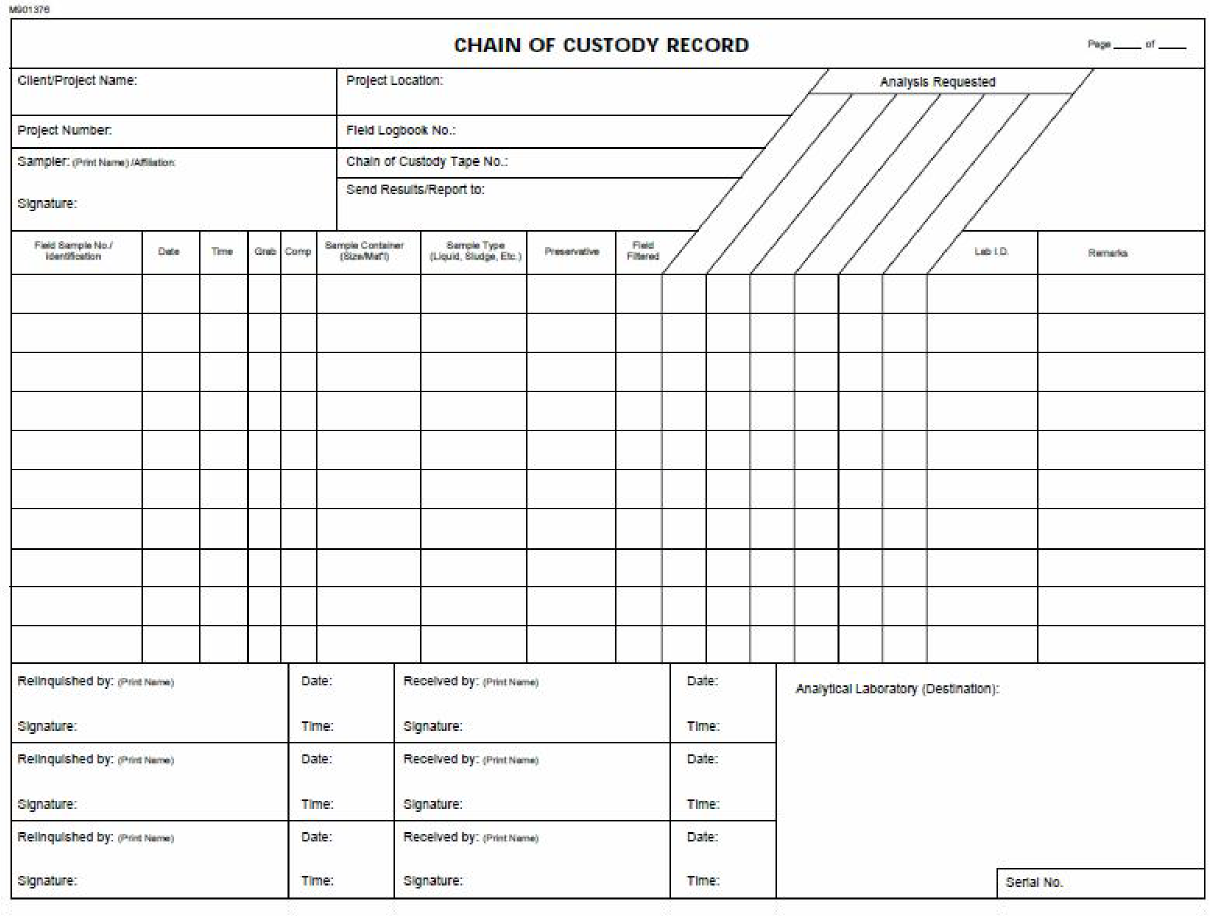
Author	Reviewer	Revisions (Technical or Editorial)
Mark Kromis Program Chemist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue

Attachment 1
Chain-of-Custody Seal

CHAIN-OF-CUSTODY SEAL

[LABORATORY]	SAMPLE NO.	DATE	SEAL BROKEN BY
	SIGNATURE		DATE
	PRINT NAME AND TITLE *(Inspector, Analyst or Technician*		

Attachment 2
Generic Chain-of-Custody / Analytical Request Form



M901376

CHAIN OF COUSTODY RECORD

Page ____ of ____

Client/Project Name:

Project Location:

Project Number:

Field Logbook No.:

Sampler: (Print Name) /Affiliation:

Signature:

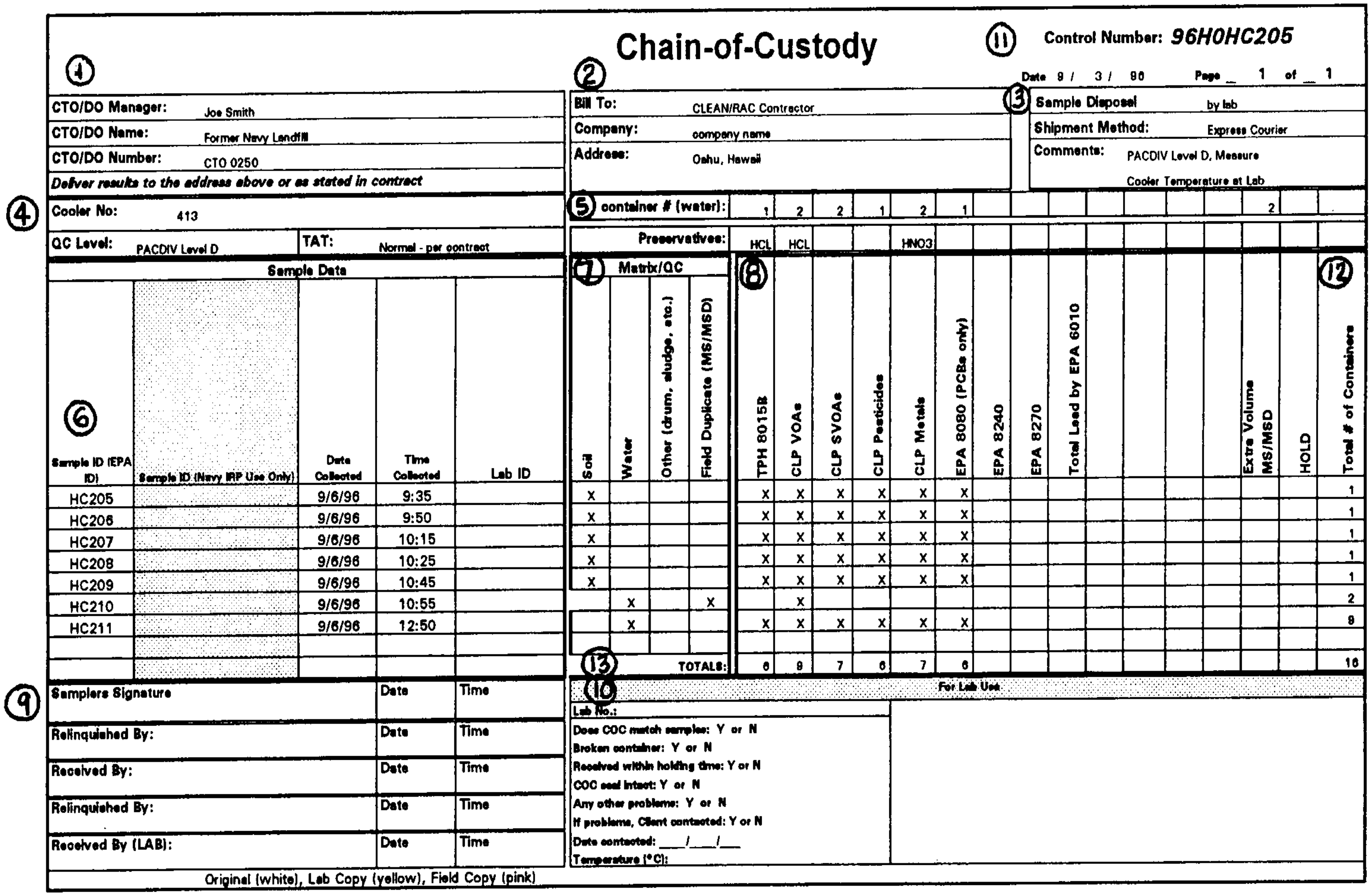
Chain of Custody Tape No.:

Send Results/Report to:

Field Sample No./ Identification	Date	Time	Grab	Comp	Sample Container (Size/Mat'l)	Sample Type (Liquid, Sludge, Etc.)	Preservative	Field Filtered	Analysis Requested						Lab I.D.	Remarks

Relinquished by: (Print Name) Signature:	Date: Time:	Received by: (Print Name) Signature:	Date: Time:	Analytical Laboratory (Destination):
Relinquished by: (Print Name) Signature:	Date: Time:	Received by: (Print Name) Signature:	Date: Time:	
Relinquished by: (Print Name) Signature:	Date: Time:	Received by: (Print Name) Signature:	Date: Time:	Serial No.

Attachment 3
Sample Completed Chain-of-Custody



Chain-of-Custody

⑪ **Control Number:** 96H0HC205

Date 9 / 3 / 96 **Page** 1 **of** 1

①

CTO/DO Manager: Joe Smith
CTO/DO Name: Former Navy Landfill
CTO/DO Number: CTO 0250
Deliver results to the address above or as stated in contract

④ **Cooler No:** 413
QC Level: PACDIV Level D **TAT:** Normal - per contract

② **Bill To:** CLEAN/RAC Contractor
Company: company name
Address: Oahu, Hawaii

③ **Sample Disposal** by lab
Shipment Method: Express Courier
Comments: PACDIV Level D, Measure Cooler Temperature at Lab

Sample Data ⑥ | ⑦ **Matrix/QC** | ⑧ | ⑫

Sample ID (EPA ID)	Sample ID (Navy IRP Use Only)	Date Collected	Time Collected	Lab ID	Soil	Water	Other (drum, sludge, etc.)	Field Duplicate (MS/MSD)	TPH 8015B	CLP VOAs	CLP SVOAs	CLP Pesticides	CLP Metals	EPA 8080 (PCBs only)	EPA 8240	EPA 8270	Total Lead by EPA 6010					Extra Volume MS/MSD	HOLD	Total # of Containers
⑤ container # (water):									1	2	2	1	2	1								2		
Preservatives:									HCL	HCL			HNO3											
HC205		9/6/96	9:35		X				X	X	X	X	X	X										1
HC206		9/6/96	9:50		X				X	X	X	X	X	X										1
HC207		9/6/96	10:15		X				X	X	X	X	X	X										1
HC208		9/6/96	10:25		X				X	X	X	X	X	X										1
HC209		9/6/96	10:45		X				X	X	X	X	X	X										1
HC210		9/6/96	10:55			X		X		X														2
HC211		9/6/96	12:50			X			X	X	X	X	X	X										9
					⑬			TOTALS:	6	9	7	6	7	6										16

⑨	Date	Time
Samplers Signature		
Relinquished By:		
Received By:		
Relinquished By:		
Received By (LAB):		

Original (white), Lab Copy (yellow), Field Copy (pink)

⑩ **For Lab Use**

Lab No.:
Does COC match samples: Y or N
Broken container: Y or N
Received within holding time: Y or N
COC seal intact: Y or N
Any other problems: Y or N
If problems, Client contacted: Y or N
Date contacted: ___/___/___
Temperature (°C):

Attachment 4
Sample Out-of-Control Form

OUT OF CONTROL FORM	Status	Date	Initial
	Noted OOC		
	Submit for CA*		
	Resubmit for CA*		
	Completed		

Date Recognized:		By:	
Dated Occurred:		Matrix	
Parameter (Test Code):		Method:	
Analyst:		Supervisor:	
1. Type of Event (Check all that apply)		2. Corrective Action (CA)* (Check all that apply)	
☐	Calibration Corr. Coefficient <0.995	☐	Repeat calibration
☐	%RSD>20%	☐	Made new standards
☐	Blank >MDL	☐	Reran analysis
☐	Does not meet criteria:	☐	Sample(s) redigested and rerun
☐	Spike	☐	Sample(s) reextracted and rerun
☐	Duplicate	☐	Recalculated
☐	LCS	☐	Cleaned system
☐	Calibration Verification	☐	Ran standard additions
☐	Standard Additions	☐	Notified
☐	MS/MSD	☐	Other (please explain)
☐	BS/BSD		
☐	Surrogate Recovery		
☐	Calculations Error		
☐	Holding Times Missed		
☐	Other (Please explain	Comments:	

Samples Affected (List by Accession AND Sample No.)

3. Results of Corrective Action	
☐	Return to Control (indicated with)
☐	Corrective Actions Not Successful - DATA IS TO BE FLAGGED with _____________.

Analyst:	Date:
Supervisor:	Date:
QA Department:	Date:

Sample Handling, Storage, and Shipping

Procedure 3-04

1.0 Purpose and Scope

1.1 This standard operating procedure describes the actions to be used by personnel engaged in handling, storing, and transporting samples. The objective is to obtain samples of actual conditions with as little alteration as possible.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 Avoid lifting heavy coolers with back muscles; instead, use leg muscles or dollies.

2.2 Wear proper gloves, such as blue nitrile and latex, as defined in the project-specific health and safety plan, when handling sample containers to avoid contacting any materials that may have spilled out of the sample containers.

3.0 Terms and Definitions

None.

4.0 Training and Qualifications

4.1 The **Contract Task Order (CTO) Manager** and the **Laboratory Project Manager** are responsible for identifying instances of non-compliance with this procedure and ensuring that future sample transport activities comply with this procedure.

4.2 The **Field Manager** is responsible for ensuring that all samples are shipped according to this procedure.

4.3 **Field personnel** are responsible for the implementation of this procedure.

4.4 The **Program Quality Manager** is responsible for ensuring that sample handling, storage, and transport activities conducted during all CTOs comply with this procedure.

4.5 All **field personnel** are responsible for the implementation of this procedure.

5.0 Procedure

5.1 Handling and Storage

Immediately following collection, label all samples according to Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*. The lids of the containers shall not be sealed with duct tape, but may be covered with custody seals or placed directly into self-sealing bags. Place the sample containers in an insulated cooler with frozen gel packs (e.g., “blue ice”) or ice in double, sealed self-sealing bags. Samples should occupy the lower portion of the cooler, while the ice should occupy the upper portion. Place an absorbent material (e.g., proper absorbent cloth material) on the bottom of the cooler to contain liquids in case of spillage. Fill all empty space between sample containers with Styrofoam® “peanuts” or other appropriate material. Prior to shipping, wrap glass sample containers on the sides, tops, and bottoms with bubble wrap or other appropriate padding and/or surround them in Styrofoam to prevent breakage during transport. Pack all glass containers for water samples in an upright position, never stacked or on their sides. Prior to shipment, replace the ice or cold packs in the coolers so that samples will be maintained as close to 4 degrees Celsius (°C) as possible from the time of collection through transport to the analytical laboratory. Ship samples within 24 hours or on a schedule allowing the laboratory to meet holding times for analyses. The procedures for maintaining sample temperatures at 4°C pertain to all field samples.

5.2 Shipping

Follow all appropriate U.S. Department of Transportation regulations (e.g., 49 Code of Federal Regulations [CFR], Parts 171-179) for shipment of air, soil, water, and other samples. Elements of these procedures are summarized below.

5.2.1 Hazardous Materials Shipment

Field personnel must state whether any sample is suspected to be a hazardous material. A sample should be assumed hazardous unless enough evidence exists to indicate it is non-hazardous. If not suspected to be hazardous, shipments may be made as described in the Section 7.2.2 for non-hazardous materials. If hazardous, follow the procedures summarized below.

Any substance or material that is capable of posing an unreasonable risk to life, health, or property when transported is classified as hazardous. Perform hazardous materials identification by checking the list of dangerous goods for that particular mode of transportation. If not on that list, materials can be classified by checking the Hazardous Materials Table (49 CFR 172.102 including Appendix A) or by determining if the material meets the definition of any hazard class or division (49 CFR Part 173), as listed in Attachment 2.

All **persons shipping hazardous materials** <u>must</u> be properly trained in the appropriate regulations, as required by HM-126F, Training for Safe Transportation of Hazardous Materials (49 CFR HM-126F Subpart H). The training covers loading, unloading, handling, storing, and transporting of hazardous materials, as well as emergency preparedness in the case of accidents. **Carriers**, such as commercial couriers, must also be trained. Modes of shipment include air, highway, rail, and water.

When shipping hazardous materials, including bulk chemicals or samples suspected of being hazardous, the proper shipping papers (49 CFR 172 Subpart C), package marking (49 CFR 172 Subpart D), labeling (49 CFR 172 Subpart E), placarding (49 CFR 172 Subpart F, generally for carriers), and packaging must be used. Attachment 1 shows an example of proper package markings. Refer to a copy of 49 CFR each time hazardous materials/potentially hazardous samples are shipped.

According to Section 2.7 of the International Air Transport Association Dangerous Goods Regulations publication, very small quantities of certain dangerous goods may be transported without certain marking and documentation requirements as described in 49 CFR Part 172; however, other labeling and packing requirements must still be followed. Attachment 2 shows the volume or weight for different classes of substances. A “Dangerous Goods in Excepted Quantities” label must be completed and attached to the associated shipping cooler (Attachment 3). Certain dangerous goods are not allowed on certain airlines in any quantity.

As stated in item 4 of Attachment 4, the Hazardous Materials Regulations do not apply to hydrochloric acid (HCl), nitric acid (HNO_3), sulfuric acid (H_2SO_4), and sodium hydroxide (NaOH) added to water samples if their pH or percentage by weight criteria is met. These samples may be shipped as non-hazardous materials as discussed below.

5.2.2 Non-Hazardous Materials Shipment

If the samples are suspected to be non-hazardous based on previous site sample results, field screening results, or visual observations, if applicable, then samples may be shipped as non-hazardous.

When a cooler is ready for shipment to the laboratory, place two copies of the chain-of-custody form inside a self-sealing bag and tape it to the inside of the insulated cooler. Then, seal the cooler with waterproof tape and label it with “Fragile,” “This-End-Up” (or directional arrows pointing up), or other appropriate notices. Place chain-of-custody seals on the coolers as discussed in Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*.

5.2.3 Shipments from Outside the Continental United States

Shipment of sample coolers to the United States from locations outside the continental United States is controlled by the U.S. Department of Agriculture (USDA) and is subject to their inspection and regulation. A “USDA Soil Import Permit” is required to prove that the receiving analytical laboratory is certified by the USDA to receive and properly dispose of soil. In addition, all sample coolers must be inspected by a **USDA representative**, affixed with a label indicating that the coolers contain environmental samples, and accompanied by shipping forms stamped by the **USDA inspector** prior to shipment.

In addition, the U.S. Customs Service must clear samples shipped from U.S. territorial possessions or foreign countries upon entry into the United States. As long as the commercial invoice is properly completed (see below), shipments typically pass through U.S. Customs Service without the need to open coolers for inspection.

Completion and use of proper paperwork will, in most cases, minimize or eliminate the need for the USDA and U.S. Customs Service to inspect the contents. Attachment 5 shows an example of how paperwork may be placed on the outside of coolers for non-hazardous materials. For hazardous materials, refer to Section 7.2.1.

In summary, tape the paperwork listed below to the outside of the coolers to accompany sample shipments. If a shipment is made up of multiple pieces (e.g., more than one cooler), the paperwork need only be attached to one cooler, provided that the **courier** agrees. All other coolers in the shipment need only to be taped and have the address and chain-of-custody seals affixed.

1. **Courier Shipping Form & Commercial Invoice:** See Attachment 6 and Attachment 7 for examples of the information to be included on the commercial invoices for soil and water, respectively. Place the courier shipping form and commercial invoice inside a clear, plastic, adhesive-backed pouch that adheres to the package (typically supplied by the courier) and place it on the cooler lid as shown in Attachment 5.
2. **Soil Import Permit (soil only):** See Attachment 8 and Attachment 9 for examples of the soil import permit and soil samples restricted entry labels, respectively. The **laboratory** shall supply these documents prior to mobilization. The USDA often stops shipments of soil without these documents. Staple together the 2-inch × 2-inch USDA label (described below) and soil import permit, and place them inside a clear plastic pouch. The **courier** typically supplies the clear, plastic, adhesive-backed pouches that adhere to the package.

   Placing one restricted entry label as shown in Attachment 5 (covered with clear packing tape) and one stapled to the actual permit is suggested.

   The USDA does not control water samples, so the requirements for soil listed above do not apply.
3. **Chain-of-Custody Seals:** The **laboratory** should supply the seals. **CTO personnel** must sign and date these. At least two seals should be placed in such a manner that they stick to both the cooler lid and body. Placing the seals over the tape (as shown in Attachment 5), then covering it with clear packing tape is suggested. This prevents the seal from coming loose and enables detection of tampering.
4. **Address Label:** Affix a label stating the destination (laboratory address) to each cooler.
5. **Special Requirements for Hazardous Materials:** See Section 7.2.1.

Upon receipt of sample coolers at the laboratory, the **sample custodian** shall inspect the sample containers as discussed in Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*. The samples shall then be immediately extracted and/or analyzed, or stored in a refrigerated storage area until they are removed for extraction and/or analysis. Whenever the samples are not being extracted or analyzed, they shall be returned to refrigerated storage.

6.0 Quality Control and Assurance

6.1 Sample handling, storage, and shipping must incorporate quality control measures to ensure conformance to these and the project requirements.

7.0 Records, Data Analysis, Calculations

7.1 Maintain records as required by implementing these procedures.

7.2 Deviations from this procedure or the project-specific sampling and analysis plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

8.0 Attachments or Reference

8.1 Attachment 1 – Example Hazardous Material Package Marking

8.2 Attachment 2 – Packing Groups

8.3 Attachment 3 – Label for Dangerous Goods in Excepted Quantities

8.4 Attachment 4 – SW-846 Preservative Exception

8.5 Attachment 5 – Non-Hazardous Material Cooler Marking Figure for Shipment from Outside the Continental United States

8.6 Attachment 6 – Commercial Invoice – Soil

8.7 Attachment 7 – Commercial Invoice – Water

8.8 Attachment 8 – Soil Import Permit

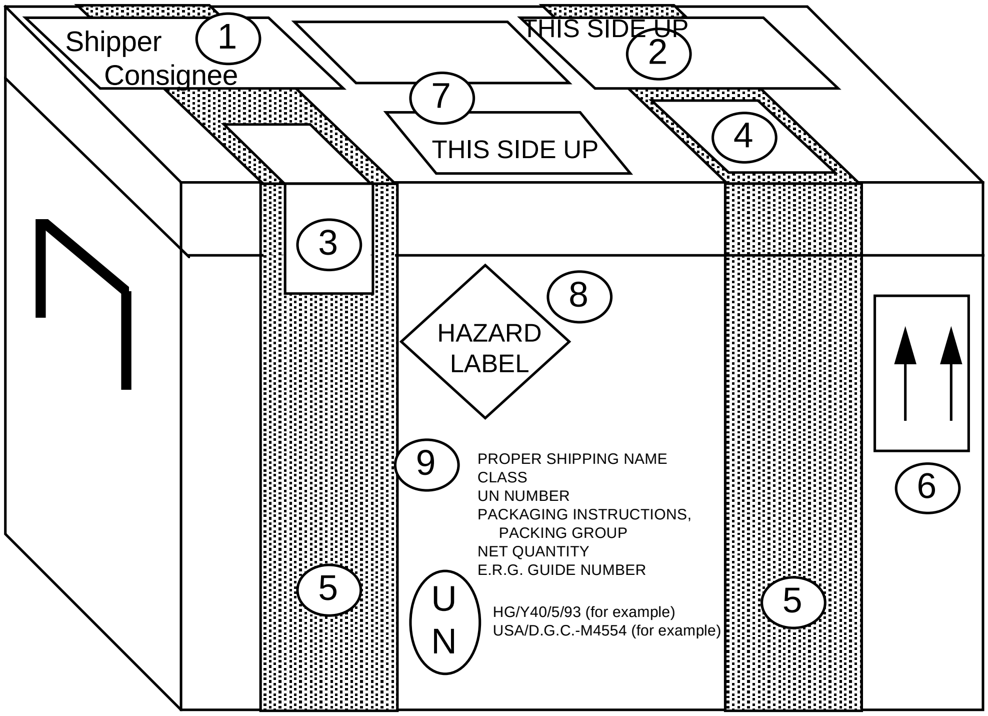
8.9 Attachment 9 – Soil Samples Restricted Entry Labels

8.10 NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.

8.11 Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*.

Author	Reviewer	Revisions (Technical or Editorial)
Mark Kromis Program Chemist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue

Attachment 1
Example Hazardous Material Package Marking



① **AIR BILL/COMMERCIAL INVOICE**

② **USDA PERMIT (Letter to Laboratory from USDA)**

③ **CUSTODY SEAL**

④ **USDA 2" X 2" SOIL IMPORT PERMIT**

⑤ **WATERPROOF STRAPPING TAPE**

⑥ **DIRECTION ARROWS STICKER - TWO REQUIRED**

⑦ **THIS SIDE UP STICKERS**

⑧ **HAZARD LABEL**

⑨ **HAZARDOUS MATERIAL INFORMATION**

⑩ **PACKAGE SPECIFICATIONS**

Attachment 2
Packing Groups

PACKING GROUP OF THE SUBSTANCE	PACKING GROUP 1		PACKING GROUP II		PACKING GROUP III	
CLASS or DIVISION of PRIMARY or SUBSIDIARY RISK	Packagings		Packagings		Packagings	
	Inner	Outer	Inner	Outer	Inner	Outer
1: Explosives	---------------------------- Forbidden (Note A) ----------------------------------					
2.1: Flammable Gas	---------------------------- Forbidden (Note B) ----------------------------------					
2.2: Non-Flammable, non-toxic gas	---------------------------- See Notes A and B ----------------------------------					
2.3: Toxic gas	---------------------------- Forbidden (Note A) ----------------------------------					
3. Flammable liquid	30 mL	300 mL	30 mL	500 mL	30 mL	1 L
4.1 Self-reactive substances	Forbidden		Forbidden		Forbidden	
4.1: Other flammable solids	Forbidden		30 g	500 g	30 g	1 kg
4.2: Pyrophoric substances	Forbidden		Not Applicable		Not Applicable	
4.2 Spontaneously combustible substances	Not Applicable		30 g	500 g	30 g	1 kg
4.3: Water reactive substances	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
5.1: Oxidizers	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
5.2: Organic peroxides (Note C)	See Note A		30 g or 30 mL	500 g or 250 mL	Not Applicable	
6.1: Poisons - Inhalation toxicity	Forbidden		1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.1: Poisons - oral toxicity	1 g or 1 mL	300 g or 300 mL	1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.1: Poisons - dermal toxicity	1 g or 1 mL	300 g or 300 mL	1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.2: Infectious substances	---------------------------- Forbidden (Note A) ----------------------------------					
7: Radioactive material (Note D)	---------------------------- Forbidden (Note A) ----------------------------------					
8: Corrosive materials	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
9: Magnetized materials	---------------------------- Forbidden (Note A) ----------------------------------					
9: Other miscellaneous materials (Note E)	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L

Note A: *Packing groups are not used for this class or division.*
Note B: *For inner packagings, the quantity contained in receptacle with a water capacity of 30 mL. For outer packagings, the sum of the water capacities of all the inner packagings contained must not exceed 1 L.*
Note C: *Applies only to Organic Peroxides when contained in a chemical kit, first aid kit or polyester resin kit.*
Note D: *See 6.1.4.1, 6.1.4.2, and 6.2.1.1 through 6.2.1.7, radioactive material in excepted packages.*
Note E: *For substances in Class 9 for which no packing group is indicated in the List of Dangerous Goods, Packing Group II quantities must be used.*

Attachment 3
Dangerous Goods in Excepted Quantities

DANGEROUS GOODS IN EXCEPTED QUANTITIES

This package contains dangerous goods in excepted small quantities and is in all respects in compliance with the applicable international and national government regulations and the IATA Dangerous Goods Regulations.

____
Signature of Shipper

______________________ ____________________
Title Date

____

____
Name and address of Shipper

This package contains substance(s) in Class(es)
(check applicable box(es))

Class:	2	3	4	5	6	8	9
	☐	☐	☐	☐	☐	☐	☐

and the applicable UN Numbers are:

Attachment 4
SW-846 Preservative Exception

Measurement	Vol. Req. (mL)	Container[2]	Preservative[3,4]	Holding Time[5]
MBAS	250	P, G	Cool, 4ºC	48 Hours
NTA	50	P, G	Cool, 4ºC	24 Hours

1. More specific instructions for preservation and sampling are found with each procedure as detailed in this manual. A general discussion on sampling water and industrial wastewater may be found in ASTM, Part 31, p. 72-82 (1976) Method D-3370.

2. Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.

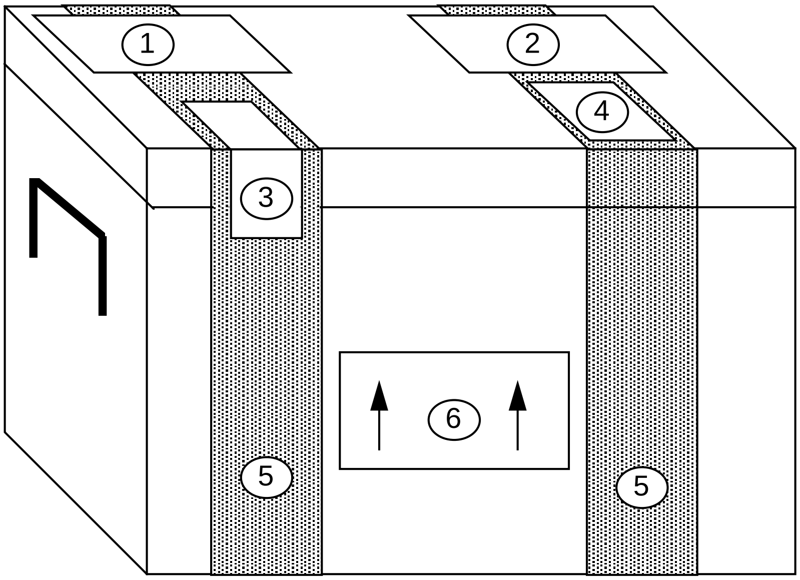
3. Sample preservation should be performed immediately upon sample collection. For composite samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4ºC until compositing and sample splitting is completed.

4. When any sample is to be shipped by common carrier or sent through the United States Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. for the preservation requirements of Table 1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentration of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

5. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of sample under study are stable for the longer time, and has received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.

6. Should only be used in the presence of residual chlorine.

Attachment 5
Non-Hazardous Material Cooler Marking Figure for Shipment from Outside the Continental United States



① **AIR BILL/COMMERCIAL INVOICE**
② **USDA PERMIT (Letter to Laboratory from USDA)**
③ **CUSTODY SEAL**
④ **USDA 2" X 2" SOIL IMPORT PERMIT**
⑤ **WATERPROOF STRAPPING TAPE**
⑥ **DIRECTION ARROWS STICKER - TWO REQUIRED**

Attachment 6
Commercial Invoice – Soil

DATE OF EXPORTATION 1/1/94	EXPORT REFERENCES (i.e., order no., invoice no., etc.) <CTO #>
SHIPPER/EXPORTER (complete name and address) Joe Smith Ogden c/o <hotel name> <hotel address>	CONSIGNEE Sample Receipt <Lab Name> <Lab Address>
COUNTRY OF EXPORT Guam, USA	IMPORTER - IF OTHER THAN CONSIGNEE
COUNTRY OF ORIGIN OF GOODS Guam, USA	
COUNTRY OF ULTIMATE DESTINATION USA	

INTERNATIONAL
AIR WAYBILL NO.

(NOTE: All shipments must be accompanied by a Federal Express International Air Waybill)

MARKS/NOS	NO. OF PKGS	TYPE OF PACKAGING	FULL DESCRIPTION OF GOODS	QTY	UNIT OF MEASURE	WEIGHT	UNIT VALUE	TOTAL VALUE
	3	cooler	Soil samples for laboratory analy				$1.00	$3.00
	TOTAL NO. OF PKGS.					TOTAL WEIGHT		TOTAL INVOICE VALUE
	3							$3.00
								Check one ☐ F.O.B. ☐ C&F ☐ C.I.F.

THESE COMMODITIES ARE LICENSED FOR THE ULTIMATE DESTINATION SHOWN.

DIVERSION CONTRARY TO UNITED STATES LAW IS PROHIBITED.

I DECLARE ALL THE INFORMATION CONTAINED IN THIS INVOICE TO BE TRUE AND CORRECT

SIGNATURE OF SHIPPER/EXPORTER (Type name and title and sign)

Name/Title	Signature	Date
Joe Smith, Ogden	Joe Smith	1/1/94

Attachment 7
Commercial Invoice – Water

DATE OF EXPORTATION 1/1/94	EXPORT REFERENCES (i.e., order no., invoice no., etc.) <CTO #>
SHIPPER/EXPORTER (complete name and address) Joe Smith Ogden c/o <hotel name> <hotel address>	CONSIGNEE Sample Receipt <Lab Name> <Lab Address>
COUNTRY OF EXPORT Guam, USA	IMPORTER - IF OTHER THAN CONSIGNEE
COUNTRY OF ORIGIN OF GOODS Guam, USA	
COUNTRY OF ULTIMATE DESTINATION USA	

INTERNATIONAL AIR WAYBILL NO.		(NOTE: All shipments must be accompanied by a Federal Express International Air Waybill)

MARKS/NOS	NO. OF PKGS	TYPE OF PACKAGING	FULL DESCRIPTION OF GOODS	QTY	UNIT OF MEASURE	WEIGHT	UNIT VALUE	TOTAL VALUE
	3	coolers	Water samples for labo analysis only				$1.00	$3.00
	TOTAL NO. OF PKGS.					TOTAL WEIGHT		TOTAL INVOICE VALUE
	3							$3.00

Check one
- ☐ F.O.B.
- ☐ C&F
- ☐ C.I.F.

THESE COMMODITIES ARE LICENSED FOR THE ULTIMATE DESTINATION SHOWN.

DIVERSION CONTRARY TO UNITED STATES LAW IS PROHIBITED.

I DECLARE ALL THE INFORMATION CONTAINED IN THIS INVOICE TO BE TRUE AND CORRECT

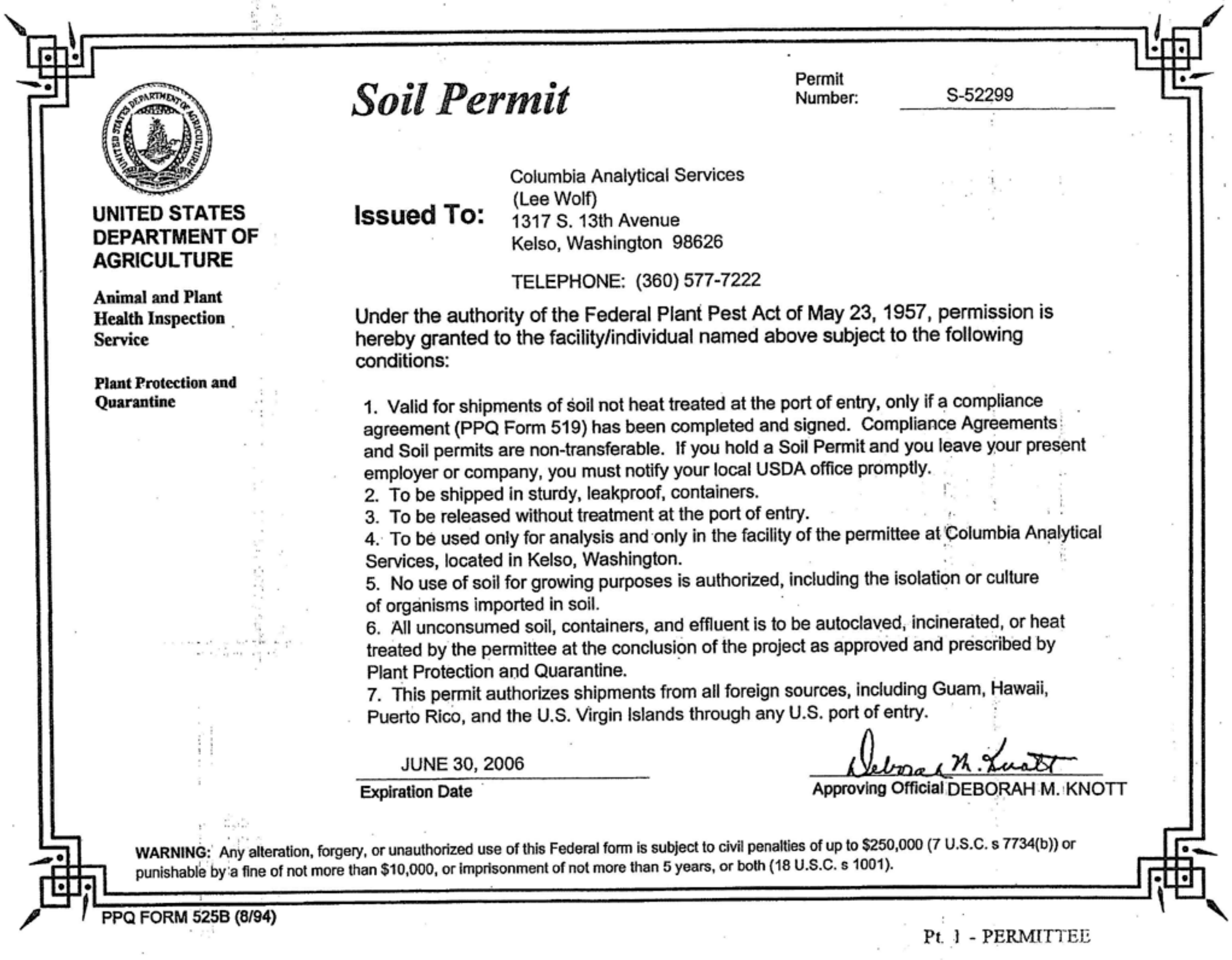
SIGNATURE OF SHIPPER/EXPORTER (Type name and title and sign)

Joe Smith, Ogden

Joe Smith

1/1/94

Attachment 8
Soil Import Permit



UNITED STATES DEPARTMENT OF AGRICULTURE

Animal and Plant Health Inspection Service

Plant Protection and Quarantine

Soil Permit

Permit Number: S-52299

Issued To:

Columbia Analytical Services
(Lee Wolf)
1317 S. 13th Avenue
Kelso, Washington 98626

TELEPHONE: (360) 577-7222

Under the authority of the Federal Plant Pest Act of May 23, 1957, permission is hereby granted to the facility/individual named above subject to the following conditions:

1. Valid for shipments of soil not heat treated at the port of entry, only if a compliance agreement (PPQ Form 519) has been completed and signed. Compliance Agreements and Soil permits are non-transferable. If you hold a Soil Permit and you leave your present employer or company, you must notify your local USDA office promptly.
2. To be shipped in sturdy, leakproof, containers.
3. To be released without treatment at the port of entry.
4. To be used only for analysis and only in the facility of the permittee at Columbia Analytical Services, located in Kelso, Washington.
5. No use of soil for growing purposes is authorized, including the isolation or culture of organisms imported in soil.
6. All unconsumed soil, containers, and effluent is to be autoclaved, incinerated, or heat treated by the permittee at the conclusion of the project as approved and prescribed by Plant Protection and Quarantine.
7. This permit authorizes shipments from all foreign sources, including Guam, Hawaii, Puerto Rico, and the U.S. Virgin Islands through any U.S. port of entry.

JUNE 30, 2006
Expiration Date

Deborah M. Knott
Approving Official DEBORAH M. KNOTT

WARNING: Any alteration, forgery, or unauthorized use of this Federal form is subject to civil penalties of up to $250,000 (7 U.S.C. s 7734(b)) or punishable by a fine of not more than $10,000, or imprisonment of not more than 5 years, or both (18 U.S.C. s 1001).

PPQ FORM 525B (8/94)

Pt. 1 - PERMITTEE

Attachment 9
Soil Samples Restricted Entry Labels

U.S. DEPARTMENT OF AGRICULTURE

ANIMAL AND PLANT HEALTH INSPECTION SERVICE

PLANT PROTECTION AND QUARANTINE

HYATTSVILLE, MARYLAND 20782

SOIL SAMPLES

RESTRICTED ENTRY

The material contained in this package is imported under authority of the Federal Plant Pest Act of May 23, 1957.

For release without treatment if addressee is currently listed as approved by Plant Protection and Quarantine.

PPQ FORM 550 *Edition of 12/77 may be used*

(JAN 83)

Monitoring Well Installation

Procedure 3-12

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the methods to be used during the installation of groundwater monitoring wells. It describes the components of monitoring well design and installation and sets forth the rationale for use of various well installation techniques in specific situations.

1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

2.0 Safety

2.1 The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the project Health and Safety Plan (HASP). In the absence of a HASP, work will be conducted according to the Contract Task Order (CTO) Work Plan (WP) and/or direction from the **Site Safety Officer (SSO)**.

2.2 Before well installation commences, appropriate entities (e.g. DigSafe, local public works departments, company facilities) must be contacted to assure the anticipated well locations are marked for utilities, including electrical, telecommunications, water, sewer, and gas.

2.3 Physical Hazards Associated with Well Installation

- Stay clear of all moving equipment and avoid wearing loose fitting clothing.
- When using an approved retractable-blade knife, always cut away from one self and make sure there are no other people in the cutting path or the retractable-blade knife.
- To avoid slip/trip/fall conditions during drilling activities, keep the area clear of excess soil cuttings and groundwater. Use textured boots/boot cover bottoms in muddy areas.
- To avoid heat/cold stress as a result of exposure to extreme temperatures and personal protective equipment (PPE), drink electrolyte replacement fluids (1 to 2 cups per hour is recommended) and, in cases of extreme cold, wear fitted insulating clothing.
- To avoid hazards associated with subsurface utilities, ensure all sampling locations have been properly surveyed as described in SOP 3-01, Utility Clearance.
- Be aware of restricted mobility caused by PPE.

3.0 Terms and Definitions

3.1 **Annulus:** The annulus is the down-hole space between the borehole wall and the well casing and screen.

3.2 **Bridge:** A bridge is an obstruction in the drill hole or annulus. A bridge is usually formed by caving of the wall of the well bore, by the intrusion of a large boulder, or by the placement of filter pack materials during well completion. Bridging can also occur in the formation during well development.

3.3 **Filter Pack:** Filter pack is sand or gravel that is smooth, uniform, clean, well-rounded, and siliceous. It is placed in the annulus of the well between the borehole wall and the well screen to prevent formation materials from entering the well and to stabilize the adjacent formation.

3.4 **Grout:** Grout is a fluid mixture of cement and water that can be forced through a tremie pipe and emplaced in the annular space between the borehole and casing to form an impermeable seal. Various additives, such as sand, bentonite, and polymers, may be included in the mixture to meet certain requirements.

3.5 **Heaving (Running) Sands:** Loose sands in a confined water-bearing zone or aquifer which tend to rise up into the drill stem when the confining unit is breached by the drill bit. Heaving sands occur when the water in the aquifer has a pressure head great enough to cause upward flow into the drill stem with enough velocity to overcome the weight of the sand.

3.6 **Sieve Analysis:** Sieve analysis is the evaluation of the particle-size distribution of a soil, sediment, or rock by measuring the percentage of the particles that will pass through standard sieves of various sizes.

4.0 Interferences

4.1 Heaving sands may be problematic in unconsolidated sands encountered below the water table.

4.2 Rotary drilling methods requiring bentonite-based drilling fluids should be used with caution to drill boreholes that will be used for monitoring well installation. The bentonite mud builds up on the borehole walls as a filter cake and permeates the adjacent formation, potentially reducing the permeability of the material adjacent to the well screen.

4.3 If water or other drilling fluids have been introduced into the boring during drilling or well installation, samples of these fluids should be obtained and analyzed for chemical constituents that may be of interest at the site. In addition, an attempt should be made to recover the quantity of fluid or water that was introduced, either by flushing the borehole prior to well installation and/or by overpumping the well during development.

4.4 Track-mounted drill rigs are suitable for travelling on many types of landscapes that truck-mounted units cannot access, but may have limitations on extremely uneven or soft terrain.

4.5 Care should be taken to prevent cross-contamination between well locations. All drilling equipment coming in contact with potentially contaminated soil and/or groundwater will be decontaminated by the drilling subcontractor prior to initial drilling activities and between drilling locations in accordance with SOP 3-06, Equipment Decontamination.

5.0 Training and Qualifications

5.1 Qualifications and Training

The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

5.2 **Responsibilities**

5.2.1 **Contract Task Order (CTO) Managers** are responsible for issuing sampling and analysis plans (SAPs) that reflect the procedures and specifications presented in this procedure. Individual municipalities, county agencies, and possibly state regulatory agencies enforce regulations that may include well construction and installation requirements. The **CTO Manager** shall be familiar with current local and state regulations, and ensure that these regulations are followed. The **CTO Manager** is responsible for ensuring that all personnel involved in monitoring well installation shall have the appropriate education, experience, and training to perform their assigned tasks.

5.2.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

5.2.3 The **Field Manager** is responsible for direct supervision of the installation of monitoring wells and ensuring that procedures and specifications are implemented in the field in accordance with the approved SAP and well installation permits. The qualifications for the **Field Manager** must be in accordance with local jurisdictions with authority over the operations conducted.

5.2.4 All field personnel are responsible for the implementation of this procedure.

5.2.5 The on-site hydrogeologist/engineer is expected to obtain a description of the lithologic samples obtained during the excavation and construction of a monitoring well. These data are often required to provide guidance regarding the installation of specific components of the monitoring well. Guidance for lithologic sample collection and sample description is contained within SOP 3-16, Soil and Rock Classification.

6.0 Equipment and Supplies

6.1 Materials provided by the drilling contractor may include:

- Drill rig, drill rods, hollow stem augers, etc.
- Decontamination equipment (e.g., steam cleaner, high-pressure washer, brushes, etc.)
- Decontamination pad materials
- Well screen/riser pipe with flush-threaded couplings including riser and bottom caps
- Clean, filter sand
- Bentonite chips or pellets
- Cement grout and tremie pipe
- Portland cement for well pad completion
- Steel protective riser covers and locking caps
- Weighted calibrated tape
- Split-spoon samplers
- 55-gallon drums or containers for drill cuttings, decontamination fluids, etc.

6.2 In addition to those materials provided by the drilling contractor, equipment and materials required by the project geologist/engineer may include, but is not limited to, the following:

- Photoionization Detector (PID)
- Spill kit, including at a minimum sorbent pads and shovel (if not provided by subcontractor)

- Plastic sheeting
- Teaspoon or spatula
- Resealable plastic bags
- Boring Log Records
- Decontamination materials (per SOP No. 3-06 - Equipment Decontamination)
- Weighted measuring tape for depth measurement
- Soil logging materials (e.g. USCS classification field card, millimeter rule, hand lens, etc.)
- Survey lathes or pin flags
- Digital camera
- PPE as required by the HASP
- Planning documents including the site-specific HASP and SAP
- Large indelible ink or paint pen
- Field logbook/field forms/site maps (water proof)

7.0 Procedure

7.1 General Procedures

- Specific drilling, sampling, and installation equipment and methodology will be dictated by the type of well to be installed (e.g., single case (Type II), double case (Type III), bedrock, etc.), geologic characteristics of the site, the type of contaminants being monitored, and local and state regulations.
- For access to locations when travelling over difficult terrain, an appropriate line should be chosen before mobilizing the drill rig or other support vehicles. If clearing of trees or ground cover is required, perform these activities in advance to avoid down time. Avoid wet or soft areas where possible or use ground mats and/or timbers to aid in supporting the rig as it travels. If drilling on soft material, place geomatting and ground mats under the rig tracks or stabilizers prior to drilling.
- A utility locate must be conducted to identify all underground utilities at the site prior to drilling (refer to SOP 3-01, Utility Clearance*)*. Proper clearance procedures for aboveground/overhead utilities must also be followed as specified in the HASP.
- Although new well materials (well screen and riser pipe) generally arrive at the site boxed and sealed within plastic bags, it is sometimes necessary to decontaminate the materials prior to their use. Well materials should be inspected by the project geologist/engineer upon delivery to check for cleanliness. If the well materials appear dirty, or if local or regional regulatory guidance requires decontamination, then well material decontamination should be performed by the drilling subcontractor in accordance with SOP 3-06, Equipment Decontamination.
- The diameter of the borehole must be a minimum of 2 inches greater than the outside diameter of the well screen or riser pipe used to construct the well. This is necessary so that sufficient annular space is available to install filter packs, bentonite seals, and grout seals, and allow the passage of tremie pipe where grouting at depth is required. Bedrock wells may require reaming after coring in order to provide a large enough borehole diameter for well installation.
- When soil sampling is required (refer to the SAP), soil samples will be collected for visual logging by advancing split-spoon samplers through the augers. The soil will be visually logged by a field geologist and include lithologic characteristics (i.e., soil type, color, density, moisture content, etc.) using the the

methods described in SOP 3-16, Soil and Rock Classification. This information will be recorded on a boring/well log form, along with well construction details.

7.2 Drilling Techniques

Drilling of monitoring well boreholes may be accomplished by a variety of methods as described below. Preferred methods include those that temporarily case the borehole during drilling (i.e., hollow stem auger and sonic methods) using an override system. Other methods can be used where specific subsurface conditions or well design criteria dictate.

- Hollow stem auger (HSA) – Borings are advanced by rotating steel hollow stem augers with an attached cutting head. Soil cuttings are displaced by the cutting head and transported to the surface via continuous spiral flights attached to each auger stem. This method is widely used for unconsolidated soils that have a tendency to collapse within the boring. A bottom plug can be placed in the bottom auger to prevent soils from entering and clogging the auger, especially in the case of heaving sands. However, a bottom plug cannot be used when soil samples are to be collected through the augers. Soil plugs that accumulate in the bottom of the auger must be removed or knocked out prior to sampling or well installation.
- Solid stem auger – This type of drilling method is similar to HSA drilling using a solid stem or sealed hollow stem auger flights to advance the boring. Solid stem, continuous flight auger use is limited to semi-consolidated sediments or to cohesive or semi-cohesive unconsolidated sediments that don’t have a tendency to collapse when disturbed.
- Sonic methods – Sonic drilling consists of advancing concentric hollow drill casings (inner and outer) using rotation in conjunction with axial vibration of the drill casing. Once the casings are advanced to the appropriate depth, the inner string is removed with a core of drill cuttings while the outer casing remains in place to keep the borehole open. Cuttings are removed from the inner casing relatively intact for logging or sampling purposes. This drilling method is used for a variety of soil types, from heaving sands to consolidated or indurated formations. Smearing of the formation along the borehole walls is minimal since moderate vibration and rotation techniques are used to advance the casings. Since the total borehole diameter in sonic drilling is only incrementally larger than the inner casing diameter, care should be taken during installation of the monitoring well to ensure the well is centered and adequate space is available for annular materials.
- Rotary methods (water or mud) – Rotary drilling methods consist of drill rods coupled to a drill bit that rotates and cuts through the soils to advance the borehole. Water or drilling fluid (“mud”) is forced through the hollow drill rods and drill bit as the rods are rotated. The soil cuttings are forced up the borehole with the drilling fluids to the surface and the fluids recirculated. The drilling fluid provides a hydrostatic pressure that reduces or prevents the borehole from collapsing. Clean, potable water must be used for water-rotary drilling to prevent introducing trace contaminants. A sample of the potable water should be collected during the course of well installation for analysis of the same parameters defined for the groundwater samples. If mud-rotary is used to advance boreholes, potable water and bentonite drilling mud should only be used. No chemical additives shall be mixed in the drilling fluid to alter viscosity or lubricating properties. Adequate well development is essential for removal of drilling mud and fluids from the formation materials and ensure collection of representative groundwater samples.
- Rotary methods (Air) – Air rotary methods are similar to water rotary but use high air velocities in place of drilling fluids to rotate the drill bit and carry the soil cuttings up the borehole to the surface. Care must be taken to ensure that contaminants are not introduced into the air stream from compressor oils, etc. Most compressor systems are compatible with a coalescing filter system. Cuttings exiting the borehole under pressure must be controlled, especially when drilling in a zone of potential contamination. This can be accomplished by using an air diverter with hose or pipe to carry the cuttings to a waste container. Letting the cuttings blow uncontrolled from the borehole is not acceptable.

7.3 Well Construction and Installation

- If rotary drilling techniques are used, the borehole should be flushed or blown free of material prior to well installation. If hollow stem augers are used, the soil or bottom plug should be removed and the augers raised approximately six inches above the bottom of the borehole, while slowly rotating the augers to remove cuttings from the bottom of the boring. The depth of the borehole should be confirmed with a weighted, calibrated tape.
- The riser pipe and screen should be connected with flush-threaded joints and assembled wearing clean, disposable gloves. No solvent or anti-seize compound should be used on the connections. The full length of the slotted portion of the well screen and unslotted riser pipe should be measured and these measurements recorded on a well construction form (Attachment 1).
- If placed in an open borehole, the assembled well should be carefully lowered and centered in the borehole so that the well is true, straight, and vertical throughout. Centering can also be accomplished with the use of centralizers, if necessary. However, centralizers should be placed so that they do not inhibit the installation of filter sand, bentonite seal, and annular grout. Wells less than 50 deep generally do not require centralizers.
- If hollow stem augers are used, the well should be lowered through the augers and each auger flight removed incrementally as the filter sand, bentonite seal, and grout are tremmied or poured into the annular space of the well. The well should be temporarily capped before filter sand and other annular materials are installed.
- Clean, silica sand should be placed around the well screen to at least 1 foot above the top of the screen. The filter sand should be appropriately graded and compatible with the selected screen size and surrounding formation materials. In general, the filter pack should not extend more than 3 feet above the top of the screen to limit the thickness of the monitoring zone. As the filter pack is placed, a weighted tape should be lowered in the annular space to verify the depth to the top of the layer. This measurement will be recorded on the well construction form (Attachment 1). If necessary, to eliminate possible bridging or creation of voids, placement of the sand pack may require the use of a tremie pipe. Tremie pipe sandpack installations are generally suggested for deeper wells and for wells which are screened some distance beneath the water table.
- A minimum 2-foot thick layer of bentonite pellets or slurry seal will be installed immediately above the filter sand to prevent vertical flow within the boring from affecting the screened interval. Bentonite chips/pellets must be hydrated if place above the water table prior to grouting. If bridging is of concern as in the case of deep wells, powdered bentonite may be mixed with water into a very thick slurry and a tremie pipe used to place the seal to the desired depth. Placement of the bentonite seal in the borehole will be recorded on the well construction form (Attachment 1).
- The remaining annular space around the well will be grouted from the top of the bentonite seal to the surface with a grout composed of neat cement, a bentonite cement mixture, or high solids sodium bentonite grout.
- Each well riser will be secured with an expandable, locking cap (vented if possible). Optionally, a hole can be drilled in the upper portion of the riser to allow venting of the well.
- The well will be completed within a concrete well pad consisting of a Portland cement/sand mixture. Well pads are generally 3 feet by 3 feet square but may be larger or smaller depending on site conditions and state-specific well construction standards. Round concrete well pads are also acceptable. A minimum of 1 inch of the finished pad should be below grade to prevent washing and undermining by soil erosion.
- If completed as a flush-mount well, the well riser will be cut off approximately 4 to 6 inches below ground surface and an expandable, locking cap placed on the well riser. The area around the riser is dug out and a steel well vault or manhole cover placed over the riser and set almost flush to the ground

to protect the well. The manhole cover should be water-tight and secured with bolts to prevent casual access. The well pad will then be constructed around the well vault and slightly mounded at the center and sloping away to prevent surface water from accumulating in the well vault.

- If completed as a stick-up well, the well riser is cut approximately 2.5 to 3 feet above the ground surface and an expandable, locking cap placed on the well riser. A steel guard pipe with hinged, locking cap is placed over the well riser as a protective casing. The bottom of the guard pipe will be set approximately 2 feet below ground surface and sealed by pouring concrete from the top of the annular grout around the pipe to grade. The concrete well pad should be completed at the same time. Weep holes will be drilled in the base of the guard pipe to facilitate draining of rainwater or purge water from inside the guard pipe.
- Bumper posts or bollards may be necessary for additional well protection, especially in high traffic areas. The bumper posts should be placed around the well pad in a configuration that provides maximum protection to the well and extend a minimum of 3 feet above the ground.

7.4 Double Cased Wells

Under certain site conditions, the use of a double-cased or telescoping (Type III) well may be necessary. Installation of double-cased wells may be required to prevent the interconnection of two separate aquifers, seal off a perched aquifer without creating a vertical hydraulic conduit, prevent cross-contamination during construction of wells in deeper aquifers hydro-stratigraphically below impacted aquifers, or case off highly impacted soils present above the aquifer to prevent potential “dragging down” of contaminants.

Similar to conventional wells, construction of double-cased wells can be accomplished using a varety of drilling methods. Well construction is initiated by “keying” a large diameter, outer casing into a stratigraphic zone of low permeability (clay layer or bedrock). The size of the outer casing should be a minimum of 2 inches greater than the outside diameter of the inner casing to allow installation of annular seal materials during well completion. A pilot borehole should be drilled through the overburden soil and/or contaminated zone into a clay confining layer or bedrock. The borehole for the outer casing should be of sufficient size to contain the outer casing with a minimum of 2 inches around the outside diameter to allow sufficient annular space for tremie or pressure grouting. The boring should extend a minimum of 2 feet into a clay layer and a minimum of 1 foot into bedrock, if possible, to ensure an adequate seal. The boring should never breach a confining layer or keyed zone under any circumstances.

Once the boring is completed, the outer casing can be set in the borehole and sealed with grout. The outer casing can be set two ways, with or without a bottom cap. If no bottom cap is applied, the casing is usually driven approximately 6 inches into the clay confining unit. A grout plug is generally placed in the bottom of the casing and once set, standing water in the casing is evacuated prior to drilling below the casing. As an alternative, a cap can be placed on the bottom of the casing and if set below the water table, the casing can be filled with clean, potable water to hold down the casing in the boring. Grouting should be conducted using tremie-grouting or pressure-grouting methods by pumping grout into the annular space between the outer casing and the borehole wall from the bottom of the casing to the ground surface. Grout around the casing should be allowed to cure at least 24 hours before attempting to drill through the bottom.

Once the grout is cured, a smaller diameter drill pipe/bit is used to bore through the grout plug or bottom cap to the desired well depth. The well is then constructed as described in Section 7.3 above.

7.5 Post Installation Procedures

- Wells should be permanently labelled or marked for identification. Well tags can be used to record the site name, well number, total depth, installation date, etc. At a minimum, the well number will be written in indelible marker or paint on both the outside of the protective casing and inside beneath the casing lid, as well as on the riser pipe.

- A measuring point will be marked on the top of the riser pipe for taking water level measurements. The measuring point can be notched using a knife or saw or can be marked with a waterproof marker or paint. The measuring point will also be the point which will be surveyed for vertical elevation data.
- Upon completion, the following measurements will be taken by the field geologist/engineer and recorded on the well construction diagram.
    - Depth to static water level
    - Depth of non-aqueous phase liquid (NAPL), if present
    - Total depth of well measured from top of casing (TOC)
    - Height of well casing above ground surface
    - Height of protective casing above ground surface
- All monitoring wells will be surveyed for horizontal and vertical control by a licensed surveyor.
- Investigation-derived waste (IDW) including drill cuttings, spent materials (e.g., PPE), and decontamination water should be properly managed in accordance with SOP 3-05, IDW Management.

8.0 Quality Control and Assurance

8.1 Field personnel will follow specific quality assurance (QA) guidelines as outlined in the SAP. Certain quality control (QC) measures should be taken to ensure proper well installation and construction in accordance with this SOP, project specific SAP, and applicable well standards.

8.2 The borehole will be checked for total open depth, and extended by further drilling or shortened by backfilling, as required before installation of the well materials.

8.3 Water level and NAPL presence will be checked during well installation to ensure that the positions of well screen, filter sand, and seals relative to water level conform to project requirements

8.4 The depth to top of each layer of annular materials (i.e., filter sand, bentonite, grout) will be verified and adjusted as necessary for proper placement.

9.0 Records, Data Analysis, Calculations

All field information will be recorded in the field logbook and/or standardized field forms by field personnel. Field data recorded will include drilling contractor information, drilling methods, well material and construction information provided on the boring logs and well construction forms, observations or problems encountered during drilling, fluid level data, and any deviations from the procedures in this SOP and other project plans. Well Construction Forms (Attachment 1) will provide visual and descriptive information the monitoring well and are often the most critical form of documentation generated during the installation of a monitoring well. The field logbook is kept as a general log of activities and should not be used in place of the boring log.

10.0 Attachments or References

10.1 Attachment 1 – Monitoring Well Construction Form

10.2 Environmental Protection Agency, United States (EPA). 1987*. A Compendium of Superfund Field Operations Methods*. Office of Solid Waste and Emergency Response. EPA/540/P-87/001.

10.3 EPA. 1990. *Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells*. EPA/600/4-89/034. Office of Research and Development, Washington. March.

10.4 EPA. 1992. *RCRA Groundwater Monitoring Draft Technical Guidance*. EPA/530/R-93/001. Office of Solid Waste. November.

10.5 EPA, 2008. SESD Operating Procedure SESDGUID-101-R0: *Design and Installation of Monitoring Wells*. USEPA, Science and Ecosystem Support Division (SESD), Athens, Georgia. Effective Date February 18, 2008.

10.6 U.S. Army Corps of Engineers. 2008. Manual No. EM 385-1-1. *Safety and Health Requirements*. 15 November 2008. http://140.194.76.129/publications/eng-manuals/em385-1-1/2008_English/toc.html.

10.7 SOP 3-01, *Utility Clearance*.

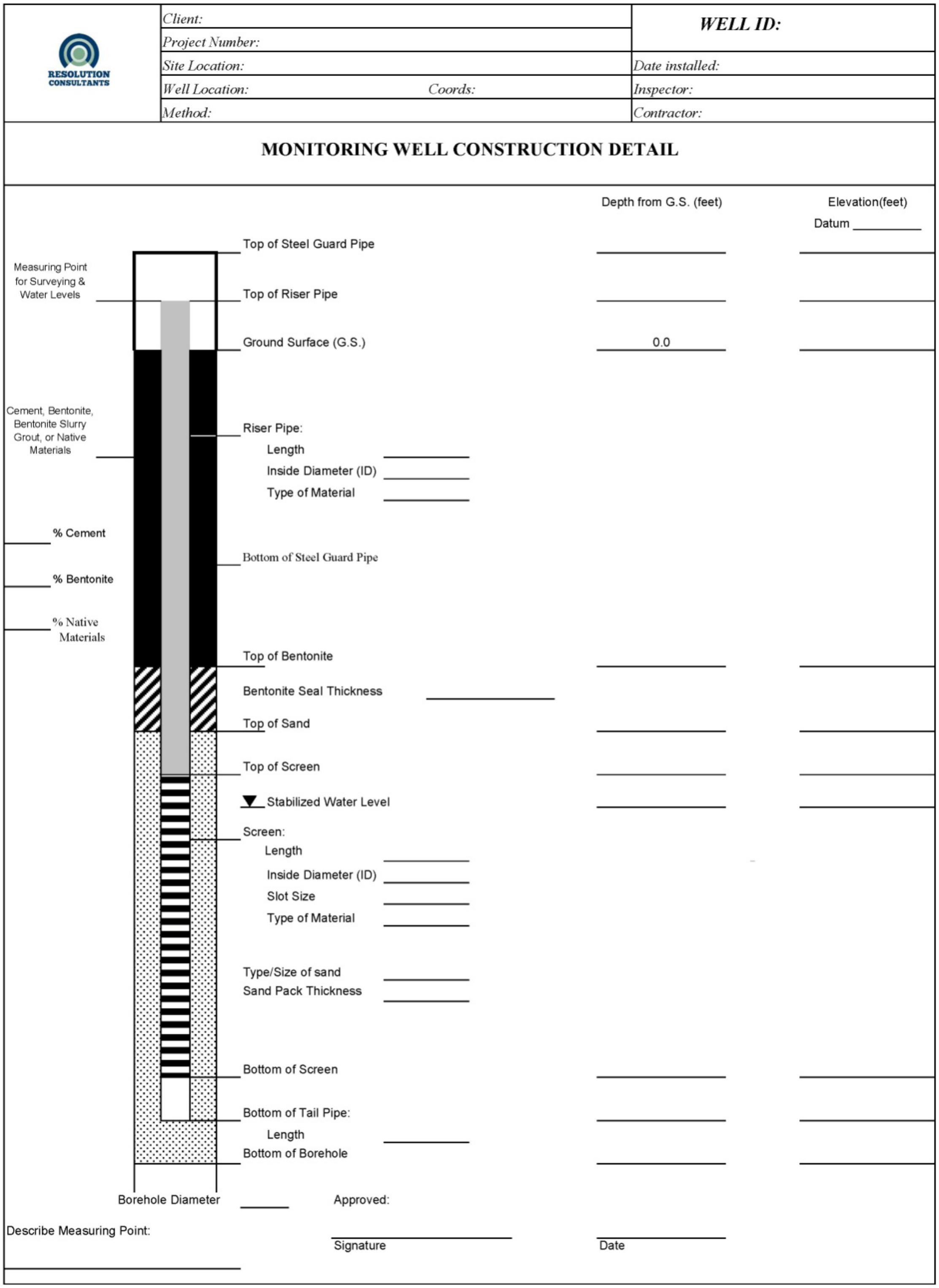
10.8 SOP 3-05, *IDW Management*

10.9 SOP 3-06, *Equipment Decontamination*.

10.10 SOP 3-16, *Soil and Rock Classification.*

Author	*Reviewer*	*Revisions (Technical or Editorial)*
Mark Kromis Program Chemist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue (May 2012)

Attachment 1
Monitoring Well Construction Form



Client:		WELL ID:
Project Number:		
Site Location:		Date installed:
Well Location:	Coords:	Inspector:
Method:		Contractor:

MONITORING WELL CONSTRUCTION DETAIL

	Depth from G.S. (feet)	Elevation(feet) Datum ____
Top of Steel Guard Pipe		
Top of Riser Pipe		
Ground Surface (G.S.)	0.0	
Top of Bentonite		
Top of Sand		
Top of Screen		
▼ Stabilized Water Level		
Bottom of Screen		
Bottom of Tail Pipe:		
Bottom of Borehole		

Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

____ % Cement

____ % Bentonite

____ % Native Materials

Riser Pipe:
Length ____
Inside Diameter (ID) ____
Type of Material ____

Bottom of Steel Guard Pipe

Bentonite Seal Thickness ____

Screen:
Length ____
Inside Diameter (ID) ____
Slot Size ____
Type of Material ____

Type/Size of sand ____
Sand Pack Thickness ____

Bottom of Tail Pipe:
Length ____

Borehole Diameter ____

Approved:

Signature ____ Date ____

Describe Measuring Point: ____

Surface and Subsurface Soil Sampling Procedures

Procedure 3-21

1.0 Purpose and Scope

1.1 This standard operating procedure (SOP) describes the procedures for soil sampling. The procedure includes surface and subsurface sampling by various methods using hand auguring, test pit, direct-push, and split-spoon equipment.

1.2 The procedure includes soil sampling for volatile organic compounds (VOCs). For project specific information (e.g. sampling depths, equipment to be used, and frequency of sampling), refer to the Sampling and Analysis Plan (SAP), which takes precedence over these procedures. Surface soil sampling, typically considered to be up to two feet below ground surface by EPA standards, is typically accomplished using hand tools such as shovels or hand augers. Test pit samples are considered subsurface samples, although normally collected via hand tools similar to surface soil sampling or by excavation machinery. Direct-push and split-spoon sampling offer the benefit of collecting soil samples from a discrete or isolated subsurface interval, without the need of extracting excess material above the target depth. These methods dramatically reduce time and cost associated with disposal of material from soil cuttings when compared to test pit sampling. In addition, direct-push and split-spoon sampling methods can obtain samples at targeted intervals greater than 15 feet in depth, allowing for discrete depth soil sampling while speeding up the sampling process. Direct-push methods work best in medium to fine-grained cohesive materials such as medium to fine sands, silts, and silty clay soils. Split-spoon sampling works well in all types of soil, but is somewhat slower than direct-push methods. Samples are composited so that each sample contains a homogenized representative portion of the sample interval. Due to potential loss of analytes, samples for volatile analysis are not composited. Samples for chemical analysis can be collected by any of the above-mentioned sampling methods, as disturbed soil samples. Undisturbed samples are collected, sealed, and sent directly to the laboratory for analysis. For undisturbed samples, the samples are not homogenized.

2.0 Safety

2.1 The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the project Health and Safety Plan (HASP). In the absence of a HASP, work will be conducted according to the Contract Task Order (CTO) Work Plan (WP) and/or direction from the **Site Safety Officer (SSO)**.

2.2 Before soil sampling commences, appropriate entities (e.g. DigSafe, local public works departments, company facilities) must be contacted to assure the anticipated soil sampling locations are marked for utilities, including electrical, telecommunications, water, sewer, and gas.

3.0 Terms and Definitions

None.

4.0 Interferences

4.1 Low recovery of soil from sampling equipment will prevent an adequate representation of the soil profile and sufficient amount of soil sample. If low recovery is a problem, the hole may be offset and re-advanced, terminated, or continued using a larger diameter sampler.

4.2 Asphalt in soil samples can cause false positive results for hydrocarbons. To ensure samples are free of asphalt, do not collect samples that may contain asphalt. If the collection of samples potentially containing asphalt is unavoidable, note the sampling depths at which the presence of asphalt are suspected.

4.3 Instrumentation interferences addressed in SOPs for Calibration of the Photoionization Detector (PID), Headspace Screening for Total Volatile Organics, and Equipment Decontamination must also be considered.

4.4 Cross contamination from sampling equipment must be prevented by using sampling equipment constructed of stainless steel that is adequately decontaminated between samples.

5.0 Training and Qualifications

5.1 Qualifications and Training

The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

5.2 Responsibilities

5.2.1 The CTO Manager is responsible for ensuring that soil sampling activities comply with this procedure. The CTO Manager is responsible for ensuring that all personnel involved in soil sampling shall have the appropriate education, experience, and training to perform their assigned tasks.

5.2.2 The Program Quality Manager is responsible for ensuring overall compliance with this procedure.

5.2.3 The Field Manager is responsible for ensuring that all soil sampling activities are conducted according to this procedure.

5.2.4 All Field Personnel are responsible for the implementation of this procedure.

6.0 Equipment and Supplies

The depth at which samples will be collected and the anticipated method of sample collection (direct-push, split-spoon, hand auger, shovel, or test pits) will be presented in the SAP. The following details equipment typically needed for soil sampling, based on the various methods. See the SAP for specific detail of equipment and supply needs.

6.1 Depending on the nature of suspected contamination, field screening instrumentation may be used for direct sampling. Appropriate instrumentation and calibration standards should be available. If volatile organic contaminants are suspected and a PID will be used, refer to the equipment and instrumentation listed in SOP 3-20 Operation and Calibration of a Photoionization Detector. Equipment in this SOP includes but is not limited to:

- PID/FID;
- Calibration gas; and
- Tedlar® gas bags (for calibration).

6.2 If field screening methods include jar headspace screening for volatile organics, refer to the equipment and procedure in SOP 3-19 Headspace Screening for Total VOCs. Equipment in this SOP includes but is not limited to:

- Clean soil (“drillers jars”) jars; and
- Aluminium foil.

6.3 Appropriate decontamination procedures must be followed for sampling equipment. Refer to SOP 3-06 Equipment Decontamination. Equipment in this SOP includes but is not limited to:

- Phosphate-free detergent;
- Isopropyl Alcohol;
- Tap water;
- Deionized Ultra-Filtered (DIUF) Water;
- Plastic buckets or washbasins;
- Brushes; and
- Polyethylene sheeting.

6.4 The following general equipment is needed for all soil sampling, regardless of method:

- Stainless steel bowls;
- Stainless steel trowels;
- Appropriate sample containers for laboratory analysis;
- Personal Protective Equipment (PPE);
- Logbook;
- Cooler and ice for preservation; and
- Stakes and flagging to document sampling location.

6.5 The following additional equipment is needed for volatile organic sampling:

- Electronic pan scale and weights for calibration; and
- Syringes or other discrete soil core samplers.

6.6 The following additional equipment may be needed for surface and test pit soil sampling:

- Hand Auger

6.7 The following additional equipment may be needed for soil sampling from direct push and/or split-spoon equipment:

- Tape measure or folding carpenter's rule for recording the length of soil recovered.

Note: All subsurface drilling equipment will be provided and maintained by the subcontractor.

7.0 Procedure

7.1 General Soil Sampling Procedure for All Soil Sampling Methods

7.1.1 Record the weather conditions and other relevant on-site conditions.

7.1.2 Select the soil sampling location, clear vegetation if necessary, and record the sampling location identification number and pertinent location details.

7.1.3 Verify that the sampling equipment is properly decontaminated, in working order, and situated at the intended sampling location.

7.1.4 Place polyethylene sheeting on the ground and assemble all necessary sampling equipment on top of it. Cover surfaces onto which soils or sampling equipment will be placed (i.e. tables with polyethylene sheeting).

7.1.5 Follow the appropriate procedures listed below for either surface, split-spoon, direct push, or test pit sample collection (7.2, 7.3, 7.4, and 7.5 respectively).

7.1.6 Collect soil samples according to procedures listed in Section 7.6 depending on project specific analyses.

7.1.7 Record date/time, sample ID, and sample descriptions in the field logbook or field form. A sketch or description of the location may also be recorded so the sample location can be re-constructed, especially if the location will not be recorded using global positioning satellite (GPS) equipment.

7.1.8 Immediately label the sample containers and place them on ice, if required for preservation. Complete the chain-of-custody form(s) as soon as possible.

7.1.9 Dispose of all excess excavated soil in accordance with the SAP.

7.1.10 If required, mark the sample location with a clearly labelled wooden stake or pin flag. If the location is on a paved surface, the location may be marked with spray paint.

7.1.11 Decontaminate the sampling equipment according to SOP 3-06 Equipment Decontamination.

7.2 Surface Sampling

7.2.1 The criteria used for selecting surface soil locations for sampling may include the following:

- Visual observations (soil staining, fill materials);
- Other relevant soil characteristics;
- Site features;
- Screening results;
- Predetermined sampling approach (i.e. grid or random); and
- Sampling objectives as provided in the SAP.

7.2.2 The following procedures are to be used to collect surface soil samples. Surface soils are considered to be soils that are up to two feet below ground surface, though state regulations and project objectives may define surface soils differently; therefore, the SAP should be consulted for direction on the depth from which to collect the surface soil samples. Sampling and other pertinent data and information will be recorded in the field logbook and/or on field forms. Photographs may be taken as needed or as specified in the SAP.

1. Gently scrape any vegetative covering until soil is exposed. Completely remove any pavement.
2. Remove soil from the exposed sampling area with a trowel, hand auger, or shovel. Put soils within the sampling interval in a stainless steel bowl for homogenizing. Monitor the breathing zone and sampling area as required in the HASP.
3. For VOC analyses, collect representative soil samples directly from the recently-exposed soil using a syringe or other soil coring device (e.g., TerraCore®, EnCore®). Follow procedures in Section 7.6.1 for VOC sampling.
4. Collect sufficient soil to fill all remaining sample jars into a stainless steel bowl. Homogenize the soil samples to obtain a uniform soil composition which is representative of the total soil sample collected according to the following procedure:
    a) Remove all rocks and non-soil objects using a stainless steel spoon or scoop.

b) Form a cone shaped mound with the sample material, then flatten the cone and split the sample into quarters.

c) Use the stainless steel spoon/scoop to mix the quarter samples that are opposite.

d) After mixing the opposite quarters, reform the cone shaped mound.

e) Repeat this procedure a minimum of five (5) times, removing any non-soil objects and breaking apart any clumps.

7.3 Split-Spoon Sampling

7.3.1 At each boring location, the frequency and depth of split-spoon samples will be determined from the SAP. Split-spoon samples may be collected continuously, intermittently, or from predetermined depths.

7.3.2 Split-spoon samplers shall be driven into undisturbed soil by driving the spoon ahead of the drill augers/casing. In cohesive soils, or soils where the borehole remains open (does not collapse), two split-spoon samples may be taken prior to advancing the augers/casing.

7.3.3 After split-spoons are retrieved, open the split-spoon and measure the recovery of soil. If a PID will be used for screening, immediately scan the recovered sample for VOCs using the PID. Scan the recovered soil boring by making a hole in the soil with a decontaminated trowel and placing the PID inlet very close to the hole. Be very careful not to get soil on the tip of the PID. Take PID readings every 6 inches along the split-spoon and/or in any areas of stained or disturbed soil. Record the highest PID reading and the depth at which it was observed along with all other pertinent observations. If required in the SAP, VOC and headspace samples should be collected (see Section 7.6.1) prior to logging the sample.

7.3.4 If headspace screening for VOCs is required in the SAP, collect a soil sample (as defined in the SAP) and perform headspace screening according to SOP 3-19 Headspace Screening for Total VOCs.

7.3.5 Soils collected using the split-spoon sampler will be logged by the field representative using the procedure required in the SAP.

7.3.6 Collect the remainder of the sample volume required into a stainless steel bowl. Homogenize the soil so the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.

7.3.7 The SAP may specify that intervals to be sent to the laboratory be determined by visual observation and/or highest PID screening or headspace results, which can only be determined once the boring is complete. In this instance, a VOC sample should be collected at each interval. The remainder of the soil from that interval will be set aside in a clearly labelled stainless steel bowl covered with aluminium foil. Once the boring has been completed and the sample interval has been determined, the remainder of the soil can be homogenized according to Section 7.2 and submitted for laboratory analysis.

7.3.8 Once a boring is complete and all required samples have been collected, the boring must be completed as specified in the SAP (e.g., completed as a monitoring well, backfilled with bentonite, etc).

7.4 Direct Push Sampling

At each boring location, the frequency of direct-push samples will be determined from the SAP. Typically, samples with direct-push equipment are collected in 4 foot (ft) intervals, but smaller (e.g., 2 ft) and larger (e.g., 5 ft) intervals are also possible.

1. Sample using Macro-Core samplers with acetate liners to obtain discrete soil samples at the depths specified in the SAP.
2. Cut open the acetate liner. If required in the SAP, immediately scan the recovered soil boring for VOCs using a PID by making a hole in the soil with a decontaminated trowel and placing the PID inlet very close to the hole. Be very careful not to get soil on the tip of the PID. Take PID readings every 6 inches along the split-spoon and/or in any areas of stained or disturbed soil. Record the

highest PID reading and the depth at which it was observed along with all other pertinent observations. VOC and headspace samples, if required in the SAP should be collected (see Section 7.6.1) prior to logging the sample.

3. If required in the SAP, collect a soil sample (as defined in the SAP) and perform headspace screening according to SOP 3-19 Headspace Screening for Total VOCs.
4. Soils collected using the direct-push sampler will be logged by the by the field representative using the procedure required in the SAP.
5. Collect the remainder of the sample into a stainless steel bowl. Homogenize the soil collected so that the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.
6. Once a boring is complete and all required samples have been collected, the boring must be completed as specified in the SAP (e.g., completed as a monitoring well, backfilled with bentonite, etc).

7.5 Test Pit Sampling

7.5.1 Excavate the test pit to the desired depth.

7.5.2 Using the excavator bucket, collect soil samples as specified in the SAP. Collect a sample and perform screening analyses as required by the SAP. If VOCs contamination is suspected, perform headspace screening according to SOP 3-19 Headspace Screening for Total VOCs.

7.5.3 Collect the sample from center of the bucket to avoid potential contamination from the bucket.

7.5.4 VOC samples should also be collected from an undisturbed section soil in the excavator bucket. The top layer of exposed soil should be scraped away just prior to collecting the VOC samples.

7.5.5 Collect the remainder of the sample volume required into a stainless steel bowl. Homogenize the soil so the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.

7.5.6 Dispose of all excavated soil according to the SAP.

7.6 Sample Collection Methods

7.6.1 Volatile Organics Sampling

For soils collected for analyses of volatile organics, including Volatile Petroleum Hydrocarbons (VPH) or other purgable compounds, a closed system is maintained. From collection through analysis, the sample bottles are not opened. The bottle kit for a routine field sample for these analyses will typically include three 40-mL VOA vials and one soil jar. Two 40-mL VOA vials will contain either 5 mL reagent water or 5 mL sodium bisulfate and magnetic stir bars (i.e., low level vials). The third VOA vial will contain 15 mL methanol with no magnetic stir bar (i.e., high level vial). These vials are usually provided by the laboratory and are pre-weighed, with the tare weight recorded on the affixed sample label. No additional sample labels are affixed to the VOA vials, as addition of a label would alter the vial weight. All information is recorded directly on the sample label using an indelible marker. The soil jar is provided for percent solids determination. For VOC or VPH analyses, samples are collected prior to sample homogenization. Collect the VOC sample in accordance with the procedure described below.

1. Determine the soil volume necessary for the required sample weight, typically 5 grams:
   a) Prepare a 5 mL sampling corer (e.g., Terra Core®) or cut-off plastic syringe.
   b) Tare the sampler by placing it on the scale, and zeroing the scale.
   c) Draw back the plunger to the 5 gram mark or 5mL (5cc) mark on cut-off syringe, and insert the open end of the sampler into an undisturbed area of soil with a twisting motion, filling the

sampler with soil. Note the location of the plunger with respect to the milliliter (cc) or other graduation printed on the sampler.

d) Weigh the filled sampler, and remove or add soil until the desired weight is obtained. Note the location of the plunger which corresponds to this weight. Do not use this sample for laboratory analysis.

2. Once the required soil volume has been determined, pull the plunger back to this mark and hold it there while filling the syringe for each sample.
3. Collect 5 grams of soil using the cut-off syringe or Terra Core® sample device. Extrude the 5-grams of soil into one of the low level 40-mL VOA vials. Quickly wipe any soil from the threads of the VOA vial with a clean Kimwipe® and immediately close the vial. It is imperative that the threads be free from soil or other debris prior to replacing the cap on the vial in order to maintain the closed system necessary for the analysis.
4. Gently swirl the vial so that all of the soil is fully wetted with the preservative.
5. Fill the other low level 40 mL VOA vial in this manner.
6. Repeat the process for the high level VOA vials, only for the high level VOA vial three 5 gram aliquots (i.e., 15 grams total) should be extruded into the high level VOA vial.

   NOTE: Depending on the laboratory, some high level VOA vials only contain 5 mL or 10 mL of methanol. If this is the case, either 5 grams total or 10 grams total, respectively, should be extruded into the high level VOA vial. In other words, the mass of soil in grams should be identical to the volume of methanol in mL (i.e., 1:1 ratio of soil to methanol).

7. Collect any additional QC sample collected (e.g., field duplicate, MS, and MSD) in the same manner as above.
8. Fill the 4-oz glass jar with soil from the same area for percent moisture determination.

7.6.2 Soil Sampling Method (All other analyses except VOC/VPH)

When all the required soil for a sampling location has been obtained, the soil can be homogenized as described in section 7.2. Collect sufficient volume to fill all of the remaining sample containers at least ¾ full for all other analyses. Homogenize the soil in a decontaminated stainless steel bowl, removing rocks, sticks, or other non-soil objects and breaking apart any lumps of soil prior to filling the remaining sample containers.

NOTE: Soil samples must contain greater than 30% solids for the data to be considered valid.

8.0 Quality Control and Assurance

8.1 Sampling personnel should follow specific quality assurance guidelines as outlined in the SAP. Proper quality assurance requirements should be provided which will allow for collection of representative samples from representative sampling points. Quality assurance requirements outlined in the SAP typically suggest the collection of a sufficient quantity of field duplicate, field blank, and other samples.

8.2 Quality control requirements are dependent on project-specific sampling objectives. The SAP will provide requirements for equipment decontamination (frequency and materials), sample preservation and holding times, sample container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

9.0 Records, Data Analysis, Calculations

All data and information (e.g., sample collection method used) must be documented on field data sheets, boring logs, or within site logbooks with permanent ink. Data recorded may include the following:

- Weather conditions;
- Arrival and departure time of persons on site;
- Instrument type, lamp (PID), make, model and serial number;
- Calibration gas used;
- Date, time and results of instrument calibration and calibration checks;
- Sampling date and time;
- Sampling location;
- Samples collected;
- Sampling depth and soil type;
- Deviations from the procedure as written; and
- Readings obtained.

10.0 Attachments or References

SOP 3-06, *Equipment Decontamination*

SOP 3-19, *Headspace Screening for Total VOCs*

SOP 3-20, *Operation and Calibration of a Photoionization Detector*

Author	Reviewer	Revisions (Technical or Editorial)
Robert Shoemaker Senior Scientist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue (May 2012)

Appendix B

Tier II Letter

TIER II SAP APPROVAL QUESTIONNAIRE
FOR NAVFAC LANT CLEAN PROJECTS

Please answer the following questions and send it to Jan Nielsen (janice.nielsen@navy.mil) **and CC the RPM** via e-mail attachment before generating a Tier-II SAP. Approval or disapproval will be indicated in the Navy response to your e-mail.

Name of Installation / Site: _______Naval Weapons Industrial Reserve Plant Bethpage New York_______

NAVFAC LANT RPM: _________Lora Fly_______________________________________

	Question	Comments
1	What base and Site/SWMU/AOC, etc., is associated with this work?	NWIRP Bethpage, NY Site 1 Operable Unit 2 Offsite groundwater plume which is comprised of TCE, DCE 111-TCA, breakdown products and Freon 113
2	What is the phase of the site actions? (LTM, RAO, SI, RI, etc.)	The ROD was issued in 2003 and implementation is in progress.
3	What is the purpose of the sampling? (LTM, Data Gap, Initial Investigation, etc.)	The investigation is to fill in data gaps and to better define the horizontal and vertical extent and concentrations of volatile organic contamination in groundwater south of the Navy/NGC facilities that has not been captured by the NGC Onsite Groundwater Containment System.
4.	Who are the primary stakeholders (EPA/State regulators, agencies, special interest groups)?	EPA, New York State Department of Environmental Conservation, Northrop Grumman various water districts.
5.	Is the entire team on board with a Tier II or graded SAP?	Partnering is not conducted in New York. NYSDEC and EPA do agree that further investigation of the plume is needed
6.	Have there been any disputes at this site? (Regulators, community, other stakeholders)	Yes. The Navy and NGC are trying to allocate cost responsibilities. A new OU was identified in 2006 emanating from the Bethpage Community Park. NYSDEC has listed the Navy as a PRP; however, the Navy is disputing that designation. The water districts sent letter to the Navy regarding potential impacts to their supply wells.
7.	Is it likely that this site might be the subject of litigation in the future (e.g. known PRP issues, potential cancer clusters, environmental justice concerns, BRAC turnover issues, media attention, etc.)?	Yes, The Navy is working with various water districts. In addition the Navy and NGC are trying to allocate cost responsibilities
8.	Are there any analytical methods that do not meet the QSM? List the analytical methods that will be used? Include non QSM methods in this question and ask if methods responding yes to this question are definitive or screening data.	No Not Applicable Not Applicable
9.	Is the lab required to be ELAP accredited for all methods/analytes? If not, please provide justification.	The lab is required to be accredited for the methods/analytes. There are a few analytes for soil and water that the laboratory is currently not accredited for, but will be accredited for shortly. The lab is currently looking into getting NELAC accreditation for TO-15 (it is already ELAP accredited). If the Laboratory cannot get accreditation by start of work (late September early October) the air samples will be subcontracted out

	Question	Comments
		to an accredited and approved laboratory.
10.	What are the sampling methods that will be used? Are there any specialized sampling methods being used? If so, please describe?	Soil samples will be collected via split spoons. Water samples from the vertical profile borings will be collected via Hydropunch, Groundwater samples from monitoring wells will be collected via low flow sampling. Air samples will be collected in Summa Canisters.

Note: 1 = If documentation is needed for any of the above items then consider adding the WS or portions of the WS from the 37 worksheet format into the Tier II SAP to capture the information.

I certify that the answers provided above are accurate.

Signature: Date: 8/7/12

Print Name/Title: ElEANOR VivAudou / Engineer

Based on the information provided above the use of the Tier II SAP format is:

PERMITTED: ☐

NOT PERMITTED: ☐

Signature: ________________ Date: __________

Print Name/Title: ________________

Appendix C

Accreditation Letters

LABORATORY ACCREDITATION BUREAU a division of A-S-B

11617 Coldwater Rd., Ste 101
Fort Wayne, IN 46845
Tel: (260) 637 2705
Fax: (260) 637 2791
www.L-A-B.com

November 30, 2012

Katahdin Analytical Services, Inc.
Leslie Dimond
600 Technology Way
Scarborough, ME 04074

Dear Leslie,

We appreciate your continued dedication to DoD/ELAP and the laboratory community. Laboratory Accreditation Bureau is granting an extension of your accreditation that was originally granted through **November 4, 2012.** This letter serves as an extension of your DoD/ELAP accreditation. The new granted through date is now **February 4, 2013**. The Certificates and the Scopes of Accreditation of your locations, **L2223 & L2223.01-1** will remain valid until the new granted through date or new certificates and scopes are issued. If within this extension period your company decides to discontinue or cancel your accreditation, your accreditation will immediately be terminated and your listing discontinued as an accredited laboratory.

The current information as described above will be modified within two business days on the directory at www.l-a-b.com. It is L-A-B's policy not to modify the scope or certificate related to extensions of accreditation.

We look forward to a long and continued successful business relationship with your company. We appreciate your dedication to continuous improvement for our laboratory community.

Sincerely,

R. Douglas Leonard, Jr.
Managing Director

THE CERTIFICATE AND SCOPE, AS WELL AS ALL VERSIONS WHICH MAY BE ISSUED IN THE FUTURE, INCLUDING THIS EXTENSION LETTER, ARE THE SOLE PROPERTY OF LABORATORY ACCREDITATION BUREAU

THE CERTIFICATE AND SCOPE, AS WELL AS ALL VERSIONS WHICH MAY BE ISSUED IN THE FUTURE, INCLUDING THIS EXTENSION LETTER, ARE THE SOLE PROPERTY OF LABORATORY ACCREDITATION BUREAU

LABORATORY
ACCREDITATION
BUREAU

Certificate Number L2223

Certificate of Accreditation

Accredited to DoD ELAP and ISO/IEC 17025:2005

Katahdin Analytical Services, Inc.

600 Technology Way
Scarborough, ME 04074

has met the requirements set forth in L-A-B's policies and procedures, all requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the U.S. Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP).*

The accredited lab has demonstrated technical competence to a defined "Scope of Accreditation" and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Accreditation Granted through: November 4, 2012

R. Douglas Leonard, Jr., Managing Director
Laboratory Accreditation Bureau
Presented the 4th of November, 2009

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*See the laboratory's Scope of Accreditation for details of the DoD ELAP requirements
Laboratory Accreditation Bureau is found to be in compliance with ISO/IEC 17011:2004 and recognized by ILAC (International Laboratory Accreditation Cooperation) and NACLA (National Cooperation for Laboratory Accreditation).

Scope of Accreditation
For
Katahdin Analytical Services, Inc.

600 Technology Way
Scarborough, ME 04074
Leslie Dimond
207-874-2400

In recognition of a successful assessment to ISO/IEC 17025:2005 and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM v4.2) based on the National Environmental Laboratory Accreditation Conference Chapter 5 Quality Systems Standard (NELAC Voted Revision June 5, 2003), accreditation is granted to Katahdin Analytical Services to perform the following tests:

Accreditation granted through: **November 4, 2012**

Testing - Environmental

Non-Potable Water

Technology	Method	Analyte
GC/ECD	EPA 8081B	2, 4`-DDD
GC/ECD	EPA 8081B	2, 4`-DDE
GC/ECD	EPA 8081B	2, 4`-DDT
GC/ECD	EPA 608 / 8081B	4, 4`-DDD
GC/ECD	EPA 608 / 8081B	4, 4`-DDE
GC/ECD	EPA 608 / 8081B	4, 4`-DDT
GC/ECD	EPA 608 / 8081B	Aldrin
GC/ECD	EPA 608 / 8081B	alpha-BHC (alpha-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Alpha-Chlordane
GC/ECD	EPA 608 / 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Cis-Nonaclor
GC/ECD	EPA 608 / 8081B	Chlordane (tech.)
GC/ECD	EPA 608 / 8081B	delta-BHC
GC/ECD	EPA 608 / 8081B	Dieldrin
GC/ECD	EPA 608 / 8081B	Endosulfan I
GC/ECD	EPA 608 / 8081B	Endosulfan II

Non-Potable Water

Technology	Method	Analyte
GC/ECD	EPA 608 / 8081B	Endosulfan sulfate
GC/ECD	EPA 608 / 8081B	Endrin
GC/ECD	EPA 608 / 8081B	Endrin aldehyde
GC/ECD	EPA 8081B	Endrin Ketone
GC/ECD	EPA 8081B	gamma-BHC (Lindane gamma-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	gamma-Chlordane
GC/ECD	EPA 608 / 8081B	Heptachlor
GC/ECD	EPA 608 / 8081B	Heptachlor epoxide
GC/ECD	EPA 8081B	Hexachlorobenzene
GC/ECD	EPA 8081B	Methoxychlor
GC/ECD	EPA 8081B	Mirex
GC/ECD	EPA 8081B	Oxychlordane
GC/ECD	EPA 608 / 8081B	Toxaphene (Chlorinated camphene)
GC/ECD	EPA 8081B	trans-Nonachlor
GC/ECD	EPA 608 / 8082A	Aroclor-1016 (PCB-1016)
GC/ECD	EPA 608 / 8082A	Aroclor-1221 (PCB-1221)
GC/ECD	EPA 608 / 8082A	Aroclor-1232 (PCB-1232)
GC/ECD	EPA 608 / 8082A	Aroclor-1242 (PCB-1242)
GC/ECD	EPA 608 / 8082A	Aroclor-1248 (PCB-1248)
GC/ECD	EPA 608 / 8082A	Aroclor-1254 (PCB-1254)
GC/ECD	EPA 608 / 8082A	Aroclor-1260 (PCB-1260)
GC/ECD	EPA 8082A MOD	Aroclor-1262 (PCB-1262)
GC/ECD	EPA 8082A MOD	Aroclor-1268 (PCB-1268)
GC/ECD	EPA 8082A	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)
GC/ECD	EPA 8082A	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)
GC/ECD	EPA 8082A	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)
GC/ECD	EPA 8082A	2,2',3,3',4,4'-Hexachlorobiphenyl (BZ 128)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5, 5'-Heptachlorobiphenyl (BZ 180)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5', 6-Heptachlorobiphenyl (BZ 183)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5-Hexachlorobiphenyl (BZ 138)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 6, 6'-Heptachlorobiphenyl (BZ 184)

Non-Potable Water

Technology	Method	Analyte
GC/ECD	EPA 8082A	2, 2', 3, 4', 5, 5', 6-Heptachlorobiphenyl (BZ 187)
GC/ECD	EPA 8082A	2, 2', 3, 4, 5'-Pentachlorobiphenyl (BZ 87)
GC/ECD	EPA 8082A	2, 2', 3, 5'-Tetrachlorobiphenyl (BZ 44)
GC/ECD	EPA 8082A	2, 2', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 153)
GC/ECD	EPA 8082A	2, 2', 4, 5, 5'-Pentachlorobiphenyl (BZ 101)
GC/ECD	EPA 8082A	2, 2', 4, 5-Tetrachlorobiphenyl (BZ 48)
GC/ECD	EPA 8082A	2, 2', 4, 5’-Tetrachlorobiphenyl (BZ 49)
GC/ECD	EPA 8082A	2, 2', 5, 5'-Tetrachlorobiphenyl (BZ 52)
GC/ECD	EPA 8082A	2, 2', 5-Trichlorobiphenyl (BZ 18)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5-Hexachlorobiphenyl (BZ 156)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5'-Hexachlorobiphenyl (BZ 157)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4'-Pentachlorobiphenyl (BZ 105)
GC/ECD	EPA 8082A	2, 3, 3’, 4, 4’, 5, 5’-Heptachlorobiphenyl (BZ 189)
GC/ECD	EPA 8082A	2, 3', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 167)
GC/ECD	EPA 8082A	2, 3', 4, 4', 5-Pentachlorobiphenyl (BZ 118)
GC/ECD	EPA 8082A	2, 3', 4, 4',5’-Pentachlorobiphenyl (BZ 123)
GC/ECD	EPA 8082A	2, 3', 4, 4'-Tetrachlorobiphenyl (BZ 66)
GC/ECD	EPA 8082A	2, 3, 4, 4’, 5-Pentachlorobiphenyl (BZ 114)
GC/ECD	EPA 8082A	2, 4, 4'-Trichlorobiphenyl (BZ 28)
GC/ECD	EPA 8082A	2, 4'-Dichlorobiphenyl (BZ 8)
GC/ECD	EPA 8082A	3, 3', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 169)
GC/ECD	EPA 8082A	3, 3', 4, 4', 5-Pentachlorobiphenyl (BZ 126)
GC/ECD	EPA 8082A	3, 3', 4, 4'-Tetrachlorobiphenyl (BZ 77)
GC/ECD	EPA 8082A	3, 4, 4’, 5-Tetrachlorobiphenyl (BZ 81)
GC/ECD	EPA 8082A	Decachlorobiphenyl (BZ 209)
GC/ECD	EPA 8151A	2, 4, 5-T
GC/ECD	EPA 8151A	2, 4-D
GC/ECD	EPA 8151A	2, 4-DB
GC/ECD	EPA 8151A	Dalapon
GC/ECD	EPA 8151A	Dicamba
GC/ECD	EPA 8151A	Dichloroprop

Non-Potable Water

Technology	Method	Analyte
GC/ECD	EPA 8151A	Dinoseb
GC/ECD	EPA 8151A	MCPA
GC/ECD	EPA 8151A	MCPP
GC/ECD	EPA 8151A	Pentachlorophenol
GC/ECD	EPA 8151A	Silvex (2, 4, 5-TP)
GC/FID	EPA 8015C/D MOD	Diesel range organics (DRO)
GC/FID	EPA 8015C/D MOD	Total Petroleum Hydrocarbon (TPH)
GC/FID	EPA 8015C/D MOD	Gasoline range organics (GRO)
GC/FID/PID	MA DEP VPH	Volatile Organic Hydrocarbons
GC/FID	MA DEP EPH	Extractable Petroleum Hydrocarbons
GC/FID	CT ETPH	Total Petroleum Hydrocarbons
GC/FID	TNRCC Method 1005	Total Petroleum Hydrocarbons
GC/FID	FL-PRO	Petroleum Range Organics
GC/ECD	EPA 8011 / 504	1, 2-Dibromoethane (EDB)
GC/ECD	EPA 8011 / 504	1, 2-Dibromo-3-chloropropane
GC/FID	RSK-175	Methane Ethane Ethene
GC/MS	EPA 8260B,C / 524.2	1, 1, 1, 2-Tetrachloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1, 1-Trichloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1, 2, 2-Tetrachloroethane
GC/MS	EPA 8260B,C	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1, 2-Trichloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1-Dichloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 1-Dichloroethene
GC/MS	EPA 8260B,C / 524.2	1, 1-Dichloropropene
GC/MS	EPA 8260B,C / 524.2	1, 2, 3-Trichlorobenzene
GC/MS	EPA 8260B,C / 524.2	1, 2, 3-Trichloropropane
GC/MS	EPA 8260B,C	1,2,3-Trimethylbenzene
GC/MS	EPA 8260B,C / 524.2	1, 2, 4-Trichlorobenzene
GC/MS	EPA 8260B,C / 524.2	1, 2, 4-Trimethylbenzene
GC/MS	EPA 8260B,C / 524.2	1, 2-Dibromo-3-chloropropane
GC/MS	EPA 8260B,C / 524.2	1, 2-Dibromoethane (EDB)

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 624 / 8260B,C / 524.2	1, 2-Dichlorobenzene
GC/MS	EPA 624 / 8260B,C / 524.2	1, 2-Dichloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 2-Dichloropropane
GC/MS	EPA 8260B,C	1,3,5-Trichlorobenzene
GC/MS	EPA 8260B,C / 524.2	1, 3, 5-Trimethylbenzene
GC/MS	EPA 624 / 8260B,C / 524.2	1, 3-Dichlorobenzene
GC/MS	EPA 8260B,C / 524.2	1, 3-Dichloropropane
GC/MS	EPA 624 / 8260B,C / 524.2	1, 4-Dichlorobenzene
GC/MS	EPA 8260B,C	1, 4-Dioxane
GC/MS	EPA 8260B,C	1-Chlorohexane
GC/MS	EPA 8260B,C / 524.2	2, 2-Dichloropropane
GC/MS	EPA 8260B,C / 524.2	2-Butanone
GC/MS	EPA 624 / 8260B,C	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B,C / 524.2	2-Chlorotoluene
GC/MS	EPA 8260B,C / 524.2	2-Hexanone
GC/MS	EPA 8260B,C / 524.2	4-Chlorotoluene
GC/MS	EPA 8260B,C / 524.2	4-Methyl-2-pentanone
GC/MS	EPA 8260B,C / 524.2	Acetone
GC/MS	EPA 8260B,C	Acetonitrile
GC/MS	EPA 624 / 8260B,C	Acrolein
GC/MS	EPA 624 / 8260B,C / 524.2	Acrylonitrile
GC/MS	EPA 8260B,C / 524.2	Allyl chloride
GC/MS	EPA 624 / 8260B,C / 524.2	Benzene
GC/MS	EPA 8260B,C	Benzyl chloride
GC/MS	EPA 8260B,C / 524.2	Bromobenzene
GC/MS	EPA 8260B,C / 524.2	Bromochloromethane
GC/MS	EPA 624 / 8260B,C / 524.2	Bromodichloromethane
GC/MS	EPA 624 / 8260B,C / 524.2	Bromoform
GC/MS	EPA 8260B,C / 524.2	Carbon disulfide
GC/MS	EPA 624 / 8260B,C / 524.2	Carbon tetrachloride
GC/MS	EPA 624 / 8260B,C / 524.2	Chlorobenzene

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 624 / 8260B,C / 524.2	Chloroethane
GC/MS	EPA 624 / 8260B,C / 524.2	Chloroform
GC/MS	EPA 8260B,C	Chloroprene
GC/MS	EPA 8260B,C / 524.2	cis-1, 2-Dichloroethene
GC/MS	EPA 624 / 8260B,C / 524.2	cis-1, 3-Dichloropropene
GC/MS	EPA 8260B,C	Cis-1,4-Dichloro-2-butene
GC/MS	EPA 8260B,C	Cyclohexane
GC/MS	EPA 624 / 8260B,C / 524.2	Dibromochloromethane
GC/MS	EPA 8260B,C / 524.2	Dibromomethane
GC/MS	EPA 624 / 8260B,C / 524.2	Dichlorodifluoromethane
GC/MS	EPA 8260B,C / 524.2	Diethyl ether
GC/MS	EPA 8260B,C	Di-isopropylether
GC/MS	EPA 8260B,C / 524.2	Ethyl methacrylate
GC/MS	EPA 624 / 8260B,C / 524.2	Ethylbenzene
GC/MS	EPA 8260B,C	Ethyl-t-butylether
GC/MS	EPA 8260B,C / 524.2	Hexachlorobutadiene
GC/MS	EPA 8260B,C	Iodomethane
GC/MS	EPA 8260B,C	Isobutyl alcohol
GC/MS	EPA 8260B,C	Isopropyl alcohol
GC/MS	EPA 8260B,C / 524.2	Isopropyl benzene
GC/MS	EPA 8260B,C / 524.2	m p-xylenes
GC/MS	EPA 8260B, C	Methyl acetate
GC/MS	EPA 8260B,C / 524.2	Methacrylonitrile
GC/MS	EPA 624 / 8260B,C	Methyl bromide (Bromomethane)
GC/MS	EPA 624 / 8260B,C / 524.2	Methyl chloride (Chloromethane)
GC/MS	EPA 8260B,C / 524.2	Methyl methacrylate
GC/MS	EPA 8260B,C / 524.2	Methyl tert-butyl ether
GC/MS	EPA 8260B,C	Methylcyclohexane
GC/MS	EPA 624 / 8260B,C / 524.2	Methylene chloride
GC/MS	EPA 8260B,C / 524.2	Naphthalene
GC/MS	EPA 8260B,C / 524.2	n-Butylbenzene

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 8260B,C / 524.2	n-Propylbenzene
GC/MS	EPA 8260B,C / 524.2	o-Xylene
GC/MS	EPA 8260B,C	Pentachloroethane
GC/MS	EPA 8260B,C / 524.2	p-Isopropyltoluene
GC/MS	EPA 8260B,C / 524.2	Propionitrile
GC/MS	EPA 8260B,C / 524.2	sec-butylbenzene
GC/MS	EPA 8260B,C / 524.2	Styrene
GC/MS	EPA 8260B,C	t-Amylmethylether
GC/MS	EPA 8260B,C / 524.2	tert-Butyl alcohol
GC/MS	EPA 8260B,C	tert-Butylbenzene
GC/MS	EPA 624 / 8260B,C / 524.2	Tetrachloroethene (Perchloroethylene)
GC/MS	EPA 8260B,C / 524.2	Tetrahydrofuran
GC/MS	EPA 624 / 8260B,C / 524.2	Toluene
GC/MS	EPA 624 / 8260B,C / 524.2	trans-1, 2-Dichloroethylene
GC/MS	EPA 624 / 8260B,C / 524.2	trans-1, 3-Dichloropropylene
GC/MS	EPA 8260B,C / 524.2	trans-1, 4-Dichloro-2-butuene
GC/MS	EPA 624 / 8260B,C / 524.2	Trichloroethene (Trichloroethylene)
GC/MS	EPA 624 / 8260B,C / 524.2	Trichlorofluoromethane
GC/MS	EPA 8260B,C	Vinyl acetate
GC/MS	EPA 624 / 8260B,C / 524.2	Vinyl chloride
GC/MS	EPA 624 / 8260B,C	Xylene
GC/MS	8260B,C SIM	1,1,1,2-Tetrachloroethane
GC/MS	8260B, C SIM	1,1,1-Trichloroethane
GC/MS	8260B,C SIM	1,1,2,2-Tetrachloroethane
GC/MS	8260B,C SIM	1, 1, 2-Trichloroethane
GC/MS	8260B,C SIM	1,2,3-Trichloropropane
GC/MS	8260B,C SIM	1,1-Dichloroethane
GC/MS	8260B,C SIM	1,1-Dichloroethene
GC/MS	8260B,C SIM	1,2,4-Trichlorobenzene
GC/MS	8260B,C SIM	1,2,4-Trimethylbenzene
GC/MS	8260B,C SIM	1,2-Dibromo-3-chloropropane

Non-Potable Water

Technology	Method	Analyte
GC/MS	8260B,C SIM	1,2-Dibromoethane
GC/MS	8260B,C SIM	1,2-Dichlorobenzene
GC/MS	8260B,C SIM	1,2-Dichloroethane
GC/MS	8260B,C SIM	1,2-Dichloropropane
GC/MS	8260B,C SIM	1,3-Dichlorobenzene
GC/MS	8260B,C SIM	1,3-Dichloropropane
GC/MS	8260B,C SIM	1,4-Dichlorobenzene
GC/MS	8260B,C SIM	2-Hexanone
GC/MS	8260B,C SIM	4-Methyl-2-pentanone
GC/MS	8260B,C SIM	Benzene
GC/MS	8260B,C SIM	Bromodichloromethane
GC/MS	8260B,C SIM	Carbon Tetrachloride
GC/MS	8260B,C SIM	Chloroform
GC/MS	8260B,C SIM	Chloromethane
GC/MS	8260B,C SIM	cis-1,2-Dichloroethene
GC/MS	8260B,C SIM	cis-1,3-Dichloropropene
GC/MS	8260B,C SIM	Dibromochloromethane
GC/MS	8260B,C SIM	Ethylbenzene
GC/MS	8260B,C SIM	Isopropylbenzene
GC/MS	8260B,C SIM	Hexachlorobutadiene
GC/MS	8260B,C SIM	Methylcyclohexane
GC/MS	8260B,C SIM	m,p-Xylene
GC/MS	8260B,C SIM	o-Xylene
GC/MS	8260B,C SIM	Tetrachloroethene
GC/MS	8260B,C SIM	trans-1,2-Dichloroethene
GC/MS	8260B,C SIM	Trans-1,3-Dichloropropene
GC/MS	8260B,C SIM	Trichloroethene
GC/MS	8260B,C SIM	Trichlorofluoromethane
GC/MS	8260B,C SIM	Vinyl Chloride
GC/MS	8260B,C SIM	Xylenes (total)
GC/MS	EPA 8270C,D	1, 2, 4, 5-Tetrachlorobenzene

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 625 / 8270C,D	1, 2, 4-Trichlorobenzene
GC/MS	EPA 625 / 8270C,D	1, 2-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 2-Diphenylhydrazine
GC/MS	EPA 8270C,D	1, 3, 5-Trinitrobenzene
GC/MS	EPA 625 / 8270C,D	1, 3-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 3-Dinitrobenzene
GC/MS	EPA 625 / 8270C,D	1, 4-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 4-Dioxane
GC/MS	EPA 8270C,D	1, 4-Naphthoquinone
GC/MS	EPA 8270C,D	1, 4-Phenylenediamine
GC/MS	EPA 8270C,D	1-Chloronaphthalene
GC/MS	EPA 8270C,D	1-Methylnaphthalene
GC/MS	EPA 8270C,D	1-Naphthylamine
GC/MS	EPA 8270C,D	2, 3, 4, 6-Tetrachlorophenol
GC/MS	EPA 8270C,D	2, 4, 5-Trochlorophenol
GC/MS	EPA 625 / 8270C,D	2, 4, 6-Trichlorophenol
GC/MS	EPA 625 / 8270C,D	2, 4-Dichlorophenol
GC/MS	EPA 625 / 8270C,D	2, 4-Dimethylphenol
GC/MS	EPA 625 / 8270C,D	2, 4-Dinitrophenol
GC/MS	EPA 625 / 8270C,D	2, 4-Dinitrotoluene (2, 4-DNT)
GC/MS	EPA 8270C,D	2, 6-Dichlorophenol
GC/MS	EPA 625 / 8270C,D	2, 6-Dinitrotoluene (2, 6-DNT)
GC/MS	EPA 8270C,D	2-Acetylaminofluorene
GC/MS	EPA 625 / 8270C,D	2-Chloronaphthalene
GC/MS	EPA 625 / 8270C,D	2-Chlorophenol
GC/MS	EPA 625 / 8270C,D	2-Methyl-4 6-dinitrophenol
GC/MS	EPA 8270C,D	2-Methylnaphthalene
GC/MS	EPA 8270C,D	2-Methylphenol
GC/MS	EPA 8270C,D	2-Naphthylamine
GC/MS	EPA 8270C,D	2-Nitroaniline
GC/MS	EPA 625 / 8270C,D	2-Nitrophenol

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	2-Picoline
GC/MS	EPA 8270C,D	3-Methylcholanthrene
GC/MS	EPA 8270C,D	3-Nitroaniline
GC/MS	EPA 8270C,D	4-Aminobiphenyl
GC/MS	EPA 625 / 8270C,D	4-Bromophenyl phenyl ether
GC/MS	EPA 625 / 8270C,D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C,D	4-Chloroaniline
GC/MS	EPA 625 / 8270C,D	4-Chlorophenyl phenylether
GC/MS	EPA 8270C,D	4-Dimethyl aminoazobenzene
GC/MS	EPA 8270C,D	3, 4-Methylphenol
GC/MS	EPA 8270C,D	4-Nitroaniline
GC/MS	EPA 625 / 8270C,D	4-Nitrophenol
GC/MS	EPA 8270C,D	4-Nitroquinoline-1-oxide
GC/MS	EPA 8270C,D	5-Nitro-o-toluidine
GC/MS	EPA 8270C,D	7, 12-Dimethylbenz(a)anthracene
GC/MS	EPA 8270C,D	a a-Dimethylphenethylamine
GC/MS	EPA 625 / 8270C,D	Acenaphthene
GC/MS	EPA 625 / 8270C,D	Acenaphthylene
GC/MS	EPA 8270C,D	Acetophenone
GC/MS	EPA 8270C,D	Aniline
GC/MS	EPA 625 / 8270C,D	Anthracene
GC/MS	EPA 8270C,D	Aramite
GC/MS	EPA 8270C,D	Atrazine
GC/MS	EPA 8270C,D	Azobenzene
GC/MS	EPA 8270C,D	Benzaldehyde
GC/MS	EPA 625 / 8270C,D	Benzidine
GC/MS	EPA 625 / 8270C,D	Benzo(a)anthracene
GC/MS	EPA 625 / 8270C,D	Benzo(a)pyrene
GC/MS	EPA 625 / 8270C,D	Benzo(b)fluoranthene
GC/MS	EPA 625 / 8270C,D	Benzo(g h i)perylene
GC/MS	EPA 625 / 8270C,D	Benzo(k)fluoranthene

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 8270C,D	Benzoic Acid
GC/MS	EPA 8270C,D	Benzyl alcohol
GC/MS	EPA 8270C,D	1,1-Biphenyl
GC/MS	EPA 625 / 8270C,D	bis(2-Chloroethoxy)methane
GC/MS	EPA 625 / 8270C,D	bis(2-Chloroethyl) ether
GC/MS	EPA 625 / 8270C,D	bis(2-Chloroisopropyl) ether (2, 2`-Oxybis(1-chloropropane)
GC/MS	EPA 625 / 8270C,D	bis(2-Ethylhexyl)adipate
GC/MS	EPA 625 / 8270C,D	bis(2-Ethylhexyl) phthalate (DEHP)
GC/MS	EPA 625 / 8270C,D	Butyl benzyl phthalate
GC/MS	EPA 8270C,D	Caprolactam
GC/MS	EPA 8270C,D	Carbazole
GC/MS	EPA 8270C,D	Chlorobenzilate
GC/MS	EPA 625 / 8270C,D	Chrysene
GC/MS	EPA 8270C,D	Diallate
GC/MS	EPA 8270C,D	Dibenzo(a,j)acridine
GC/MS	EPA 625 / 8270C,D	Dibenz(a h)anthracene
GC/MS	EPA 8270C,D	Dibenzofuran
GC/MS	EPA 8270C,D	Diethyladipate
GC/MS	EPA 625 / 8270C,D	Diethyl phthalate
GC/MS	EPA 8270C,D	Dimethoate
GC/MS	EPA 625 / 8270C,D	Dimethyl phthalate
GC/MS	EPA 625 / 8270C,D	Di-n-butyl phthalate
GC/MS	EPA 625 / 8270C,D	Di-n-octyl phthalate
GC/MS	EPA 8270C,D	Dinoseb
GC/MS	EPA 8270C,D	Disulfoton
GC/MS	EPA 8270C,D	Ethyl methanesulfonate
GC/MS	EPA 8270C,D	Ethyl parathion
GC/MS	EPA 8270C,D	Ethyl methacrylate
GC/MS	EPA 8270C,D	Famfur
GC/MS	EPA 625 / 8270C,D	Fluoranthene
GC/MS	EPA 625 / 8270C,D	Fluorene

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 625 / 8270C,D	Hexachlorobenzene
GC/MS	EPA 625 / 8270C,D	Hexachlorobutadiene
GC/MS	EPA 625 / 8270C,D	Hexachlorocyclopentadiene
GC/MS	EPA 625 / 8270C,D	Hexachloroethane
GC/MS	EPA 8270C,D	Hexachlorophene
GC/MS	EPA 8270C,D	Hexachloropropene
GC/MS	EPA 625 / 8270C,D	Indeno(1, 2, 3-cd)pyrene
GC/MS	EPA 8270C,D	Isodrin
GC/MS	EPA 625 / 8270C,D	Isophorone
GC/MS	EPA 8270C,D	Isosafrole
GC/MS	EPA 8270C,D	Kepone
GC/MS	EPA 8270C,D	Methapyriline
GC/MS	EPA 8270C,D	Methy methanesulfonate
GC/MS	EPA 8270C,D	Methyl parathion
GC/MS	EPA 625 / 8270C,D	Naphthalene
GC/MS	EPA 625 / 8270C,D	Nitrobenzene
GC/MS	EPA 8270C,D	Nitroquinoline-1-oxide
GC/MS	EPA 8270C,D	n-Nitrosodiethylamine
GC/MS	EPA 625 / 8270C,D	n-Nitrosodimethylamine
GC/MS	EPA 8270C,D	n-Nitroso-di-n-butylamine
GC/MS	EPA 625 / 8270C,D	n-Nitrosodi-n-propylamine
GC/MS	EPA 625 / 8270C,D	n-Nitrosodiphenylamine
GC/MS	EPA 8270C,D	n-Nitrosomethylethylamine
GC/MS	EPA 8270C,D	n-Nitrosomorpholine
GC/MS	EPA 8270C,D	n-Nitrosopiperidine
GC/MS	EPA 8270C,D	n-Nitrosopyrrolidine
GC/MS	EPA 8270C,D	O,O,O-Triethyl phosphorothioate
GC/MS	EPA 8270C,D	o,o-Diethyl o-2pyrazinyl phosphorothioate
GC/MS	EPA 8270C,D	o-Toluidine
GC/MS	EPA 8270C,D	Pentachlorobenzene
GC/MS	EPA 8270C,D	Pentachloronitrobenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 625 / 8270C,D	Pentachlorophenol
GC/MS	EPA 8270C,D	Phenacetin
GC/MS	EPA 625 / 8270C,D	Phenanthrene
GC/MS	EPA 625 / 8270C,D	Phenol
GC/MS	EPA 8270C,D	Phorate
GC/MS	EPA 8270C,D	Pronamide
GC/MS	EPA 625 / 8270C,D	Pyrene
GC/MS	EPA 8270C,D	Pyridine
GC/MS	EPA 8270C,D	Safrole
GC/MS	EPA 8270C,D	Sulfotepp
GC/MS	EPA 8270C,D	Thionazin
GC/MS	EPA 625 / 8270C,D	3, 3’-Dichlorobenzidine
GC/MS	EPA 8270C,D	3, 3’-Dimethylbenzidine
GC/MS	EPA 8270C,D SIM	1,1'-Biphenyl
GC/MS	EPA 8270C,D SIM	1,2,4,5-Tetrachlorobenzene
GC/MS	EPA 8270C,D SIM	1,4-Dioxane
GC/MS	EPA 8270C,D SIM	1-Methylnaphthalene
GC/MS	EPA 8270C,D SIM	2,2'-Oxybis(1-chloropropane
GC/MS	EPA 8270C,D SIM	2,3,4,6-Tetrachlorophenol
GC/MS	EPA 8270C,D SIM	2,4,5-Trichlorophenol
GC/MS	EPA 8270C,D SIM	2,4,6-Trichlorophenol
GC/MS	EPA 8270C,D SIM	2,4-Dichlorophenol
GC/MS	EPA 8270C,D SIM	2,4-Dimethylphenol
GC/MS	EPA 8270C,D SIM	2,4-Dinitrophenol
GC/MS	EPA 8270C,D SIM	2,4-Dinitrotoluene
GC/MS	EPA 8270C,D SIM	2,6-Dinitrotoluene
GC/MS	EPA 8270C,D SIM	2-Chloronaphthalene
GC/MS	EPA 8270C,D SIM	2-Chlorophenol
GC/MS	EPA 8270C,D SIM	2-Methylnaphthalene
GC/MS	EPA 8270C,D SIM	2-Methylphenol
GC/MS	EPA 8270C,D SIM	2-Nitroaniline

Non-Potable Water		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D SIM	2-Nitrophenol
GC/MS	EPA 8270C,D SIM	3&4-Methylphenol
GC/MS	EPA 8270C,D SIM	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C,D SIM	3-Nitroaniline
GC/MS	EPA 8270C,D SIM	4,6-Dinitro-2-methylphenol
GC/MS	EPA 8270C,D SIM	4-Bromophenyl-phenylether
GC/MS	EPA 8270C,D SIM	4-Chloro-3-methylphenol
GC/MS	EPA 8270C,D SIM	4-Chloroaniline
GC/MS	EPA 8270C,D SIM	4-Chlorophenyl-phenylether
GC/MS	EPA 8270C,D SIM	4-Nitroaniline
GC/MS	EPA 8270C,D SIM	4-Nitrophenol
GC/MS	EPA 8270C,D SIM	Acenaphthene
GC/MS	EPA 8270C,D SIM	Acenaphthylene
GC/MS	EPA 8270C,D SIM	Acetophenone
GC/MS	EPA 8270C,D SIM	Anthracene
GC/MS	EPA 8270C,D SIM	Atrazine
GC/MS	EPA 8270C,D SIM	Benzaldehyde
GC/MS	EPA 8270C,D SIM	Benzo(a)anthracene
GC/MS	EPA 8270C,D SIM	Benzo(a)pyrene
GC/MS	EPA 8270C,D SIM	Benzo(b)fluoranthene
GC/MS	EPA 8270C,D SIM	Benzo(g,h,i)perylene
GC/MS	EPA 8270C,D SIM	Benzo(k)fluoranthene
GC/MS	EPA 8270C,D SIM	Bis(2-chloroethoxy)methane
GC/MS	EPA 8270C,D SIM	Bis(2-chloroethyl)ether
GC/MS	EPA 8270C,D SIM	Bis(2-ethylhexyl)phthalate
GC/MS	EPA 8270C,D SIM	Butylbenzylphthalate
GC/MS	EPA 8270C,D SIM	Caprolactam
GC/MS	EPA 8270C,D SIM	Carbazole
GC/MS	EPA 8270C,D SIM	Chrysene
GC/MS	EPA 8270C,D SIM	Dibenzo(a,h)anthracene
GC/MS	EPA 8270C,D SIM	Dibenzofuran

Non-Potable Water

Technology	Method	Analyte
GC/MS	EPA 8270C,D SIM	Diethylphthalate
GC/MS	EPA 8270C,D SIM	Dimethyl phthalate
GC/MS	EPA 8270C,D SIM	Di-n-butylphthalate
GC/MS	EPA 8270C,D SIM	Di-n-octylphthalate
GC/MS	EPA 8270C,D SIM	Fluoranthene
GC/MS	EPA 8270C,D SIM	Fluorene
GC/MS	EPA 8270C,D SIM	Hexachlorobenzene
GC/MS	EPA 8270C,D SIM	Hexachlorobutadiene
GC/MS	EPA 8270C,D SIM	Hexachlorocyclopentadiene
GC/MS	EPA 8270C,D SIM	Hexachloroethane
GC/MS	EPA 8270C,D SIM	Indeno(1,2,3-cd)pyrene
GC/MS	EPA 8270C,D SIM	Isophorone
GC/MS	EPA 8270C,D SIM	Naphthalene
GC/MS	EPA 8270C,D SIM	Nitrobenzene
GC/MS	EPA 8270C,D SIM	n-Nitroso-di-n-propylamine
GC/MS	EPA 8270C,D SIM	n-Nitrosodiphenylamine
GC/MS	EPA 8270C,D SIM	Pentachlorophenol
GC/MS	EPA 8270C,D SIM	Phenanthrene
GC/MS	EPA 8270C,D SIM	Phenol
GC/MS	EPA 8270C,D SIM	Pyrene
HPLC/UV	EPA 8330A/8330B	1, 3, 5-Trinitrobenzene
HPLC/UV	EPA 8330A/8330B	1, 3-Dinitrobenzene
HPLC/UV	EPA 8330A/8330B	2, 4, 6-Trinitrotoluene
HPLC/UV	EPA 8330A/8330B	2, 4-Dinitrotoluene
HPLC/UV	EPA 8330A/8330B	2, 6-Dinitrotoluene
HPLC/UV	EPA 8330A/8330B	2-Amino-4, 6 -Dinitrotoluene
HPLC/UV	EPA 8330A/8330B	2-Nitrotoluene
HPLC/UV	EPA 8330A/8330B	3-Nitrotoluene
HPLC/UV	EPA 8330A/8330B	3,5-Dinitroaniline
HPLC/UV	EPA 8330A/8330B	4-Amino-2, 6-Dinitrotoluene
HPLC/UV	EPA 8330A/8330B	4-Nitrotoluene

Non-Potable Water		
Technology	**Method**	**Analyte**
HPLC/UV	EPA 8330A/8330B	Ethylene glycol dinitrate (EGDN)
HPLC/UV	EPA 8330A/8330B	Hexahydro-1, 3, 5-trinitro-1, 3, 5-triazine (RDX)
HPLC/UV	EPA 8330A/8330B	Nitrobenzene
HPLC/UV	EPA 8330A MOD	Nitroglycerin
HPLC/UV	EPA 8330B	Nitroglycerin
HPLC/UV	EPA 8330A/8330B	Octahydro-1, 3, 5, 7-tetrazocine (HMX)
HPLC/UV	EPA 8330A/8330B	Pentaerythritol Tetranitrate (PETN)
HPLC/UV	EPA 8330A/8330B	Tetryl
CVAA	EPA 245.1 / 7470A	Mercury
CVAF	EPA 1631E	Low Level Mercury
ICP/AES	EPA 200.7 / 6010B,C	Aluminum
ICP/AES	EPA 200.7 / 6010B,C	Antimony
ICP/AES	EPA 200.7 / 6010B,C	Arsenic
ICP/AES	EPA 200.7 / 6010B,C	Barium
ICP/AES	EPA 200.7 / 6010B,C	Beryllium
ICP/AES	EPA 200.7 / 6010B,C	Boron
ICP/AES	EPA 200.7 / 6010B,C	Cadmium
ICP/AES	EPA 200.7 / 6010B,C	Calcium
ICP/AES	EPA 200.7 / 6010B,C	Chromium
ICP/AES	EPA 200.7 / 6010B,C	Cobalt
ICP/AES	EPA 200.7 / 6010B,C	Copper
ICP/AES	EPA 200.7 / 6010B,C	Iron
ICP/AES	EPA 200.7 / 6010B,C	Lead
ICP/AES	EPA 200.7 / 6010B,C	Magnesium
ICP/AES	EPA 200.7 / 6010B,C	Manganese
ICP/AES	EPA 200.7 / 6010B,C	Molybdenum
ICP/AES	EPA 200.7 / 6010B,C	Nickel
ICP/AES	EPA 200.7 / 6010B,C	Potassium
ICP/AES	EPA 200.7 / 6010B,C	Selenium
ICP/AES	EPA 200.7 / 6010B,C	Silicon
ICP/AES	EPA 200.7 / 6010B,C	Silver

Non-Potable Water

Technology	Method	Analyte
ICP/AES	EPA 200.7 / 6010B,C	Sodium
ICP/AES	EPA 6010B,C	Strontium
ICP/AES	EPA 200.7 / 6010B,C	Thallium
ICP/AES	EPA 200.7 / 6010B,C	Tin
ICP/AES	EPA 200.7 / 6010B,C	Titanium
ICP/AES	EPA 200.7 / 6010B,C	Vanadium
ICP/AES	EPA 200.7 / 6010B,C	Zinc
ICP/MS	EPA 200.8 / 6020A	Aluminum
ICP/MS	EPA 200.8 / 6020A	Antimony
ICP/MS	EPA 200.8 / 6020A	Arsenic
ICP/MS	EPA 200.8 / 6020A	Barium
ICP/MS	EPA 200.8 / 6020A	Beryllium
ICP/MS	EPA 200.8 / 6020A	Boron
ICP/MS	EPA 200.8 / 6020A	Cadmium
ICP/MS	EPA 200.8 / 6020A	Calcium
ICP/MS	EPA 200.8 / 6020A	Chromium
ICP/MS	EPA 200.8 / 6020A	Cobalt
ICP/MS	EPA 200.8 / 6020A	Copper
ICP/MS	EPA 200.8 / 6020A	Iron
ICP/MS	EPA 200.8 / 6020A	Lead
ICP/MS	EPA 200.8 / 6020A	Magnesium
ICP/MS	EPA 200.8 / 6020A	Manganese
ICP/MS	EPA 200.8 / 6020A	Molybdenum
ICP/MS	EPA 200.8 / 6020A	Nickel
ICP/MS	EPA 200.8 / 6020A	Potassium
ICP/MS	EPA 200.8 / 6020A	Selenium
ICP/MS	EPA 200.8 / 6020A	Silicon
ICP/MS	EPA 200.8 / 6020A	Silver
ICP/MS	EPA 200.8 / 6020A	Sodium
ICP/MS	EPA 6020A	Strontium
ICP/MS	EPA 200.8 / 6020A	Thallium

Non-Potable Water

Technology	Method	Analyte
ICP/MS	EPA 200.8 / 6020A	Tin
ICP/MS	EPA 200.8 / 6020A	Titanium
ICP/MS	EPA 200.8 / 6020A	Tungsten
ICP/MS	EPA 200.8	Uranium
ICP/MS	EPA 200.8 / 6020A	Vanadium
ICP/MS	EPA 200.8 / 6020A	Zinc
IC	EPA 300.0 / 9056A	Bromide
IC	EPA 300.0 / 9056A	Chloride
IC	EPA 300.0 / 9056A	Fluoride
IC	EPA 300.0 / 9056A	Nitrate as N
IC	EPA 300.0 / 9056A	Nitrite as N
IC	EPA 300.0 / 9056A	Nitrate + Nitrite
IC	EPA 300.0 / 9056A	Orthophosphate as P
IC	EPA 300.0 / 9056A	Sulfate
IC	SOP CA-776	Lactic Acid
IC	SOP CA-776	Acetic Acid
IC	SOP CA-776	Propionic Acid
IC	SOP CA-776	Formic Acid
IC	SOP CA-776	Butyric Acid
IC	SOP CA-776	Pyruvic Acid
IC	SOP CA-776	i-Pentanoic Acid
IC	SOP CA-776	Pentanoic Acid
IC	SOP CA-776	i-Hexanoic Acid
IC	SOP CA-776	Hexanoic Acid
Titration	EPA 310.1 / SM 2320B	Alkalinity
Caculation	SM 2340B	Hardness
Gravimetric	EPA 1664A / EPA 9070A	Oil and Grease, Oil and Grease with SGT
Gravimetric	SM 2540B,C,D	Solids
ISE	EPA 120.1 / SM 2510B	Conductivity
ISE	SM 2520B	Practical Salinity
ISE	SM 4500F- C	Fluoride

Non-Potable Water

Technology	Method	Analyte
ISE	SM 4500H+ B	pH
ISE	SM 5210B	TBOD / CBOD
Physical	EPA 1010A	Ignitability
Physical	EPA 9040C	pH
Titration	SM 2340C	Hardness
Titration	SM 4500SO_3 B	Sulfite
Titration	EPA 9034 / SM 4500S^{2-} F	Sulfide
Titration	Chap. 7.3.4	Reactive Sulfide
IR	EPA 9060A / SM 5310B	Total organic carbon
Turbidimetric	EPA 180.1 / SM 2130B	Turbidity
Turbidimetric	EPA 9038 / ASTM 516-02	Sulfate
UV/VIS	EPA 335.4 / EPA 9012B / SM 4500-CN G	Amenable cyanide
UV/VIS	EPA 350.1 / SM 4500NH3 H	Ammonia as N
UV/VIS	SM 3500Fe D	Ferrous Iron
UV/VIS	EPA 351.2	Kjeldahl nitrogen - total
UV/VIS	EPA 353.2 / SM 4500NO3 F	Nitrate + Nitrite
UV/VIS	EPA 353.2 / SM 4500NO3 F	Nitrate as N
UV/VIS	EPA 353.2 / SM 4500NO3 F	Nitrite as N
UV/VIS	EPA 365.2 / SM 4500P E	Orthophosphate as P
UV/VIS	EPA 365.4	Phosphorus total
UV/VIS	EPA 821/R-91-100	AVS-SEM
UV/VIS	EPA 410.4	COD
UV/VIS	EPA 420.1 / 9065	Total Phenolics
UV/VIS	SM 4500Cl G	Total Residual Chlorine
UV/VIS	SM 5540C	MBAS
UV/VIS	EPA 7196A / SM 3500-Cr D	Chromium VI
UV/VIS	EPA 9012B / 335.4	Total Cyanide
UV/VIS	EPA 9251 / SM 4500Cl E	Chloride
UV/VIS	Chap. 7.3.4	Reactive Cyanide

Preparation	Method	Type
Cleanup Methods	EPA 3640A	Gel Permeation Clean-up
Cleanup Methods	EPA 3630C	Silica Gel
Cleanup Methods	EPA 3660B	Sulfur Clean-Up
Cleanup Methods	EPA 3665A	Sulfuric Acid Clean-Up
Organic Preparation	EPA 3510C	Separatory Funnel Extraction
Organic Preparation	EPA 3520C	Continuous Liquid-Liquid Extraction
Inorganic Preparation	EPA 3010A	Hotblock
Volatile Organic Preparation	EPA 5030C	Purge and Trap

Solid and Chemical Waste

Technology	Method	Analyte
GC/ECD	8081B	2,4`-DDD
GC/ECD	8081B	2,4`-DDE
GC/ECD	8081B	2,4`-DDT
GC/ECD	EPA 8081B	4, 4`-DDD
GC/ECD	EPA 8081B	4, 4`-DDE
GC/ECD	EPA 8081B	4, 4`-DDT
GC/ECD	EPA 8081B	Aldrin
GC/ECD	EPA 8081B	alpha-BHC (alpha-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	Alpha-Chlordane
GC/ECD	EPA 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC/ECD	EPA 608 / 8081B	Chlordane (tech.)
GC/ECD	8081B	Cis-Nonachlor
GC/ECD	EPA 8081B	delta-BHC
GC/ECD	EPA 8081B	Dieldrin
GC/ECD	EPA 8081B	Endosulfan I
GC/ECD	EPA 8081B	Endosulfan II
GC/ECD	EPA 8081B	Endosulfan sulfate

Solid and Chemical Waste

Technology	Method	Analyte
GC/ECD	EPA 8081B	Endrin
GC/ECD	EPA 8081B	Endrin aldehyde
GC/ECD	EPA 8081B	Endrin Ketone
GC/ECD	EPA 8081B	gamma-BHC (Lindane gamma-Hexachlorocyclohexane)
GC/ECD	EPA 8081B	gamma-Chlordane
GC/ECD	EPA 8081B	Heptachlor
GC/ECD	EPA 8081B	Heptachlor epoxide
GC/ECD	8081B	Hexachlorobenzene
GC/ECD	EPA 8081B	Methoxychlor
GC/ECD	8081B	Mirex
GC/ECD	8081B	Oxychlordane
GC/ECD	EPA 8081B	Toxaphene (Chlorinated camphene)
GC/ECD	8081B	Trans-Nonachlor
GC/ECD	EPA 8082A	Aroclor-1016 (PCB-1016)
GC/ECD	EPA 8082A	Aroclor-1221 (PCB-1221)
GC/ECD	EPA 8082A	Aroclor-1232 (PCB-1232)
GC/ECD	EPA 8082A	Aroclor-1242 (PCB-1242)
GC/ECD	EPA 8082A	Aroclor-1248 (PCB-1248)
GC/ECD	EPA 8082A	Aroclor-1254 (PCB-1254)
GC/ECD	EPA 8082A	Aroclor-1260 (PCB-1260)
GC/ECD	EPA 8082A MOD	Aroclor-1262 (PCB-1262)
GC/ECD	EPA 8082A MOD	Aroclor-1268 (PCB-1268)
GC/ECD	EPA 8082A	2, 2', 3, 3', 4, 4', 5, 5', 6-Nonachlorobiphenyl (BZ 206)
GC/ECD	EPA 8082A	2, 2', 3, 3', 4, 4', 5, 6-Octachlorobiphenyl (BZ 195)
GC/ECD	EPA 8082A	2, 2', 3, 3', 4, 4', 5-Heptachlorobiphenyl (BZ 170)
GC/ECD	EPA 8082A	2, 2', 3, 3', 4, 4'-Hexachlorobiphenyl (BZ 128)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5, 5'-Heptachlorobiphenyl (BZ 180)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5', 6-Heptachlorobiphenyl (BZ 183)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 5-Hexachlorobiphenyl (BZ 138)
GC/ECD	EPA 8082A	2, 2', 3, 4, 4', 6, 6'-Heptachlorobiphenyl (BZ 184)
GC/ECD	EPA 8082A	2, 2', 3, 4', 5, 5', 6-Heptachlorobiphenyl (BZ 187)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/ECD	EPA 8082A	2, 2', 3, 4, 5'-Pentachlorobiphenyl (BZ 87)
GC/ECD	EPA 8082A	2, 2', 3, 5'-Tetrachlorobiphenyl (BZ 44)
GC/ECD	EPA 8082A	2, 2', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 153)
GC/ECD	EPA 8082A	2, 2', 4, 5, 5'-Pentachlorobiphenyl (BZ 101)
GC/ECD	EPA 8082A	2, 2', 4, 5-Tetrachlorobiphenyl (BZ 48)
GC/ECD	EPA 8082A	2, 2', 4, 5’-Tetrachlorobiphenyl (BZ 49)
GC/ECD	EPA 8082A	2, 2', 5, 5'-Tetrachlorobiphenyl (BZ 52)
GC/ECD	EPA 8082A	2, 2', 5-Trichlorobiphenyl (BZ 18)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5-Hexachlorobiphenyl (BZ 156)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4', 5'-Hexachlorobiphenyl (BZ 157)
GC/ECD	EPA 8082A	2, 3, 3', 4, 4'-Pentachlorobiphenyl (BZ 105)
GC/ECD	EPA 8082A	2, 3, 3’, 4, 4’, 5, 5’-Heptachlorobiphenyl (BZ 189)
GC/ECD	EPA 8082A	2, 3', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 167)
GC/ECD	EPA 8082A	2, 3', 4, 4', 5-Pentachlorobiphenyl (BZ 118)
GC/ECD	EPA 8082A	2, 3', 4, 4',5’-Pentachlorobiphenyl (BZ 123)
GC/ECD	EPA 8082A	2, 3', 4, 4'-Tetrachlorobiphenyl (BZ 66)
GC/ECD	EPA 8082A	2, 3, 4, 4’, 5-Pentachlorobiphenyl (BZ 114)
GC/ECD	EPA 8082A	2, 4, 4'-Trichlorobiphenyl (BZ 28)
GC/ECD	EPA 8082A	2, 4'-Dichlorobiphenyl (BZ 8)
GC/ECD	EPA 8082A	3, 3', 4, 4', 5, 5'-Hexachlorobiphenyl (BZ 169)
GC/ECD	EPA 8082A	3, 3', 4, 4', 5-Pentachlorobiphenyl (BZ 126)
GC/ECD	EPA 8082A	3, 3', 4, 4'-Tetrachlorobiphenyl (BZ 77)
GC/ECD	EPA 8082A	3, 4, 4’, 5-Tetrachlorobiphenyl (BZ 81)
GC/ECD	EPA 8082A	Decachlorobiphenyl (BZ 209)
GC/ECD	EPA 8151A	2, 4, 5-T
GC/ECD	EPA 8151A	2, 4-D
GC/ECD	EPA 8151A	2, 4-DB
GC/ECD	EPA 8151A	Dalapon
GC/ECD	EPA 8151A	Dicamba
GC/ECD	EPA 8151A	Dichloroprop
GC/ECD	EPA 8151A	Dinoseb

Solid and Chemical Waste

Technology	Method	Analyte
GC/ECD	EPA 8151A	MCPA
GC/ECD	EPA 8151A	MCPP
GC/ECD	EPA 8151A	Pentachlorophenol
GC/ECD	EPA 8151A	Silvex (2, 4, 5-TP)
GC/FID	EPA 8015C/D	Diesel range organics (DRO)
GC/FID	EPA 8015C/D	Total Petroleum Hydrocarbons (TPH)
GC/FID	EPA 8015C/D	Gasoline range organics (GRO)
GC/FID/PID	MA DEP VPH	Volatile Organic Hydrocarbons
GC/FID	MA DEP EPH	Extractable Petroleum Hydrocarbons
GC/FID	MA DEP EPH EPA 3546	Extractable Petroleum Hydrocarbons Microwave Extraction Preparation
GC/FID	CT-ETPH	Total Petroleum Hydrocarbons
GC/FID	TNRCC Method 1005	Total Petroleum Hydrocarbons
GC/FID	FL-PRO	Petroleum Range Organics
GC/ECD	EPA 8011	1, 2-Dibromoethane (EDB)
GC/ECD	EPA 8011	1, 2-Dibromo-3-chloropropane
GC/MS	EPA 8260B,C	1, 1, 1, 2-Tetrachloroethane
GC/MS	EPA 8260B,C	1,1,2-Trichloro-1,2,2-trifluoroethane
GC/MS	EPA 8260B,C	1, 1, 1-Trichloroethane
GC/MS	EPA 8260B,C	1, 1, 2, 2-Tetrachloroethane
GC/MS	EPA 8260B,C	1, 1, 2-Trichloroethane
GC/MS	EPA 8260B,C	1, 1-Dichloroethane
GC/MS	EPA 8260B,C	1, 1-Dichloroethylene
GC/MS	EPA 8260B,C	1, 1-Dichloropropene
GC/MS	EPA 8260B,C	1, 2, 3-Trichlorobenzene
GC/MS	EPA 8260B,C	1, 2, 3-Trichloropropane
GC/MS	EPA 8260B,C	1,2,3-Trimethylbenzene
GC/MS	EPA 8260B,C	1, 2, 4-Trichlorobenzene
GC/MS	EPA 8260B,C	1, 2, 4-Trimethylbenzene
GC/MS	EPA 8260B,C	1, 2-Dibromo-3-chloropropane
GC/MS	EPA 8260B,C	1, 2-Dibromoethane
GC/MS	EPA 8260B,C	1, 2-Dichlorobenzene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B,C	1, 2-Dichloroethane
GC/MS	EPA 8260B,C	1, 2-Dichloropropane
GC/MS	EPA 8260B,C	1,3,5-Trichlorobenzene
GC/MS	EPA 8260B,C	1, 3, 5-Trimethylbenzene
GC/MS	EPA 8260B,C	1, 3-Dichlorobenzene
GC/MS	EPA 8260B,C	1, 3-Dichloropropane
GC/MS	EPA 8260B,C	1, 4-Dichlorobenzene
GC/MS	EPA 8260B,C	1, 4-Dioxane
GC/MS	EPA 8260B,C	1-Chlorohexane
GC/MS	EPA 8260B,C	2, 2-Dichloropropane
GC/MS	EPA 8260B,C	2-Butanone
GC/MS	EPA 8260B,C	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B,C	2-Chlorotoluene
GC/MS	EPA 8260B,C	2-Hexanone
GC/MS	EPA 8260B,C	4-Chlorotoluene
GC/MS	EPA 8260B,C	4-Methyl-2-pentanone
GC/MS	EPA 8260B,C	Acetone
GC/MS	EPA 8260B,C	Acetonitrile
GC/MS	EPA 8260B,C	Acrolein
GC/MS	EPA 8260B,C	Acrylonitrile
GC/MS	EPA 8260B,C	Allyl chloride
GC/MS	EPA 8260B,C	Benzene
GC/MS	EPA 8260B,C	Benzyl chloride
GC/MS	EPA 8260B,C	Bromobenzene
GC/MS	EPA 8260B,C	Bromochloromethane
GC/MS	EPA 8260B,C	Bromodichloromethane
GC/MS	EPA 8260B,C	Bromoform
GC/MS	EPA 8260B,C	Carbon disulfide
GC/MS	EPA 8260B,C	Carbon tetrachloride
GC/MS	EPA 8260B,C	Chlorobenzene
GC/MS	EPA 8260B,C	Chloroethane

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8260B,C	Chloroform
GC/MS	EPA 8260B,C	Chloroprene
GC/MS	EPA 8260B,C	cis-1, 2-Dichloroethene
GC/MS	EPA 8260B,C	cis-1, 3-Dichloropropene
GC/MS	EPA 8260B,C	cis-1,3-Dichloro-2-butene
GC/MS	EPA 8260B,C	Cyclohexane
GC/MS	EPA 8260B,C	Dibromochloromethane
GC/MS	EPA 8260B,C	Dibromomethane
GC/MS	EPA 8260B,C	Dichlorodifluoromethane
GC/MS	EPA 8260B,C	Diethyl ether
GC/MS	EPA 8260B,C	Di-isopropylether
GC/MS	EPA 8260B,C	1,2-Dibromoethane (EDB)
GC/MS	EPA 8260B,C	Ethyl methacrylate
GC/MS	EPA 8260B,C	Ethylbenzene
GC/MS	EPA 8260B,C	Ethyl-t-butylether
GC/MS	EPA 8260B,C	Hexachlorobutadiene
GC/MS	EPA 8260B,C	Iodomethane
GC/MS	EPA 8260B,C	Isobutyl alcohol
GC/MS	EPA 8260B,C	Isopropyl alcohol
GC/MS	EPA 8260B,C	Isopropyl benzene
GC/MS	EPA 8260B,C	m p-xylenes
GC/MS	EPA 8260B, C	Methyl acetate
GC/MS	EPA 8260B,C	Methacrylonitrile
GC/MS	EPA 8260B,C	Methyl bromide (Bromomethane)
GC/MS	EPA 8260B,C	Methyl chloride (Chloromethane)
GC/MS	EPA 8260B,C	Methyl methacrylate
GC/MS	EPA 8260B,C	Methyl tert-butyl ether
GC/MS	EPA 8260B,C	Methylcyclohexane
GC/MS	EPA 8260B,C	Methylene chloride
GC/MS	EPA 8260B,C	Naphthalene
GC/MS	EPA 8260B,C	n-Butylbenzene

Solid and Chemical Waste

Technology	Method	Analyte
GC/MS	EPA 8260B,C	n-proplybenzene
GC/MS	EPA 8260B,C	o-Xylene
GC/MS	EPA 8260B,C	pentachloroethane
GC/MS	EPA 8260B,C	p-Isopropyltoluene
GC/MS	EPA 8260B,C	Propionitrile
GC/MS	EPA 8260B,C	sec-butylbenzene
GC/MS	EPA 8260B,C	Styrene
GC/MS	EPA 8260B,C	t-Amylmethylether
GC/MS	EPA 8260B,C	tert-Butyl alcohol
GC/MS	EPA 8260B,C	tert-Butylbenzene
GC/MS	EPA 8260B,C	Tetrachloroethylene (Perchloroethylene)
GC/MS	EPA 8260B,C	Tetrahydrofuran
GC/MS	EPA 8260B,C	Toluene
GC/MS	EPA 8260B,C	trans-1, 2-Dichloroethylene
GC/MS	EPA 8260B,C	trans-1, 3-Dichloropropylene
GC/MS	EPA 8260B,C	Trans-1, 4-Dichloro-2-butuene
GC/MS	EPA 8260B,C	Trichloroethene (Trichloroethylene)
GC/MS	EPA 8260B,C	Trichlorofluoromethane
GC/MS	EPA 8260B,C	Vinyl acetate
GC/MS	EPA 8260B,C	Vinyl chloride
GC/MS	EPA 8260B,C	Xylene
GC/MS	8260B,C SIM	1,1,1,2-Tetrachloroethane
GC/MS	8260B, C SIM	1,1,1-Trichloroethane
GC/MS	8260B,C SIM	1,1,2,2-Tetrachloroethane
GC/MS	8260B,C SIM	1, 1, 2-Trichloroethane
GC/MS	8260B,C SIM	1,2,3-Trichloropropane
GC/MS	8260B,C SIM	1,1-Dichloroethane
GC/MS	8260B,C SIM	1,1-Dichloroethene
GC/MS	8260B,C SIM	1,2,4-Trichlorobenzene
GC/MS	8260B,C SIM	1,2,4-Trimethylbenzene
GC/MS	8260B,C SIM	1,2-Dibromo-3-chloropropane

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	8260B,C SIM	1,2-Dibromoethane
GC/MS	8260B,C SIM	1,2-Dichlorobenzene
GC/MS	8260B,C SIM	1,2-Dichloroethane
GC/MS	8260B,C SIM	1,2-Dichloropropane
GC/MS	8260B,C SIM	1,3-Dichlorobenzene
GC/MS	8260B,C SIM	1,3-Dichloropropane
GC/MS	8260B,C SIM	1,4-Dichlorobenzene
GC/MS	8260B,C SIM	2-Hexanone
GC/MS	8260B,C SIM	4-Methyl-2-pentanone
GC/MS	8260B,C SIM	Benzene
GC/MS	8260B,C SIM	Bromodichloromethane
GC/MS	8260B,C SIM	Carbon Tetrachloride
GC/MS	8260B,C SIM	Chloroform
GC/MS	8260B,C SIM	Chloromethane
GC/MS	8260B,C SIM	cis-1,2-Dichloroethene
GC/MS	8260B,C SIM	cis-1,3-Dichloropropene
GC/MS	8260B,C SIM	Dibromochloromethane
GC/MS	8260B,C SIM	Ethylbenzene
GC/MS	8260B,C SIM	Isopropylbenzene
GC/MS	8260B,C SIM	Hexachlorobutadiene
GC/MS	8260B,C SIM	Methylcyclohexane
GC/MS	8260B,C SIM	m,p-Xylene
GC/MS	8260B,C SIM	o-Xylene
GC/MS	8260B,C SIM	Tetrachloroethene
GC/MS	8260B,C SIM	trans-1,2-Dichloroethene
GC/MS	8260B,C SIM	Trans-1,3-Dichloropropene
GC/MS	8260B,C SIM	Trichloroethene
GC/MS	8260B,C SIM	Trichlorofluoromethane
GC/MS	8260B,C SIM	Vinyl Chloride
GC/MS	8260B,C SIM	Xylenes (total)
GC/MS	EPA 8270C,D	1, 2, 4, 5-Tetrachlorobenzene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	1, 2, 4-Trichlorobenzene
GC/MS	EPA 8270C,D	1, 2-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 2-Diphenylhydrazine
GC/MS	EPA 8270C,D	1, 3, 5-Trinitrobenzene
GC/MS	EPA 8270C,D	1, 3-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 3-Dinitrobenzene
GC/MS	EPA 8270C,D	1, 4-Dichlorobenzene
GC/MS	EPA 8270C,D	1, 4-Dioxane
GC/MS	EPA 8270C,D	1, 4-Naphthoquinone
GC/MS	EPA 8270C,D	1, 4-Phenylenediamine
GC/MS	EPA 8270C,D	1,1-Biphenyl
GC/MS	EPA 8270C,D	1-Chloronaphthalene
GC/MS	EPA 8270C,D	1-Methylnaphthalene
GC/MS	EPA 8270C,D	1-Naphthylamine
GC/MS	EPA 8270C,D	2, 3, 4, 6-Tetrachlorophenol
GC/MS	EPA 8270C,D	2, 4, 5-Trochlorophenol
GC/MS	EPA 8270C,D	2, 4, 6-Trichlorophenol
GC/MS	EPA 8270C,D	2, 4-Dichlorophenol
GC/MS	EPA 8270C,D	2, 4-Dimethylphenol
GC/MS	EPA 8270C,D	2, 4-Dinitrophenol
GC/MS	EPA 8270C,D	2, 4-Dinitrotoluene (2 4-DNT)
GC/MS	EPA 8270C,D	2, 6-Dichlorophenol
GC/MS	EPA 8270C,D	2, 6-Dinitrotoluene (2 6-DNT)
GC/MS	EPA 8270C,D	2-Acetylaminofluorene
GC/MS	EPA 8270C,D	2-Chloronaphthalene
GC/MS	EPA 8270C,D	2-Chlorophenol
GC/MS	EPA 8270C,D	2-Methyl-4, 6-dinitrophenol
GC/MS	EPA 8270C,D	2-Methylnaphthalene
GC/MS	EPA 8270C,D	2-Methylphenol
GC/MS	EPA 8270C,D	2-Naphthylamine
GC/MS	EPA 8270C,D	2-Nitroaniline

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	2-Nitrophenol
GC/MS	EPA 8270C,D	2-Picoline
GC/MS	EPA 8270C,D	3, 3`-Dichlorobenzidine
GC/MS	EPA 8270C,D	3, 3’-Dimethylbenzidine
GC/MS	EPA 8270C,D	3,4-Methylphenol
GC/MS	EPA 8270C,D	3-Methylcholanthrene
GC/MS	EPA 8270C,D	3-Nitroaniline
GC/MS	EPA 8270C,D	4-Aminobiphenyl
GC/MS	EPA 8270C,D	4-Bromophenyl phenyl ether
GC/MS	EPA 8270C,D	4-Chloro-3-methylphenol
GC/MS	EPA 8270C,D	4-Chloroaniline
GC/MS	EPA 8270C,D	4-Chlorophenyl phenylether
GC/MS	EPA 8270C,D	4-Dimethyl aminoazobenzene
GC/MS	EPA 8270C,D	4-Nitroaniline
GC/MS	EPA 8270C,D	4-Nitrophenol
GC/MS	EPA 8270C,D	4-Nitroquinoline-1-oxide
GC/MS	EPA 8270C,D	5-Nitro-o-toluidine
GC/MS	EPA 8270C,D	7,12-Dimethylbenz(a)anthracene
GC/MS	EPA 8270C,D	a a-Dimethylphenethylamine
GC/MS	EPA 8270C,D	Acenaphthene
GC/MS	EPA 8270C,D	Acenaphthylene
GC/MS	EPA 8270C,D	Acetophenone
GC/MS	EPA 8270C,D	Aniline
GC/MS	EPA 8270C,D	Anthracene
GC/MS	EPA 8270C,D	Aramite
GC/MS	EPA 8270C,D	Atrazine
GC/MS	EPA 8270C,D	Azobenzene
GC/MS	EPA 8270C,D	Benzaldehyde
GC/MS	EPA 8270C,D	Benzidine
GC/MS	EPA 8270C,D	Benzo(a)anthracene
GC/MS	EPA 8270C,D	Benzo(a)pyrene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Benzo(b)fluoranthene
GC/MS	EPA 8270C,D	Benzo(g h i)perylene
GC/MS	EPA 8270C,D	Benzo(k)fluoranthene
GC/MS	EPA 8270C,D	Benzoic Acid
GC/MS	EPA 8270C,D	Benzyl alcohol
GC/MS	EPA 8270C,D	bis(2-Chloroethoxy)methane
GC/MS	EPA 8270C,D	bis(2-Chloroethyl) ether
GC/MS	EPA 8270C,D	bis(2-Chloroisopropyl) ether (2, 2`-Oxybis(1-chloropropane))
GC/MS	EPA 8270C,D	bis(2-Ethylhexyl) phthalate (DEHP)
GC/MS	EPA 625 / 8270C,D	Bis(2-Ethylhexyl)adipate
GC/MS	EPA 8270C,D	Butyl benzyl phthalate
GC/MS	EPA 8270C,D	Caprolactam
GC/MS	EPA 8270C,D	Carbazole
GC/MS	EPA 8270C,D	Chlorobenzilate
GC/MS	EPA 8270C,D	Chrysene
GC/MS	EPA 8270C,D	Diallate
GC/MS	EPA 8270C,D	Dibenz(a h)anthracene
GC/MS	EPA 8270C,D	Dibenzo(a,j)acridine
GC/MS	EPA 8270C,D	Dibenzofuran
GC/MS	EPA 8270C,D	Diethyl phthalate
GC/MS	EPA 8270C,D	Diethyladipate
GC/MS	EPA 8270C,D	Dimethoate
GC/MS	EPA 8270C,D	Dimethyl phthalate
GC/MS	EPA 8270C,D	Di-n-butyl phthalate
GC/MS	EPA 8270C,D	Di-n-octyl phthalate
GC/MS	EPA 8270C,D	Dinoseb
GC/MS	EPA 8270C,D	Disulfoton
GC/MS	EPA 8270C,D	Ethyl methacrylate
GC/MS	EPA 8270C,D	Ethyl methanesulfonate
GC/MS	EPA 8270C,D	Ethyl parathion
GC/MS	EPA 8270C,D	Famfur

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Fluoranthene
GC/MS	EPA 8270C,D	Fluorene
GC/MS	EPA 8270C,D	Hexachlorobenzene
GC/MS	EPA 8270C,D	Hexachlorobutadiene
GC/MS	EPA 8270C,D	Hexachlorocyclopentadiene
GC/MS	EPA 8270C,D	Hexachloroethane
GC/MS	EPA 8270C,D	Hexachlorophene
GC/MS	EPA 8270C,D	Hexachloropropene
GC/MS	EPA 8270C,D	Indeno(1, 2, 3-cd)pyrene
GC/MS	EPA 8270C,D	Isodrin
GC/MS	EPA 8270C,D	Isophorone
GC/MS	EPA 8270C,D	Isosafrole
GC/MS	EPA 8270C,D	Kepone
GC/MS	EPA 8270C,D	Methapyriline
GC/MS	EPA 8270C,D	Methyl methanesulfonate
GC/MS	EPA 8270C,D	Methyl parathion
GC/MS	EPA 8270C,D	Naphthalene
GC/MS	EPA 8270C,D	Nitrobenzene
GC/MS	EPA 8270C,D	n-Nitrosodiethylamine
GC/MS	EPA 8270C,D	n-Nitrosodimethylamine
GC/MS	EPA 8270C,D	n-Nitroso-di-n-butylamine
GC/MS	EPA 8270C,D	n-Nitrosodi-n-propylamine
GC/MS	EPA 8270C,D	n-Nitrosodiphenylamine
GC/MS	EPA 8270C,D	n-Nitrosomethylethylamine
GC/MS	EPA 8270C,D	n-Nitrosomorpholine
GC/MS	EPA 8270C,D	n-Nitrosopiperidine
GC/MS	EPA 8270C,D	n-Nitrosopyrrolidine
GC/MS	EPA 8270C,D	O, O, O-Triethyl phosphorothioate
GC/MS	EPA 8270C,D	o,o-Diethyl o-2-pyrazinyl phosphorothioate
GC/MS	EPA 8270C,D	o-Toluidine
GC/MS	EPA 8270C,D	Pentachlorobenzene

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D	Pentachloronitrobenzene
GC/MS	EPA 8270C,D	Pentachlorophenol
GC/MS	EPA 8270C,D	Phenacetin
GC/MS	EPA 8270C,D	Phenanthrene
GC/MS	EPA 8270C,D	Phenol
GC/MS	EPA 8270C,D	Phorate
GC/MS	EPA 8270C,D	Pronamide
GC/MS	EPA 8270C,D	Pyrene
GC/MS	EPA 8270C,D	Pyridine
GC/MS	EPA 8270C,D	Safrole
GC/MS	EPA 8270C,D	Sulfotepp
GC/MS	EPA 8270C,D	Thionazin
GC/MS	EPA 8270C,D SIM	1,1'-Biphenyl
GC/MS	EPA 8270C,D SIM	1,2,4,5-Tetrachlorobenzene
GC/MS	EPA 8270C,D SIM	1,4-Dioxane
GC/MS	EPA 8270C,D SIM	1-Methylnaphthalene
GC/MS	EPA 8270C,D SIM	2,2'-Oxybis(1-chloropropane
GC/MS	EPA 8270C,D SIM	2,3,4,6-Tetrachlorophenol
GC/MS	EPA 8270C,D SIM	2,4,5-Trichlorophenol
GC/MS	EPA 8270C,D SIM	2,4,6-Trichlorophenol
GC/MS	EPA 8270C,D SIM	2,4-Dichlorophenol
GC/MS	EPA 8270C,D SIM	2,4-Dimethylphenol
GC/MS	EPA 8270C,D SIM	2,4-Dinitrophenol
GC/MS	EPA 8270C,D SIM	2,4-Dinitrotoluene
GC/MS	EPA 8270C,D SIM	2,6-Dinitrotoluene
GC/MS	EPA 8270C,D SIM	2-Chloronaphthalene
GC/MS	EPA 8270C,D SIM	2-Chlorophenol
GC/MS	EPA 8270C,D SIM	2-Methylnaphthalene
GC/MS	EPA 8270C,D SIM	2-Methylphenol
GC/MS	EPA 8270C,D SIM	2-Nitroaniline
GC/MS	EPA 8270C,D SIM	2-Nitrophenol

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D SIM	3&4-Methylphenol
GC/MS	EPA 8270C,D SIM	3,3'-Dichlorobenzidine
GC/MS	EPA 8270C,D SIM	3-Nitroaniline
GC/MS	EPA 8270C,D SIM	4,6-Dinitro-2-methylphenol
GC/MS	EPA 8270C,D SIM	4-Bromophenyl-phenylether
GC/MS	EPA 8270C,D SIM	4-Chloro-3-methylphenol
GC/MS	EPA 8270C,D SIM	4-Chloroaniline
GC/MS	EPA 8270C,D SIM	4-Chlorophenyl-phenylether
GC/MS	EPA 8270C,D SIM	4-Nitroaniline
GC/MS	EPA 8270C,D SIM	4-Nitrophenol
GC/MS	EPA 8270C,D SIM	Acenaphthene
GC/MS	EPA 8270C,D SIM	Acenaphthylene
GC/MS	EPA 8270C,D SIM	Acetophenone
GC/MS	EPA 8270C,D SIM	Anthracene
GC/MS	EPA 8270C,D SIM	Atrazine
GC/MS	EPA 8270C,D SIM	Benzaldehyde
GC/MS	EPA 8270C,D SIM	Benzo(a)anthracene
GC/MS	EPA 8270C,D SIM	Benzo(a)pyrene
GC/MS	EPA 8270C,D SIM	Benzo(b)fluoranthene
GC/MS	EPA 8270C,D SIM	Benzo(g,h,i)perylene
GC/MS	EPA 8270C,D SIM	Benzo(k)fluoranthene
GC/MS	EPA 8270C,D SIM	Bis(2-chloroethoxy)methane
GC/MS	EPA 8270C,D SIM	Bis(2-chloroethyl)ether
GC/MS	EPA 8270C,D SIM	Bis(2-ethylhexyl)phthalate
GC/MS	EPA 8270C,D SIM	Butylbenzylphthalate
GC/MS	EPA 8270C,D SIM	Caprolactam
GC/MS	EPA 8270C,D SIM	Carbazole
GC/MS	EPA 8270C,D SIM	Chrysene
GC/MS	EPA 8270C,D SIM	Dibenzo(a,h)anthracene
GC/MS	EPA 8270C,D SIM	Dibenzofuran
GC/MS	EPA 8270C,D SIM	Diethylphthalate

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
GC/MS	EPA 8270C,D SIM	Dimethyl phthalate
GC/MS	EPA 8270C,D SIM	Di-n-butylphthalate
GC/MS	EPA 8270C,D SIM	Di-n-octylphthalate
GC/MS	EPA 8270C,D SIM	Fluoranthene
GC/MS	EPA 8270C,D SIM	Fluorene
GC/MS	EPA 8270C,D SIM	Hexachlorobenzene
GC/MS	EPA 8270C,D SIM	Hexachlorobutadiene
GC/MS	EPA 8270C,D SIM	Hexachlorocyclopentadiene
GC/MS	EPA 8270C,D SIM	Hexachloroethane
GC/MS	EPA 8270C,D SIM	Indeno(1,2,3-cd)pyrene
GC/MS	EPA 8270C,D SIM	Isophorone
GC/MS	EPA 8270C,D SIM	Naphthalene
GC/MS	EPA 8270C,D SIM	Nitrobenzene
GC/MS	EPA 8270C,D SIM	n-Nitroso-di-n-propylamine
GC/MS	EPA 8270C,D SIM	n-Nitrosodiphenylamine
GC/MS	EPA 8270C,D SIM	Pentachlorophenol
GC/MS	EPA 8270C,D SIM	Phenanthrene
GC/MS	EPA 8270C,D SIM	Phenol
GC/MS	EPA 8270C,D SIM	Pyrene
HPLC/UV	EPA 8330A	1 ,3, 5-Trinitrobenzene
HPLC/UV	EPA 8330A	1, 3-Dinitrobenzene
HPLC/UV	EPA 8330A	2, 4, 6-Trinitrotoluene
HPLC/UV	EPA 8330A	2, 4-Dinitrotoluene
HPLC/UV	EPA 8330A	2, 6-Dinitrotoluene
HPLC/UV	EPA 8330A	2-Amino-4, 6-dinitrotoluene
HPLC/UV	EPA 8330A	2-Nitrotoluene
HPLC/UV	EPA 8330A	3-Nitrotoluene
HPLC/UV	EPA 8330A	3,5-Dinitroaniline
HPLC/UV	EPA 8330A	4-Amino-2,6-dinitrotoluene
HPLC/UV	EPA 8330A	4-Nitrotoluene
HPLC/UV	EPA 8330A	Ethylene glycol dinitrate (EGDN)

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
HPLC/UV	EPA 8330A	Hexahydr-1, 3, 5-trinitro-1, 3, 5-triazine (RDX)
HPLC/UV	EPA 8330A	Nitrobenzene
HPLC/UV	EPA 8330A MOD	Nitroglycerin
HPLC/UV	EPA 8330A	Octahydro-1, 3, 5, 7-tetrazocine (HMX)
HPLC/UV	EPA 8330A	Pentaerythritol Tetranitrate (PETN)
HPLC/UV	EPA 8330A	Tetryl
HPLC/UV	8330B (W/O Soil Grinding)	1, 3, 5-Trinitrobenzene
HPLC/UV	8330B (W/O Soil Grinding)	1, 3-Dinitrobenzene
HPLC/UV	8330B (W/O Soil Grinding)	2, 4, 6-Trinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	2, 4-Dinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	2, 6-Dinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	2-Amino-4, 6 –Dinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	2-Nitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	3-Nitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	3,5-Dinitroaniline
HPLC/UV	8330B (W/O Soil Grinding)	4-Amino-2,3-Dinitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	4-Nitrotoluene
HPLC/UV	8330B (W/O Soil Grinding)	Ethylene glycol dinitrate (EGDN)
HPLC/UV	8330B (W/O Soil Grinding)	Hexahydr-1, 3, 5-trinitro-1, 3, 5-triazine (RDX)
HPLC/UV	8330B (W/O Soil Grinding)	Nitrobenzene
HPLC/UV	8330B (W/O Soil Grinding)	Nitroglycerin
HPLC/UV	8330B (W/O Soil Grinding)	Octahydro-1, 3, 5, 7-tetrazocine (HMX)
HPLC/UV	8330B (W/O Soil Grinding)	Pentaerythritol Tetranitrate (PETN)
HPLC/UV	8330B (W/O Soil Grinding)	Tetryl

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
CVAA	EPA 7471B	Mercury
CVAF	EPA 1631E	Low Level Mercury
ICP/AES	EPA 6010B,C	Aluminum
ICP/AES	EPA 6010B,C	Antimony
ICP/AES	EPA 6010B,C	Arsenic
ICP/AES	EPA 6010B,C	Barium
ICP/AES	EPA 6010B,C	Beryllium
ICP/AES	EPA 6010B,C	Boron
ICP/AES	EPA 6010B,C	Cadmium
ICP/AES	EPA 6010B,C	Calcium
ICP/AES	EPA 6010B,C	Chromium
ICP/AES	EPA 6010B,C	Cobalt
ICP/AES	EPA 6010B,C	Copper
ICP/AES	EPA 6010B,C	Iron
ICP/AES	EPA 6010B,C	Lead
ICP/AES	EPA 6010B,C	Magnesium
ICP/AES	EPA 6010B,C	Manganese
ICP/AES	EPA 6010B,C	Molybdenum
ICP/AES	EPA 6010B,C	Nickel
ICP/AES	EPA 6010B,C	Potassium
ICP/AES	EPA 6010B,C	Selenium
ICP/AES	EPA 6010B,C	Silicon
ICP/AES	EPA 6010B,C	Silver
ICP/AES	EPA 6010B,C	Sodium
ICP/AES	EPA 6010B,C	Strontium
ICP/AES	EPA 6010B,C	Thallium
ICP/AES	EPA 6010B,C	Tin
ICP/AES	EPA 6010B,C	Titanium
ICP/AES	EPA 6010B,C	Vanadium
ICP/AES	EPA 6010B,C	Zinc
ICP/MS	EPA 6020A	Aluminum

Solid and Chemical Waste		
Technology	**Method**	**Analyte**
ICP/MS	EPA 6020A	Antimony
ICP/MS	EPA 6020A	Arsenic
ICP/MS	EPA 6020A	Barium
ICP/MS	EPA 6020A	Beryllium
ICP/MS	EPA 6020A	Boron
ICP/MS	EPA 6020A	Cadmium
ICP/MS	EPA 6020A	Calcium
ICP/MS	EPA 6020A	Chromium
ICP/MS	EPA 6020A	Cobalt
ICP/MS	EPA 6020A	Copper
ICP/MS	EPA 6020A	Iron
ICP/MS	EPA 6020A	Lead
ICP/MS	EPA 6020A	Magnesium
ICP/MS	EPA 6020A	Manganese
ICP/MS	EPA 6020A	Molybdenum
ICP/MS	EPA 6020A	Nickel
ICP/MS	EPA 6020A	Potassium
ICP/MS	EPA 6020A	Selenium
ICP/MS	EPA 6020A	Silver
ICP/MS	EPA 6020A	Sodium
ICP/MS	EPA 6020A	Strontium
ICP/MS	EPA 6020A	Thallium
ICP/MS	EPA 6020A	Tin
ICP/MS	EPA 6020A	Titanium
ICP/MS	EPA 6020A	Tungsten
ICP/MS	EPA 6020A	Vanadium
ICP/MS	EPA 6020A	Zinc
IC	EPA 9056A	Chloride
IC	EPA 9056A	Fluoride
IC	EPA 9056A	Nitrate as N
IC	EPA 9056A	Nitrite as N

Solid and Chemical Waste

Technology	Method	Analyte
IC	EPA 9056A	Orthophosphate
IC	EPA 9056A	Sulfate
Gravimetric	EPA 9071A / 9071B	Oil and Grease, Oil and Grease with SGT
Physical	EPA 1010A	Ignitability
Physical	EPA 9045D	pH
Titration	Chap 7.3.4	Reactive Sulfide
Titration	Walkley-Black	Total Organic Carbon
IR	Lloyd Kahn	Total organic carbon
Turbidimetric	EPA 9038 / ASTM 516-02	Sulfate
UV/VIS	EPA 350.1 / SM 4500NH3 H	Ammonia as N
UV/VIS	EPA 9251 / SM 4500Cl E	Chloride
UV/VIS	Chap. 7.3.4	Reactive Cyanide
UV/VIS	EPA 821/R-91-100	AVS-SEM
UV/VIS	SM 3500Fe D	Ferrous Iron
Cleanup Methods	EPA 3630C	Silica Gel
UV/VIS	EPA 7196	Chromium VI
UV/VIS	EPA 7196A	Chromium VI
UV/VIS	EPA 9012B	Total cyanide
Preparation	**Method**	**Type**
Preparation	EPA 1311	Toxicity Characteristic Leaching Procedure
Preparation	EPA 1312	Synthetic Precipitation Leaching Procedure
Cleanup Methods	EPA 3660B	Sulfur Clean-up
Cleanup Methods	EPA 3620C	Florsil Clean-up
Cleanup Methods	EPA 3630C	Silica Gel Clean-up
Cleanup Methods	EPA 3640A	GPC Clean-up
Organic Preparation	EPA 3540C	Soxhlet Extraction
Organic Preparation	EPA 3545A	Pressurized Fluid Extraction

Organic Preparation	EPA 3546	Microwave Extraction Preparation for EPA 8082A, 8081B and 8270C, D
Organic Preparation	EPA 3550C	Sonication
Inorganics Preparation	EPA 3050B	Hotblock
Inorganics Preparation	EPA 3060A	Alkaline Digestion
Volatile Organics Preparation	EPA 5035/5035A	Closed System Purge and Trap

Air

Technology	**Method**	**Analyte**
GC/MS	EPA TO-15	Propene
GC/MS	EPA TO-15	1, 1, 1-Trichloroethane
GC/MS	EPA TO-15	1, 1, 2, 2-Tetrachloroethane
GC/MS	EPA TO-15	1, 1, 2-Trichloroethane
GC/MS	EPA TO-15	1, 1-Dichloroethane
GC/MS	EPA TO-15	1, 1-Dichloroethylene
GC/MS	EPA TO-15	1, 2, 4-Trichlorobenzene
GC/MS	EPA TO-15	1, 2, 4-Trimethylbenzene
GC/MS	EPA TO-15	1, 2-Dibromoethane (EDB)
GC/MS	EPA TO-15	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)
GC/MS	EPA TO-15	1, 2-Dichlorobenzene
GC/MS	EPA TO-15	1, 2-Dichloroethane
GC/MS	EPA TO-15	1, 2-Dichloroethenes (Total)
GC/MS	EPA TO-15	1, 2-Dichloropropane
GC/MS	EPA TO-15	1, 3, 5-Trimethylbenzene
GC/MS	EPA TO-15	1, 3-Butadiene
GC/MS	EPA TO-15	1, 3-Dichlorobenzene
GC/MS	EPA TO-15	1, 4-Dichlorobenzene
GC/MS	EPA TO-15	1,4-Difluorobenzene
GC/MS	EPA TO-15	1, 4-Dioxane
GC/MS	EPA TO-15	2-Butanone
GC/MS	EPA TO-15	2-Hexanone
GC/MS	EPA TO-15	2-Propanol
GC/MS	EPA TO-15	4-Ethyltoluene

Air		
Technology	**Method**	**Analyte**
GC/MS	EPA TO-15	4-Methyl-2-pentanone
GC/MS	EPA TO-15	Acetone
GC/MS	EPA TO-15	Acrolein
GC/MS	EPA TO-15	Benzene
GC/MS	EPA TO-15	Benzyl chloride
GC/MS	EPA TO-15	Bromochloromethane
GC/MS	EPA TO-15	Bromodichloromethane
GC/MS	EPA TO-15	Bromoform
GC/MS	EPA TO-15	Carbon disulfide
GC/MS	EPA TO-15	Carbon tetrachloride
GC/MS	EPA TO-15	Chlorobenzene
GC/MS	EPA TO-15	Chloroethane
GC/MS	EPA TO-15	Chloroform
GC/MS	EPA TO-15	Cis-1, 2-Dichloroethene
GC/MS	EPA TO-15	Cis-1, 3-Dichloropropene
GC/MS	EPA TO-15	Cyclohexane
GC/MS	EPA TO-15	Dibromochloromethane
GC/MS	EPA TO-15	Dichlorodifluoromethane (Freon 12)
GC/MS	EPA TO-15	Ethanol
GC/MS	EPA TO-15	Ethyl acetate
GC/MS	EPA TO-15	Ethylbenzene
GC/MS	EPA TO-15	Hexachlorobutadiene
GC/MS	EPA TO-15	Isopropyl alcohol
GC/MS	EPA TO-15	m, p-Xylene
GC/MS	EPA TO-15	Methyl bromide (Bromomethane)
GC/MS	EPA TO-15	Methyl chloride (Chloromethane)
GC/MS	EPA TO-15	Methyl methacrylate
GC/MS	EPA TO-15	Methyl tert-butyl ether
GC/MS	EPA TO-15	Methylene chloride
GC/MS	EPA TO-15	Naphthalene
GC/MS	EPA TO-15	n-Heptane

Air		
Technology	**Method**	**Analyte**
GC/MS	EPA TO-15	n-Hexane
GC/MS	EPA TO-15	o-Xylene
GC/MS	EPA TO-15	Styrene
GC/MS	EPA TO-15	Tetrachloroethylene (Perchloroethylene)
GC/MS	EPA TO-15	Tetrahydrofuran
GC/MS	EPA TO-15	Toluene
GC/MS	EPA TO-15	trans-1, 2-Dichloroethylene
GC/MS	EPA TO-15	trans-1, 3-Dichloropropylene
GC/MS	EPA TO-15	Trichloroethene (Trichloroethylene)
GC/MS	EPA TO-15	Trichlorofluoromethane (Freon 11)
GC/MS	EPA TO-15	1,1,2-Trichloro1,2,2-trifluoroethane (Freon 113)
GC/MS	EPA TO-15	Vinyl acetate
GC/MS	EPA TO-15	Vinyl chloride
GC/MS	EPA TO-15	Xylenes (Total)

Notes:

1) This laboratory offers commercial testing service.

Approved by: ____________________
R. Douglas Leonard
Chief Technical Officer

Date: November 26, 2012

Issued: 11/04/09
Revised: 01/11/10
Revised: 04/06/10
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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2013
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Revised June 11, 2012

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. DEBORAH J. NADEAU
KATAHDIN ANALYTICAL SERVICES INC
600 TECHNOLOGY WAY
SCABOROUGH, ME 04074

NY Lab Id No: 11121

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 624
Acrylonitrile	EPA 624

Amines

2-Nitroaniline	EPA 8270C
	EPA 8270D
3-Nitroaniline	EPA 8270C
	EPA 8270D
4-Chloroaniline	EPA 8270C
	EPA 8270D
4-Nitroaniline	EPA 8270C
	EPA 8270D
Carbazole	EPA 8270C
	EPA 8270D

Benzidines

3,3'-Dichlorobenzidine	EPA 625
	EPA 8270C
	EPA 8270D
Benzidine	EPA 625
	EPA 8270C
	EPA 8270D

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 608
	EPA 8081A
	EPA 8081B

Chlorinated Hydrocarbon Pesticides

4,4'-DDE	EPA 608
	EPA 8081A
	EPA 8081B
4,4'-DDT	EPA 608
	EPA 8081A
	EPA 8081B
Aldrin	EPA 608
	EPA 8081A
	EPA 8081B
alpha-BHC	EPA 608
	EPA 8081A
	EPA 8081B
alpha-Chlordane	EPA 8081A
	EPA 8081B
beta-BHC	EPA 608
	EPA 8081A
	EPA 8081B
Chlordane Total	EPA 608
	EPA 8081A
	EPA 8081B
delta-BHC	EPA 608
	EPA 8081A
	EPA 8081B
Dieldrin	EPA 608
	EPA 8081A

Serial No.: 47123

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Chlorinated Hydrocarbon Pesticides

Dieldrin	EPA 8081B
Endosulfan I	EPA 608
	EPA 8081A
	EPA 8081B
Endosulfan II	EPA 608
	EPA 8081A
	EPA 8081B
Endosulfan sulfate	EPA 608
	EPA 8081A
	EPA 8081B
Endrin	EPA 608
	EPA 8081A
	EPA 8081B
Endrin aldehyde	EPA 608
	EPA 8081A
	EPA 8081B
Endrin Ketone	EPA 8081A
	EPA 8081B
gamma-Chlordane	EPA 8081A
	EPA 8081B
Heptachlor	EPA 608
	EPA 8081A
	EPA 8081B
Heptachlor epoxide	EPA 608
	EPA 8081A

Chlorinated Hydrocarbon Pesticides

Heptachlor epoxide	EPA 8081B
Lindane	EPA 608
	EPA 8081A
	EPA 8081B
Methoxychlor	EPA 8081A
	EPA 8081B
Toxaphene	EPA 608
	EPA 8081A
	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260B
1,2,4,5-Tetrachlorobenzene	EPA 8270C
1,2,4-Trichlorobenzene	EPA 625
	EPA 8270C
	EPA 8270D
2-Chloronaphthalene	EPA 625
	EPA 8270C
	EPA 8270D
Hexachlorobenzene	EPA 625
	EPA 8270C
	EPA 8270D
Hexachlorobutadiene	EPA 625
	EPA 8270C
	EPA 8270D
Hexachlorocyclopentadiene	EPA 625

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Chlorinated Hydrocarbons

Hexachlorocyclopentadiene	EPA 8270C
	EPA 8270D
Hexachloroethane	EPA 625
	EPA 8270C
	EPA 8270D

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Dinoseb	EPA 8151A

Demand

Biochemical Oxygen Demand	SM 18-21 5210B (01)
Carbonaceous BOD	SM 18-21 5210B (01)
Chemical Oxygen Demand	EPA 410.4 Rev. 2.0
	HACH 8000

Fuel Oxygenates

Methyl tert-butyl ether	EPA 8260B

Haloethers

4-Bromophenylphenyl ether	EPA 625
	EPA 8270C
	EPA 8270D
4-Chlorophenylphenyl ether	EPA 625
	EPA 8270C
4-Chlorophenylphenyl ether	EPA 8270D
Bis (2-chloroisopropyl) ether	EPA 625
	EPA 8270C
	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 625
	EPA 8270C
	EPA 8270D
Bis(2-chloroethyl)ether	EPA 625
	EPA 8270C
	EPA 8270D

Low Level Polynuclear Aromatics

Acenaphthene	EPA 8270C SIM
	EPA 8270D
Acenaphthylene	EPA 8270C SIM
	EPA 8270D
Anthracene	EPA 8270C SIM
	EPA 8270D
Benzo(a)anthracene	EPA 8270C SIM
	EPA 8270D
Benzo(a)pyrene	EPA 8270C SIM
	EPA 8270D
Benzo(b)fluoranthene	EPA 8270C SIM
	EPA 8270D
Benzo(g,h,i)perylene	EPA 8270C SIM
	EPA 8270D

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Low Level Polynuclear Aromatics

Benzo(k)fluoroanthene	EPA 8270C SIM EPA 8270D
Chrysene	EPA 8270C SIM EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270C SIM EPA 8270D
Fluoranthene	EPA 8270C SIM EPA 8270D
Fluorene	EPA 8270C SIM EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270C SIM EPA 8270D
Naphthalene	EPA 8270C SIM EPA 8270D
Phenanthrene	EPA 8270C SIM EPA 8270D
Pyrene	EPA 8270C SIM EPA 8270D

Mineral

Acidity	SM 18-21 2310B.4a (97)
Alkalinity	SM 18-21 2320B (97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1 EPA 9056A SM 18-21 4500-Cl- E (97)

Mineral

Fluoride, Total	EPA 9056A SM 18-21 4500-F C (97)
Hardness, Total	EPA 200.7 Rev. 4.4
Sulfate (as SO4)	ASTM D516-90 02 & 07 EPA 300.0 Rev. 2.1 EPA 9056A

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 625 EPA 8270C EPA 8270D
2,6-Dinitrotoluene	EPA 625 EPA 8270C EPA 8270D
Isophorone	EPA 625 EPA 8270C EPA 8270D
Nitrobenzene	EPA 625 EPA 8270C EPA 8270D

Nitrosoamines

N-Nitrosodimethylamine	EPA 625 EPA 8270C EPA 8270D
N-Nitrosodi-n-propylamine	EPA 625 EPA 8270C

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All approved analytes are listed below:

Nitrosoamines

N-Nitrosodi-n-propylamine	EPA 8270D
N-Nitrosodiphenylamine	EPA 625
	EPA 8270C
	EPA 8270D

Nutrient

Ammonia (as N)	EPA 350.1 Rev. 2.0
	SM 18 4500-NH3 H
Kjeldahl Nitrogen, Total	EPA 351.2 Rev. 2.0
Nitrate (as N)	EPA 300.0 Rev. 2.1
	EPA 353.2 Rev. 2.0
	EPA 9056A
Nitrite (as N)	EPA 300.0 Rev. 2.1
	EPA 353.2 Rev. 2.0
	EPA 9056A
Orthophosphate (as P)	EPA 300.0 Rev. 2.1
	EPA 9056A
	SM 18-21 4500-P E
Phosphorus, Total	EPA 365.4 Rev. 1974

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015 B
	EPA 8015C
Gasoline Range Organics	EPA 8015 B
	EPA 8015C

Phthalate Esters

Benzyl butyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Diethyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Dimethyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Di-n-butyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D
Di-n-octyl phthalate	EPA 625
	EPA 8270C
	EPA 8270D

Polychlorinated Biphenyls

PCB-1016	EPA 608
	EPA 8082
	EPA 8082A
PCB-1221	EPA 608
	EPA 8082
	EPA 8082A

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MS. DEBORAH J. NADEAU
KATAHDIN ANALYTICAL SERVICES INC
600 TECHNOLOGY WAY
SCABOROUGH, ME 04074

NY Lab Id No: 11121

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Polychlorinated Biphenyls

PCB-1232	EPA 608
	EPA 8082
	EPA 8082A
PCB-1242	EPA 608
	EPA 8082
	EPA 8082A
PCB-1248	EPA 608
	EPA 8082
	EPA 8082A
PCB-1254	EPA 608
	EPA 8082
	EPA 8082A
PCB-1260	EPA 608
	EPA 8082
	EPA 8082A

Polynuclear Aromatics

Acenaphthene	EPA 625
	EPA 8270C
	EPA 8270D
Acenaphthylene	EPA 625
	EPA 8270C
	EPA 8270D
Anthracene	EPA 625
	EPA 8270C
	EPA 8270D

Polynuclear Aromatics

Benzo(a)anthracene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(a)pyrene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(b)fluoranthene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(ghi)perylene	EPA 625
	EPA 8270C
	EPA 8270D
Benzo(k)fluoranthene	EPA 625
	EPA 8270C
	EPA 8270D
Chrysene	EPA 625
	EPA 8270C
	EPA 8270D
Dibenzo(a,h)anthracene	EPA 625
	EPA 8270C
	EPA 8270D
Fluoranthene	EPA 625
	EPA 8270C
	EPA 8270D
Fluorene	EPA 625

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Polynuclear Aromatics

Fluorene	EPA 8270C
	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 625
	EPA 8270C
	EPA 8270D
Naphthalene	EPA 625
	EPA 8270C
	EPA 8270D
Phenanthrene	EPA 625
	EPA 8270C
	EPA 8270D
Pyrene	EPA 625
	EPA 8270C
	EPA 8270D

Priority Pollutant Phenols

2,4,5-Trichlorophenol	EPA 8270C
	EPA 8270D
2,4,6-Trichlorophenol	EPA 625
	EPA 8270C
	EPA 8270D
2,4-Dichlorophenol	EPA 625
	EPA 8270C
	EPA 8270D
2,4-Dimethylphenol	EPA 625
	EPA 8270C

Priority Pollutant Phenols

2,4-Dimethylphenol	EPA 8270D
2,4-Dinitrophenol	EPA 625
	EPA 8270C
	EPA 8270D
2,6-Dichlorophenol	EPA 8270C
	EPA 8270D
2-Chlorophenol	EPA 625
	EPA 8270C
	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 625
	EPA 8270C
	EPA 8270D
2-Methylphenol	EPA 8270C
	EPA 8270D
2-Nitrophenol	EPA 625
	EPA 8270C
	EPA 8270D
3-Methylphenol	EPA 8270C
4-Chloro-3-methylphenol	EPA 625
	EPA 8270C
	EPA 8270D
4-Methylphenol	EPA 8270C
	EPA 8270D
4-Nitrophenol	EPA 625
	EPA 8270C

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Priority Pollutant Phenols	
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 625
	EPA 8151A
	EPA 8270C
	EPA 8270D
Phenol	EPA 625
	EPA 8270C
	EPA 8270D
Residue	
Settleable Solids	SM 18-21 2540 F (97)
Solids, Total	SM 18-21 2540B (97)
Solids, Total Dissolved	SM 18-21 2540C (97)
Solids, Total Suspended	SM 18-21 2540D (97)
Semi-Volatile Organics	
1,2-Dichlorobenzene, Semi-volatile	EPA 8270C
	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270C
	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270C
	EPA 8270D
2-Methylnaphthalene	EPA 8270C
	EPA 8270D
Acetophenone	EPA 8270C
	EPA 8270D
Benzoic Acid	EPA 8270C

Semi-Volatile Organics	
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270C
	EPA 8270D
Dibenzofuran	EPA 8270C
	EPA 8270D
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260B
1,2-Dichlorobenzene	EPA 624
	EPA 8260B
1,3-Dichlorobenzene	EPA 624
	EPA 8260B
1,4-Dichlorobenzene	EPA 624
	EPA 8260B
Benzene	EPA 624
	EPA 8260B
Chlorobenzene	EPA 624
	EPA 8260B
Ethyl benzene	EPA 624
	EPA 8260B
Isopropylbenzene	EPA 8260B
Naphthalene, Volatile	EPA 8260B
Styrene	EPA 8260B
Toluene	EPA 624
	EPA 8260B
Total Xylenes	EPA 624

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Volatile Aromatics	
Total Xylenes	EPA 8260B
Volatile Halocarbons	
1,1,1-Trichloroethane	EPA 624
	EPA 8260B
1,1,2,2-Tetrachloroethane	EPA 624
	EPA 8260B
1,1,2-Trichloroethane	EPA 624
	EPA 8260B
1,1-Dichloroethane	EPA 624
	EPA 8260B
1,1-Dichloroethene	EPA 624
	EPA 8260B
1,2-Dibromo-3-chloropropane	EPA 8011
1,2-Dibromoethane	EPA 8011
1,2-Dichloroethane	EPA 624
	EPA 8260B
1,2-Dichloropropane	EPA 624
	EPA 8260B
2-Chloroethylvinyl ether	EPA 624
Bromochloromethane	EPA 8260B
Bromodichloromethane	EPA 624
	EPA 8260B
Bromoform	EPA 624
	EPA 8260B
Bromomethane	EPA 624

Volatile Halocarbons	
Bromomethane	EPA 8260B
Carbon tetrachloride	EPA 624
	EPA 8260B
Chloroethane	EPA 624
	EPA 8260B
Chloroform	EPA 624
	EPA 8260B
Chloromethane	EPA 624
	EPA 8260B
cis-1,2-Dichloroethene	EPA 8260B
cis-1,3-Dichloropropene	EPA 624
	EPA 8260B
Dibromochloromethane	EPA 624
	EPA 8260B
Dichlorodifluoromethane	EPA 624
	EPA 8260B
Methylene chloride	EPA 624
	EPA 8260B
Tetrachloroethene	EPA 624
	EPA 8260B
trans-1,2-Dichloroethene	EPA 624
	EPA 8260B
trans-1,3-Dichloropropene	EPA 624
	EPA 8260B
Trichloroethene	EPA 624

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Volatile Halocarbons	
Trichloroethene	EPA 8260B
Trichlorofluoromethane	EPA 624
	EPA 8260B
Vinyl chloride	EPA 624
	EPA 8260B
Volatiles Organics	
1,4-Dioxane	EPA 8260B
2-Butanone (Methylethyl ketone)	EPA 8260B
2-Hexanone	EPA 8260B
4-Methyl-2-Pentanone	EPA 8260B
Acetone	EPA 8260B
Carbon Disulfide	EPA 8260B
Vinyl acetate	EPA 8260B
Wastewater Metals I	
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020

Wastewater Metals I	
Cadmium, Total	EPA 6020A
Calcium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Iron, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Lead, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A

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Wastewater Metals I

Magnesium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Potassium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Sodium, Total	EPA 200.7 Rev. 4.4

Wastewater Metals I

Sodium, Total	EPA 6010B
	EPA 6010C
Strontium, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A

Wastewater Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Antimony, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Arsenic, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A

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Wastewater Metals II

Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Chromium VI	EPA 7196A
	SM 18-19 3500-Cr D
Mercury, Low Level	EPA 1631E
Mercury, Total	EPA 245.1 Rev. 3.0
	EPA 7470A
Selenium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Vanadium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Wastewater Metals II

Zinc, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A

Wastewater Metals III

Cobalt, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Molybdenum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Thallium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Tin, Total	EPA 200.7 Rev. 4.4
	EPA 6010B

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Wastewater Metals III

Tin, Total	EPA 6010C
Titanium, Total	EPA 6010B
	EPA 6010C

Wastewater Miscellaneous

Boron, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 6010C
Bromide	EPA 300.0 Rev. 2.1
Color	SM 18-21 2120B (01)
Cyanide, Total	EPA 335.4 Rev. 1.0
	EPA 9012A
	EPA 9012B
Oil & Grease Total Recoverable (HEM)	EPA 1664A
	EPA 9070 (Solvent:Hexane)
	EPA 9070A (Solvent:Hexane)
Organic Carbon, Total	EPA 9060
	EPA 9060A
	SM 18-21 5310B (00)
Phenols	EPA 420.1 Rev. 1978
	EPA 9065
Silica, Dissolved	EPA 6010B
	EPA 6010C
Specific Conductance	EPA 120.1 Rev. 1982
	SM 18-21 2510B (97)
Sulfide (as S)	SM 18 4500-S E

Wastewater Miscellaneous

Surfactant (MBAS)	SM 18-21 5540C (00)
Turbidity	EPA 180.1 Rev. 2.0
	SM 18-21 2130 B (01)

Sample Preparation Methods

	EPA 3010A
	EPA 3510C
	EPA 3520C
	EPA 5030B

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260B
Acrylonitrile	EPA 8260B

Amines

2-Nitroaniline	EPA 8270C
	EPA 8270D
3-Nitroaniline	EPA 8270C
	EPA 8270D
4-Chloroaniline	EPA 8270C
	EPA 8270D
4-Nitroaniline	EPA 8270C
	EPA 8270D
Carbazole	EPA 8270C
	EPA 8270D

Benzidines

3,3'-Dichlorobenzidine	EPA 8270C
	EPA 8270D

Characteristic Testing

Ignitability	EPA 1010
	EPA 1010A

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081A
	EPA 8081B
4,4'-DDE	EPA 8081A
	EPA 8081B

Chlorinated Hydrocarbon Pesticides

4,4'-DDT	EPA 8081A
	EPA 8081B
Aldrin	EPA 8081A
	EPA 8081B
alpha-BHC	EPA 8081A
	EPA 8081B
alpha-Chlordane	EPA 8081A
	EPA 8081B
beta-BHC	EPA 8081A
	EPA 8081B
Chlordane Total	EPA 8081A
	EPA 8081B
delta-BHC	EPA 8081A
	EPA 8081B
Dieldrin	EPA 8081A
	EPA 8081B
Endosulfan I	EPA 8081A
	EPA 8081B
Endosulfan II	EPA 8081A
	EPA 8081B
Endosulfan sulfate	EPA 8081A
	EPA 8081B
Endrin	EPA 8081A
	EPA 8081B
Endrin aldehyde	EPA 8081A

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Chlorinated Hydrocarbon Pesticides

Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081A
	EPA 8081B
gamma-Chlordane	EPA 8081A
	EPA 8081B
Heptachlor	EPA 8081A
	EPA 8081B
Heptachlor epoxide	EPA 8081A
	EPA 8081B
Lindane	EPA 8081A
	EPA 8081B
Methoxychlor	EPA 8081A
	EPA 8081B
Toxaphene	EPA 8081A
	EPA 8081B

Chlorinated Hydrocarbons

1,2,4,5-Tetrachlorobenzene	EPA 8270C
1,2,4-Trichlorobenzene	EPA 8270C
	EPA 8270D
2-Chloronaphthalene	EPA 8270C
	EPA 8270D
Hexachlorobenzene	EPA 8270C
	EPA 8270D
Hexachlorobutadiene	EPA 8270C
	EPA 8270D

Chlorinated Hydrocarbons

Hexachlorocyclopentadiene	EPA 8270C
	EPA 8270D
Hexachloroethane	EPA 8270C
	EPA 8270D

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dicamba	EPA 8151A
Dinoseb	EPA 8151A
Pentachlorophenol	EPA 8151A

Haloethers

4-Bromophenylphenyl ether	EPA 8270C
	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270C
	EPA 8270D
Bis (2-chloroisopropyl) ether	EPA 8270C
	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270C
	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270C
	EPA 8270D

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KATAHDIN ANALYTICAL SERVICES INC
600 TECHNOLOGY WAY
SCABOROUGH, ME 04074

NY Lab Id No: 11121

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270C SIM
	EPA 8270D
Acenaphthylene	EPA 8270C SIM
	EPA 8270D
Anthracene	EPA 8270C SIM
	EPA 8270D
Benzo(a)anthracene	EPA 8270C SIM
	EPA 8270D
Benzo(a)pyrene	EPA 8270C SIM
	EPA 8270D
Benzo(b)fluoranthene	EPA 8270C SIM
	EPA 8270D
Benzo(g,h,i)perylene	EPA 8270C SIM
	EPA 8270D
Benzo(k)fluoroanthene	EPA 8270C SIM
	EPA 8270D
Chrysene	EPA 8270C SIM
	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270C SIM
	EPA 8270D
Fluoranthene	EPA 8270C SIM
	EPA 8270D
Fluorene	EPA 8270C SIM
	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270C SIM

Low Level Polynuclear Aromatic Hydrocarbons

Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270C SIM
	EPA 8270D
Phenanthrene	EPA 8270C SIM
	EPA 8270D
Pyrene	EPA 8270C SIM
	EPA 8270D

Metals I

Barium, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Cadmium, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Calcium, Total	EPA 6010B
	EPA 6010C
Chromium, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Copper, Total	EPA 6010B
	EPA 6010C
	EPA 6020

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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Issued April 02, 2012
Revised June 11, 2012

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Metals I	
Copper, Total	EPA 6020A
Iron, Total	EPA 6010B
	EPA 6010C
Lead, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Magnesium, Total	EPA 6010B
	EPA 6010C
Manganese, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Nickel, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Potassium, Total	EPA 6010B
	EPA 6010C
Silver, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Sodium, Total	EPA 6010B
	EPA 6010C

Metals I	
Strontium, Total	EPA 6010B
	EPA 6010C

Metals II	
Aluminum, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Antimony, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Arsenic, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Beryllium, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471A
Selenium, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A

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Metals II	
Vanadium, Total	EPA 6010B
	EPA 6010C
	EPA 6020A
Zinc, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Metals III	
Cobalt, Total	EPA 6010B
	EPA 6010C
Thallium, Total	EPA 6010B
	EPA 6010C
	EPA 6020
	EPA 6020A
Minerals	
Bromide	EPA 9056A
Chloride	EPA 9056A
	EPA 9251
Fluoride, Total	EPA 9056A
Sulfate (as SO4)	EPA 9038
	EPA 9056A
Miscellaneous	
Boron, Total	EPA 6010B
	EPA 6010C

Miscellaneous	
Cyanide, Total	EPA 9012A
	EPA 9012B
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 8270C
	EPA 8270D
2,6-Dinitrotoluene	EPA 8270C
	EPA 8270D
Isophorone	EPA 8270C
	EPA 8270D
Nitrobenzene	EPA 8270C
	EPA 8270D
Nitrosoamines	
N-Nitrosodimethylamine	EPA 8270C
	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 8270C
	EPA 8270D
N-nitrosomethylethylamine	EPA 8270C
Nutrients	
Nitrate (as N)	EPA 9056A
Nitrite (as N)	EPA 9056A
Orthophosphate (as P)	EPA 9056A
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015 B
	EPA 8015C

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Petroleum Hydrocarbons

Gasoline Range Organics	EPA 8015 B
	EPA 8015C
Oil & Grease Total Recoverable (HEM)	EPA 9071 (Solvent:Hexane)
	EPA 9071B (Solvent:Hexane)

Phthalate Esters

Benzyl butyl phthalate	EPA 8270C
	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270C
	EPA 8270D
Diethyl phthalate	EPA 8270C
	EPA 8270D
Dimethyl phthalate	EPA 8270C
	EPA 8270D
Di-n-butyl phthalate	EPA 8270C
	EPA 8270D
Di-n-octyl phthalate	EPA 8270C
	EPA 8270D

Polychlorinated Biphenyls

PCB-1016	EPA 8082
	EPA 8082A
PCB-1221	EPA 8082
	EPA 8082A
PCB-1232	EPA 8082
	EPA 8082A
PCB-1242	EPA 8082

Polychlorinated Biphenyls

PCB-1242	EPA 8082A
PCB-1248	EPA 8082
	EPA 8082A
PCB-1254	EPA 8082
	EPA 8082A
PCB-1260	EPA 8082
	EPA 8082A

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270C
	EPA 8270D
Acenaphthylene	EPA 8270C
	EPA 8270D
Anthracene	EPA 8270C
	EPA 8270D
Benzo(a)anthracene	EPA 8270C
	EPA 8270D
Benzo(a)pyrene	EPA 8270C
	EPA 8270D
Benzo(b)fluoranthene	EPA 8270C
	EPA 8270D
Benzo(ghi)perylene	EPA 8270C
	EPA 8270D
Benzo(k)fluoranthene	EPA 8270C
	EPA 8270D
Chrysene	EPA 8270C

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Polynuclear Aromatic Hydrocarbons

Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270C
	EPA 8270D
Fluoranthene	EPA 8270C
	EPA 8270D
Fluorene	EPA 8270C
	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270C
	EPA 8270D
Naphthalene	EPA 8270C
	EPA 8270D
Phenanthrene	EPA 8270C
	EPA 8270D
Pyrene	EPA 8270C
	EPA 8270D

Priority Pollutant Phenols

2,4,5-Trichlorophenol	EPA 8270C
2,4,6-Trichlorophenol	EPA 8270C
	EPA 8270D
2,4-Dichlorophenol	EPA 8270C
	EPA 8270D
2,4-Dimethylphenol	EPA 8270C
2,4-Dinitrophenol	EPA 8270C
	EPA 8270D
2,6-Dichlorophenol	EPA 8270C

Priority Pollutant Phenols

2,6-Dichlorophenol	EPA 8270D
2-Chlorophenol	EPA 8270C
	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270C
	EPA 8270D
2-Methylphenol	EPA 8270C
	EPA 8270D
2-Nitrophenol	EPA 8270C
	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270C
	EPA 8270D
4-Methylphenol	EPA 8270C
	EPA 8270D
4-Nitrophenol	EPA 8270C
	EPA 8270D
Pentachlorophenol	EPA 8270C
	EPA 8270D
Phenol	EPA 8270C
	EPA 8270D

Semi-Volatile Organics

1,2-Dichlorobenzene, Semi-volatile	EPA 8270C
	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270C
	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270C

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Semi-Volatile Organics

1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270C EPA 8270D
Acetophenone	EPA 8270C EPA 8270D
Benzoic Acid	EPA 8270C
Benzyl alcohol	EPA 8270C EPA 8270D
Dibenzofuran	EPA 8270C EPA 8270D

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260B
1,2-Dichlorobenzene	EPA 8260B
1,3-Dichlorobenzene	EPA 8260B
1,4-Dichlorobenzene	EPA 8260B
Benzene	EPA 8260B
Bromobenzene	EPA 8260B
Chlorobenzene	EPA 8260B
Ethyl benzene	EPA 8260B
Isopropylbenzene	EPA 8260B
Naphthalene, Volatile	EPA 8260B EPA 8260C
Styrene	EPA 8260B
Toluene	EPA 8260B
Total Xylenes	EPA 8260B

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260B
1,1,1-Trichloroethane	EPA 8260B
1,1,2,2-Tetrachloroethane	EPA 8260B
1,1,2-Trichloroethane	EPA 8260B
1,1-Dichloroethane	EPA 8260B
1,1-Dichloroethene	EPA 8260B
1,2,3-Trichloropropane	EPA 8260B
1,2-Dibromo-3-chloropropane	EPA 8260B
1,2-Dibromoethane	EPA 8260B
1,2-Dichloroethane	EPA 8260B
1,2-Dichloropropane	EPA 8260B
2-Chloroethylvinyl ether	EPA 8260B
Bromochloromethane	EPA 8260B
Bromodichloromethane	EPA 8260B
Bromoform	EPA 8260B
Bromomethane	EPA 8260B
Carbon tetrachloride	EPA 8260B
Chloroethane	EPA 8260B
Chloroform	EPA 8260B
Chloromethane	EPA 8260B
cis-1,2-Dichloroethene	EPA 8260B
cis-1,3-Dichloropropene	EPA 8260B
Dibromochloromethane	EPA 8260B
Dichlorodifluoromethane	EPA 8260B
Methylene chloride	EPA 8260B

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Volatile Halocarbons

Tetrachloroethene	EPA 8260B
trans-1,2-Dichloroethene	EPA 8260B
trans-1,3-Dichloropropene	EPA 8260B
Trichloroethene	EPA 8260B
Trichlorofluoromethane	EPA 8260B
Vinyl chloride	EPA 8260B

Volatile Organics

1,4-Dioxane	EPA 8260B
2-Butanone (Methylethyl ketone)	EPA 8260B
2-Hexanone	EPA 8260B
4-Methyl-2-Pentanone	EPA 8260B
Acetone	EPA 8260B
Carbon Disulfide	EPA 8260B
Methyl tert-butyl ether	EPA 8260B
Vinyl acetate	EPA 8260B

Sample Preparation Methods

EPA 1311
EPA 3010A
EPA 3050B
EPA 3060A
EPA 3540C
EPA 3545
EPA 3550B
EPA 3550C
EPA 3580A

Sample Preparation Methods

EPA 5030B
EPA 5035

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