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FINAL TIER 2 SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) SITE SCREENING PROCESS INVESTIGATION SITE 69 BUILDING 1018 OXIDIZER PROCESS BUILDING AREA OF CONCERN 31 (AOC 31) BUILDING 259 OLD STOREHOUSE/DETONATOR PRODUCTION NSWC INDIAN HEAD MD

07/01/2013

TETRA TECH INC

TITLE PAGE

(UFP-QAPP Manual Section 2.1 and UFP-QAPP Workbook Worksheet [WS] #1)

Final

Tier 2 Sampling and Analysis Plan

(Field Sampling Plan and Quality Assurance Project Plan)

Site Screening Process Investigation

Site 69 – Building 1018 (Oxidizer Process Building)
AOC 31 – Building 259 (Old Storehouse / Detonator Production)

Naval Support Facility Indian Head

Indian Head, Maryland

Prepared for:
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Contract Task Order JU14

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EXECUTIVE SUMMARY

This Uniform Federal Policy (UFP) Sampling and Analysis Plan (SAP) (Navy "Tier 2" format) has been prepared for Naval Facilities Engineering Command (NAVFAC) Washington by Tetra Tech, Inc. (Tt) under the *Comprehensive Long-Term Environmental Action Navy (CLEAN)* Contract No. N62470-08-D-1001, Contract Task Order (CTO) JU14. This UFP-SAP provides the site/project-specific work plan components for the Site Screening Process (SSP) investigations for two Navy Installation Restoration Program (IRP) sites at Naval Support Facility (NSF) Indian Head (NSF-IH) in Indian Head, Maryland: Site 69 – Building 1018 (Oxidizer Process Building) and Area of Concern (AOC) 31 – Building 259 (Old Storehouse / Detonator Production) (each referred to herein as the site). This SAP will be accompanied in the field by the project-specific *Health and Safety Plan (HASP)* and the *NSF-IH Master UFP-SAP* (Tt, 2009).

Site 69 is located in the center of the Main Area (Figure 2). The site extends from former Building 1018 (initially understood source area) to Town Gut Creek (receiving water body) and measures over 10 acres. The site topography slopes steeply from former Building 1018 (30 feet [ft] above mean sea level [msl]) to the creek (5 ft msl) (Figure 4a). The site contains many buildings, elevated walkways, and access roads associated with perchlorate processing and storage. Otherwise, the ground surface is mostly grassed with some eroded drainage paths, some creeks and grassed drainage swales, and several concrete-lined channels leading to Town Gut Creek. The loading dock at Building 1018 was the initial transfer location for perchlorate grains to be processed at the facility. The building was used for the grinding of ammonium perchlorate and potassium perchlorate into powder form, and the interior was washed out periodically onto the surrounding ground surface. Building 1018 and all its associated structures/features (e.g., hydraulic lift and loading dock) were demolished and removed by the Navy in 2012. No CERCLA risk evaluations have been performed to date. Sampling to support the demolishment activities revealed elevated levels of perchlorate in the soil and standing water in the vicinity.

AOC 31 is located in the north-central portion of the Main Area (Figure 2). The site measures 0.4 acre, surrounding former Building 259 (source), and extending over to the wooded habitat west of the building (potential runoff receiving area). The site topography is relatively flat with only 5 ft relief from east to west across the site (Figure 4b). Following demolition and restoration of the site by NSF-IH in 2012, the site contains no features. The ground surface is entirely grassed with a wooded area bounding the western side of the site. Former Building 259 was built in 1917 and used as a storehouse. During World War I, lead azide was produced outside the building and "cooled by water that ran through the trench outside." Prior to its demolition in 2012, the building inventory included heat exchangers, mills, reactors, ovens, and a fume hood. The building slab measured 320 square feet. The building, and the materials within the building prior to their removal, were decontaminated (from explosives) prior to demolition. No CERCLA risk evaluations have been performed to date.

The objectives of the SSP-level investigation for each of Site 69 and AOC 31 are as follows:

- Acquire sufficient data to assess the extent of environmental contamination and the associated risks to human health, welfare, and the environment.
- The data collected for the SSP investigations are to be sufficient to provide the basis for a determination that either of the following: (1) A Remedial Investigation (RI), another investigation, and/or a removal action, as appropriate, be performed on the area addressed by the SSP; or (2) The area does not pose a threat, or potential threat, to public health, welfare, or the environment and therefore the area should be removed from further study under the NSF-IH Federal Facility Agreement (FFA) guidelines.

Meeting these objectives and completing the SSP investigation fieldwork will require several field tasks and the use of multiple subcontractors as describe throughout this SAP. Field tasks include the following: utility

clearance, soil borings, monitoring well installations, monitoring well groundwater sampling, surface and subsurface soil sampling, sediment and surface water sampling, surveying, management of investigation-derived waste (IDW), decontamination activities, and other related ancillary tasks. The following subcontractors will be required to complete the SSP investigations: utility clearance, drilling / direct push technology (DPT), survey, IDW management, and offsite laboratory services. Following offsite laboratory analysis of the various samples, the data will be validated, evaluated, and presented in the SSP Report. The SSP Report will be prepared consistent with Navy and EPA guidance and recent SSP reports for NSF-IH.

Data Quality Objectives (DQOs) have been identified or developed herein, including decision action limits and risk-based screening levels for each analyte. Samples in all applicable media will be analyzed for potential site-related contaminants (e.g., perchlorate at Site 69 and energetics and lead at AOC 31), which have been selected via research on operations at each site. Other parameters and analyses detailed in this SAP will support the risk evaluations and an evaluation of geochemical conditions at each site.

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ACRONYMS AND ABBREVIATIONS

~	about or approximately
#	number
%	percent
%D	percent difference
ºC	degree Celsius
ºF	degree Fahrenheit
<	less than
>	greater than
µg	microgram(s)
µg/kg	microgram(s) per kilogram
µg/L	microgram(s) per liter
µm	micron(s) or micrometer(s)
a.k.a.	also known as
amu	atomic mass unit
ANSI/ASQ	American National Standards Institute/American Society for Quality
AOC	Area of Concern
ASTM	American Society for Standards and Materials
bgs	below ground surface
BTAG	[EPA Region 3] Biological Technical Assistance Group
c/o	care of
CAS	Chemical Abstract Service [Number]
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CD	chlorite dismutase
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
CoC	chain-of-custody [form]
COC	Chemical of Concern
COMAR	Code of Maryland Regulations
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CRDL	Contract-Required Detection Limit
CSM	Conceptual Site Model
CTO	Contract Task Order
CVAA	Cold Vapor Atomic Absorption
DAF	Dilution Attenuation Factor
DL	Detection Limit
DoD	Department of Defense
DCN	Document Control Number
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DPT	Direct Push Technology (a.k.a. Geoprobe®)
DQI	Data Quality Indicator
DQO	Data Quality Objective
DV	data validation
DVM	Data Validation Manager
eco	ecological
EDD	electronic data deliverable
ELAP	[DoD] Environmental Laboratory Accreditation Program

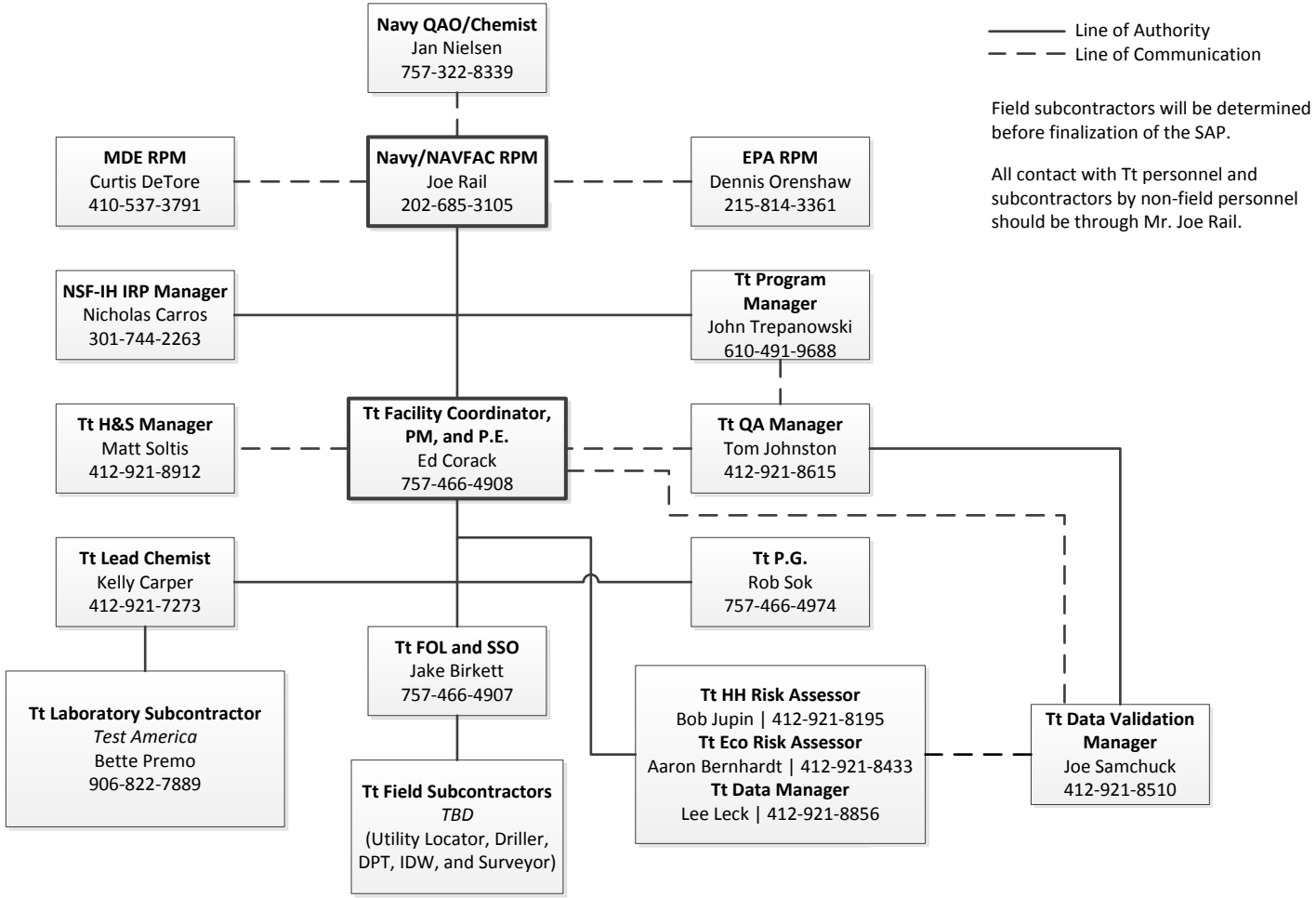
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
ERP	[Navy] Environmental Restoration Program
ESTCP	Environmental Security Technology Certification Program
FCR	Field Change Request
FFA	Federal Facility Agreement
FID	flame ionization detector
FOL	Field Operations Leader
FS	Feasibility Study
FSP	Field Sampling Plan
ft	feet or foot
FTMR	Field Task Modification Request
g	gram(s)
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/Mass Spectrometer
GC-FID	Gas Chromatograph – Flame Ionization Detector
GIS	Geographic Information System
GPC	Gel Permeation Chromatography
GPS	Global Positioning System
H&S	health and safety
HASP	Health and Safety Plan
HH	human health
HHRA	human health risk assessment
HI	Hazard Index
HMX	His/Her Majesty's Explosive (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
HQ	Hazard Quotient
HPLC	High Pressure Liquid Chromatograph
IC	Ion Chromatograph
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma
ID	identification
IDQTF	Intergovernmental Data Quality Task Force
IDW	investigation-derived waste
ILCR	Incremental Lifetime Cancer Risk
IRP	[Navy] Installation Restoration Program
ITRC	Interstate Technology and Regulatory Council
kg	kilogram(s)
L	liter(s)
LANL	Los Alamos National Laboratory
LC	liquid chromatography
LCS	Laboratory Control Sample
LFB	Laboratory Fortified Blank
LIMS	Laboratory Information Management Systems
LOD	Limit of Detection
LOQ	Limit of Quantification
MCL	Maximum Contaminant Level
mg	milligram(s)
mg/kg	milligram(s) per kilogram

mg/L	milligram(s) per liter
MCL	[federal] Maximum Contaminant Level
MDE	Maryland Department of Environment
mL	milliliter(s)
msl	[above] mean sea level
mV	millivolt(s)
MPC	Measurement Performance Criteria
MQO	Measurement Quality Objectives
MDL	Method Detection Limit
MNA	monitored natural attenuation
MS	mass spectrometry
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSR	Management Systems Review
NA or N/A	not applicable
NAVFAC	Naval Facilities Engineering Command
NEDD	NIRIS Electronic Data Deliverable
NIRIS	Navy Installation Restoration Information Solution
NIST	National Institute of Standards and Technology
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOSSA	Naval Ordnance Safety and Security Activity
NPL	National Priorities List
NSF	Naval Support Facility
NSF-IH	Naval Support Facility Indian Head
NTU	Nephelometric Turbidity Unit
ORNL	Oak Ridge National Laboratory
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency and Response
oz	ounce(s)
PAL	Project Action Limit
PAH	polycyclic aromatic hydrocarbon
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PDF	Portable Document Format
P.E.	Professional Engineer
P.G.	Professional Geologist
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
PQL	Project Quantitation Limit
PQLG	Project Quantitation Limit Goal
PQO	Project Quality Objective
PRAP	Proposed Remedial Action Plan
PRP	Potentially Responsible Party
PRQL	Project-Required Quantitation Limit
PSL	Project Screening Limit
PT	Proficiency Testing (previously known as performance evaluation (PE) sample)
PVC	polyvinyl chloride
QA	Quality Assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer

QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
qPCR	quantitative polymerase chain reaction
QS	Quality System
QSM	Quality Systems Manual
RAGS	[U.S. EPA] Risk Assessment Guidance for Superfund
RDX	Royal Demolition Explosive (hexahydro-1,3,5-trinitro-1,3,5-triazine)
RI	Remedial Investigation
RIC	Reconstructed Ion Chromatogram
ROD	Record of Decision
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RSD	Relative Standard Deviation
RSL	[EPA] Regional Screening Level
RT	Retention Time
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SOW	scope of work (or statement of work)
SSL	Soil Screening Level
SSA	Site Screening Area
SSP	Site Screening Process
SVOC	semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TBD	To Be Determined
TOC	total organic carbon
Tt	Tetra Tech
UCL	upper confidence limit
U.S.	United States
UFP	Uniform Federal Policy
WS	Worksheet
wt%	percent by weight

1 PROJECT ORGANIZATIONAL CHART

(UFP-QAPP Manual Section 2.4.1 and UFP-QAP Workbook WS #5)



Notes:

QA – Quality Assurance QAO – Quality Assurance Officer MDE – Maryland Department of Environment NAVFAC – Naval Facilities Engineering Command
RPM – Remedial Project Manager EPA – U.S. Environmental Protection Agency [Region 3] NSF-IH – Naval Support Facility Indian Head IRP – Installation Restoration Program
H&S – Health and Safety PM – Project Manager P.E. – Professional Engineer P.G. – Professional Geologist FOL – Field Operations Lead Tt – Tetra Tech
SSO – Site Safety Officer HH – Human Health Eco – Ecological DPT – Direct Push Technology IDW – Investigation-Derived Waste TBD – To Be Determined

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2 COMMUNICATION PATHWAYS

(UFP-QAPP Manual Section 2.4.2 and UFP-QAPP Workbook WS #6)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Changes in schedule	Tt PM Navy RPM	Ed Corack Joe Rail	757-466-4908 202-685-3105	Tt PM informs the Navy RPM via telephone within 1 day. Navy RPM informs Regulatory RPMs via email within 7 days. Tt PM will document the changes within 5 days and send the Navy RPM a concurrence letter (or equivalent) within 7 days of identifying the need for change. Navy RPM will send scope change approval to Tt Program office before work is started.
Issues in the field that result in minor modifications of field methodology or sampling protocol	Tt FOL Tt PM	Jake Birkett Ed Corack	757-466-4907 757-466-4908	Tt FOL informs Tt PM/P.E. as soon as possible via phone, and Tt PM informs Navy RPM and Tt P.G. via email within 1 day. Tt FOL documents in field log book. Navy RPM informs Regulatory RPMs via email within 7 days.
Field conditions that result in changes in scope of field work or major modifications in field methodology or sampling protocol	Tt FOL Tt PM	Jake Birkett Ed Corack	757-466-4907 757-466-4908	Tt FOL informs Tt PM/P.E. as soon as possible via phone. Tt PM informs the Navy RPM and Tt P.G. as soon as possible via phone. Tt FOL and PM prepare a field task modification request (FTMR) within 2 days, and Navy RPM provides request to Regulatory RPMs within 2 days via email.
Recommendation to stop work and initiate work upon corrective action	Tt FOL Tt PM Tt QA Manager Tt H&S Manager Navy RPM	Jake Birkett Ed Corack Tom Johnston Matt Soltis Joe Rail	757-466-4907 757-466-4908 412-921-8615 412-921-8912 202-685-3105	Responsible party immediately informs subcontractors, Navy, and Tt PM via phone and email. Navy RPM informs Regulatory RPMs via email. Tt PM will inform Navy RPM (verbally or via email) by close of the next working day. Navy RPM will issue scope change approval (verbally or via email at RPM discretion). If warranted (as determined by the Navy RPM), scope change will be documented before work is executed. The Tt FOL will document the changes on a FTMR form within 2 days of identifying the need for change and obtain required approvals within five days of initiating the form. If Tt is the responsible party for a stop work command, the Tt FOL will inform onsite personnel, subcontractor(s), the Navy RPM, and the Facility POC (NSF-IH IRP Manager) within 1 hour (verbally or by email). The Navy RPM will notify the Regulatory RPMs within 1 day. If a subcontractor is the responsible party, the subcontractor PM must inform the Tt FOL within 15 minutes, and the Tt FOL will then follow the procedure listed above.
Corrective Action for field program	Tt QA Manager Tt PM	Tom Johnston Ed Corack	412-921-8615 757-466-4908	Tt QA Manager will notify Tt PM via email within 1 day that the corrective action has been completed. Tt PM will then notify the Navy RPM via email within 1 day.
Field data quality issues	Tt FOL Tt PM	Jake Birkett Ed Corack	757-466-4907 757-466-4908	Tt FOL will inform Tt PM via phone or by email (at FOL discretion) on the same day that a field data quality issue is discovered.

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Analytical data quality issues	Test America PM Tt Project Chemist Tt DVM Tt PM Navy RPM	Bette Premo Kelly Carper Joe Samchuck Ed Corack Joe Rail	906-822-7889 412-921-7273 412-921-8510 757-466-4908 202-685-3105	The Laboratory PM will notify (via phone or email) the Tt Project Chemist within 1 day of when an issue related to laboratory data is discovered. The Tt Project Chemist will notify (via phone or via email) the data validation staff and the Tt PM within 1 day. Tt DVM or Project Chemist notifies Tt PM via phone or email within 48 hours of validation completion that a non-routine and significant laboratory quality deficiency has been detected that could affect this project and/or other projects. The Tt PM verbally advises the Navy RPM within 24 hours of notification from the Project Chemist or DVM. The Navy RPM takes corrective action that is appropriate for the identified deficiency. Examples of significant laboratory deficiencies include data reported that has a corresponding failed tune or initial calibration verification. In the event of a significant laboratory deficiency, the navy RPM should contact the Navy Chemist/QA Officer.

Notes:
Tt – Tetra Tech PM – Project Manager RPM – Remedial Project Manager FOL – Field Operations Lead QA – Quality Assurance DV – Data Validation
P.E. – Professional Engineer P.G. – Professional Geologist FTMR – Field Task Modification Request (or Field Change Request [FCR])
Test America – White Water Associates and Alliance Partner Test America DVM – Data Validation Manager NAVFAC – Naval Facilities Engineering Command

3 PROJECT PLANNING SESSION PARTICIPANTS SHEET(S)

(UFP-QAPP Manual Section 2.5.1 and UFP-QAPP Workbook WS #9)

3.1 Partnering Team Scoping Session No. 1

Project Name:	Site 69 and AOC 31 Site Screening Process (SSP) Investigation(s)	**Site Name:**	Site 69 – Building 1018 (Oxidizer Process Building) AOC 31 – Building 259 (Old Storehouse / Detonator Production)
Projected Date(s) of Sampling:	Fall 2011	**Site Location:**	Naval Support Facility Indian Head (NSF-IH)
Project Manager:	Ed Corack, Tetra Tech (Tt)		
Date of Session:	May 11, 2011		
Scoping Session Purpose:	Initial scoping session for the SSP Investigations at Site 69 and AOC 31 c/o the Navy-format Uniform Federal Policy (UFP) Sampling and Analysis Plan (SAP) work plan.		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Dennis Orenshaw	RPM	EPA Region 3	215-814-3361	orenshaw.dennis@epa.gov	Regulatory oversight
Curtis DeTore	RPM	MDE	410-537-3791	cdetore@mde.state.md.us	Regulatory oversight
Joe Rail	RPM	NAVFAC Washington	202-685-3105	joseph.rail@navy.mil	Navy RPM
Nate Delong	RPM	NAVFAC Washington	202-685-3297	nathan.delong@navy.mil	NTR
Nicholas Carros	IRP Manager	NAVFAC Washington	301-744-2263	nicholas.carros@navy.mil	Onsite/Facility IRP Manager
Ed Corack	PM	Tt	757-466-4908	ed.corack@tetratech.com	Navy Contractor
Scott Nesbit	Facility Coordinator	Tt	412-921-7134	scott.nesbit@tetratech.com	Navy Contractor
Margaret Kasim	Activity Manager	CH2M HILL	703-376-5154	margaret.kasim@ch2m.com	Navy Contractor
Vicki Waranoski	Meeting Scribe	CH2M HILL	703-376-5049	victoria.waranoski@ch2m.com	Navy Contractor

First scoping session for the SSPs at Site 69 and AOC 31. New IRP site and Area of Concern (AOC). Both to undergo Site Screening Process (SSP) as Site Screening Areas (SSAs) per the NSF-IH Federal Facility Agreement (FFA).

The Team agreed the Tier 2 UFP-SAP format should be used for this project. [Jon Tucker/NAVFAC LANT Chemist provided a presentation to the Team on the new Tier 2 format at this Partnering Meeting].

PowerPoint presentation(s) provided onscreen and via handouts.

Comments/Decisions:
Both sites have come about as a result of preparation for building demolitions. Pre-demolition sampling for (a) waste characterization and (b) decontamination requirements was conducted by NSF-IH Environmental/Safety department personnel. Elevated perchlorate was found in both wastewater, surface water, and soil at Building 1018 (Site 69). Several energetics were detected inside Building 259 (AOC 31) and several detonator-production-related metals were detected outside Building 259 (AOC 31).

Team reviewed preliminary conceptual site model (CSM) for each site.

Team discussed likely receptors for each site: ecological receptors (tbd; screening-level eco evaluation at most); human health receptors –construction worker, industrial worker, visitor, and trespasser. Future residential scenario also will be evaluated to be conservative.

Potentially all media (groundwater, soil, surface water, and sediment) are contaminated at each site. The presence of sediment/surface water at AOC 31 is questionable—site visit needed to confirm wet conditions near the woods. [follow-up – no sediment or surface water media observed at the site].

Team used judgmental/biased approach to place initial sample locations based on perceived release locations, site features, and topography. The sample coverage at Site 69 ends up being quite extensive—almost Remedial Investigation (RI)-level. The Team thinks this is needed due to the likely amount of perchlorate released and the size and topography of Site 69. Sediments at Site 69 likely will be sampled for perchlorate because of anticipated high perchlorate concentrations in groundwater and the degree of historical release(s).

Team developed the initial problem statements as follows:

> **Site 69:** Based on site history and NSF-IH Environmental Dept sample results, releases occurred to soil and groundwater from perchlorate grain handling and washout procedures for Building 1018. Perchlorate is the only chemical associated with the site operations. Nitrate/nitrite also will be included due to their frequent association with perchlorate. Additional data are needed to determine the extent of contamination, preliminary human health and ecological risks, and whether an RI is necessary for the site.
>
> **AOC 31:** Based on site history and NSF-IH Environmental Dept sample results, releases occurred to soil and groundwater from storage and/or detonator production activities at Building 259 and the adjacent ditch. Based on research on the detonator production and likely storage materials, the chemicals likely associated with the site operations are perchlorate, nitrate/nitrite, select metals, and select explosives. Additional data are needed to determine the extent of contamination, preliminary human health and ecological risks, and whether an RI is necessary for the site.

The proposed sampling approach for the Site 69 will be comprised of the following:

- Installation of three monitoring wells along the likely groundwater flow path, one of which will be installed at the known source location outside of Building 1018. Surface and subsurface soil samples will be collected during installation at each location.
- Groundwater monitoring of the three new monitoring wells.
- Ten surface soil and five subsurface soil samples collected across the site (all five subsurface soil samples are collocated with the surface soil samples, and three sets are collocated with the three new monitoring wells). Data will be assessed for the potential for soils to be an ongoing source of groundwater contamination.
- Eight each collocated sediment and surface water samples collected from drainage swales/creeks and the receiving water body (Town Gut Creek).

The proposed sampling approach for the AOC 31 will be comprised of the following:

- Installation of one monitoring well at the likely source location (the ditch [at end of concrete-lined ditch]). Surface and subsurface soil samples will be collected during installation of this well.
- One concrete chip sample of the ditch lining.
- Groundwater monitoring of the one new monitoring well.
- Three surface soil samples in the ditch (just below the concrete where it exists). One subsurface soil sample collocated with a surface soil sample at the new monitoring well location at the end of the ditch. One surface soil samples at the drain pipe location on the west side of Building 259. [Total five surface soil samples and one subsurface soil sample]. Data will be assessed for the potential for soils to be an ongoing source of groundwater contamination.
- One each collocated sediment and surface water sample at the end of the drainage swale path near the woods to the west of the Building 259.

<u>Action Items:</u>
Tt to complete proposed sampling scheme and refine CSMs and exposure pathway analyses for next scoping session. Tt to develop/refine decision rules with/from problem statements for next scoping session.

<u>Consensus Decisions:</u>
None.

3.2 Tetra Tech Team Charter Meeting

Project Name:	Site 69 and AOC 31 Site Screening Process (SSP) Investigation(s)	**Site Name:**	Site 69 – Building 1018 (Oxidizer Process Building) AOC 31 – Building 259 (Old Storehouse / Detonator Production)
Projected Date(s) of Sampling:	Fall 2011	**Site Location:**	Naval Support Facility Indian Head (NSF-IH)
Project Manager:	Ed Corack, Tetra Tech (Tt)		
Date of Session:	June 15, 2011		
Scoping Session Purpose:	SSP charter and kickoff meeting following first scoping with the Tier 1 Partnering Team.		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Ronnie Britto	Senior Consultant	Tt	901-849-0193	Ronnie.Britto@tetratech.com	Senior Consultant
Ann Cognetti	Chemist	Tt	412-921-8862	Ann.Cognetti@tetratech.com	Chemist
Kelly Carper	Project Chemist	Tt	412-921-7273	Kelly.Carper@tetratech.com	Project Chemist
Tom Johnston	QAM	Tt	412-921-8615	Tom.Johnston@tetratech.com	QAM
Ed Corack	PM	Tt	757-466-4908	ed.corack@tetratech.com	PM
Scott Nesbit	Facility Coordinator	Tt	412-921-7134	scott.nesbit@tetratech.com	Facility Coordinator
Lee Ann Sinagoga	Risk Assessment Manager	Tt	412-921-8887	LeeAnn.Sinagoga@tetratech.com	Risk Assessment Manager
Suzanne Paxton	GIS Tech	Tt	412-921-8817	Suzanne.Paxton@tetratech.com	GIS Tech

QAM – Quality Assurance Manager PM – Project Manager

This was a conference call meeting.

Comments/Decisions:
The PM provided an overview of the project via PowerPoint presentation.

- The overview identified organizational info, including Navy and regulator members of the Tier 1 Partnering Team, as well as Tt personnel and roles for the SAP through the SSP Reports for each of Site 69 and AOC 31.
- Required subcontractors for the SSP will include laboratory, survey, IDW, utility, and driller/DPT.
- Milestones (including intermediate, workable tasks) were defined from the SAP through the SSP fieldwork events and reports.

PM set up and identified a project share folder on Pittsburgh server.

Action Items:
Lee Ann to assign lead human health and ecological risk assessors through the RI risk assessments [by June 16, 2011].

Consensus Decisions:
None.

3.3 Partnering Team Scoping Session No. 2

Project Name:	Site 69 and AOC 31 Site Screening Process (SSP) Investigation(s)	**Site Name:**	Site 69 – Building 1018 (Oxidizer Process Building) AOC 31 – Building 259 (Old Storehouse / Detonator Production)
Projected Date(s) of Sampling:	Winter 2012	**Site Location:**	Naval Support Facility Indian Head (NSF-IH)
Project Manager:	Ed Corack, Tetra Tech (Tt)		
Date of Session:	August 3, 2011		
Scoping Session Purpose:	Follow-on scoping session for the SSPs at Site 69 and AOC 31.		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Dennis Orenshaw	RPM	EPA Region 3	215-814-3361	orenshaw.dennis@epa.gov	Regulatory oversight
Curtis DeTore	RPM	MDE	410-537-3791	cdetore@mde.state.md.us	Regulatory oversight
Joe Rail	RPM	NAVFAC Washington	202-685-3105	joseph.rail@navy.mil	Navy RPM
Nate Delong	RPM	NAVFAC Washington	202-685-3297	nathan.delong@navy.mil	NTR
Nicholas Carros	IRP Manager	NAVFAC Washington	301-744-2263	nicholas.carros@navy.mil	Onsite/Facility IRP Manager
Ed Corack	PM	Tt	757-466-4908	ed.corack@tetratech.com	Navy Contractor
Scott Nesbit	Facility Coordinator	Tt	412-921-7134	scott.nesbit@tetratech.com	Navy Contractor
Margaret Kasim	Activity Manager	CH2M HILL	703-376-5154	margaret.kasim@ch2m.com	Navy Contractor
Vicki Waranoski	Meeting Scribe	CH2M HILL	703-376-5049	victoria.waranoski@ch2m.com	Navy Contractor

Presentation via PowerPoint onscreen and handouts.

Comments/Decisions:
Team reviewed the updated problem statements and individual DQOs/decision rules. Team reviewed the updated CSMs, including 3-d figure and Exposure Pathway Analysis matrix for each site.

Team reviewed and modified the SSP sampling approach (locations) for each site. A site visit to AOC 31 confirmed no surface water or sediment present at the location near the woods to the west of Building 259. Therefore, this location will be another surface soil sample [New total five surface soil samples at AOC 31].

Team reviewed and revised/confirmed the analytes for groundwater, soil, sediment, and surface water at Site 69 and groundwater, soil, and concrete at AOC 31.

Site 69	
Analytes for Groundwater, Soil, Sediment, and Surface Water	**Miscellaneous / Other**
Oxidizers	**Groundwater**
Perchlorate	Nitrate
	Nitrite

AOC 31	
Analytes for Groundwater, Soil, and Concrete	**Miscellaneous / Other**
Explosives	**Groundwater**
2,4-Dinitrotoluene	Nitrate
2,6-Dinitrotoluene	Nitrite
HMX	
RDX	
Tetryl	
2,4,5-Trinitrotoluene	
2-Nitrotoluene	
3-Nitrotoluene	
4-Nitrotoluene	
Nitrobenzene	
1,3-Dinitrobenzene	
4-Amino-2,6-Dinitrotoluene	
2-Amino-4,6-Dinitrotoluene	
1,3,5-Trinitrobenzene	
Oxidizers	
Perchlorate	
Metals (Total & Dissolved)	
Lead	
Mercury	

Action Items:
None.

Consensus Decisions:
SSP analytes will consist of those noted above. These should capture all likely potential contaminants and support the baseline human health and screening ecological risk assessments.

3.4 Partnering Team Scoping Session No. 3

Project Name:	Site 69 and AOC 31 Site Screening Process (SSP) Investigation(s)	**Site Name:**	Site 69 – Building 1018 (Oxidizer Process Building) AOC 31 – Building 259 (Old Storehouse / Detonator Production)
Projected Date(s) of Sampling:	Winter 2012	**Site Location:**	Naval Support Facility Indian Head (NSF-IH)
Project Manager:	Ed Corack, Tetra Tech (Tt)		
Date of Session:	February 8, 2012		
Scoping Session Purpose:	Site visit.		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Dennis Orenshaw	RPM	EPA Region 3	215-814-3361	orenshaw.dennis@epa.gov	Regulatory oversight
Curtis DeTore	RPM	MDE	410-537-3791	cdetore@mde.state.md.us	Regulatory oversight
Joe Rail	RPM	NAVFAC Washington	202-685-3105	joseph.rail@navy.mil	Navy RPM
Nate Delong	RPM	NAVFAC Washington	202-685-3297	nathan.delong@navy.mil	NTR
Nicholas Carros	IRP Manager	NAVFAC Washington	301-744-2263	nicholas.carros@navy.mil	Onsite/Facility IRP Manager
Ed Corack	PM / Facility Coordinator	Tt	757-466-4908	ed.corack@tetratech.com	Navy Contractor
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John Trepanowski	Program Manager	Tt	610-382-1532	john.trepanowski@tetratech.com	Navy Contractor
Margaret Kasim	Activity Manager	CH2M HILL	703-376-5154	margaret.kasim@ch2m.com	Navy Contractor
Vicki Waranoski	Meeting Scribe	CH2M HILL	703-376-5049	victoria.waranoski@ch2m.com	Navy Contractor

Team visited Site 69 and AOC 31 to truth sample locations, terrain and vegetation, etc.

Comments/Decisions:

Site 69: Building 1018 has been demolished already by NSF-IH. Some Site 69 sample locations adjusted to accommodate assumed utilities and terrain/vegetation.

AOC 31: Building 259 and the concrete trench have been demolished already by NSF-IH. Pre-determined sample locations will be located with GPS for the SSP fieldwork.

Action Items:

None.

Consensus Decisions:

UFP-SAP can be finalized with adjusted sample locations.

4 CONCEPTUAL SITE MODEL

(UFP-QAPP Manual Section 2.5.2 and UFP-QAPP Workbook WS #10)

This section summarizes the preliminary Conceptual Site Models (CSMs) for each of Site 69 (Building 1018 – Oxidizer Process Building) and AOC 31 (Building 259 – Old Storehouse / Detonator Production). See Section 5 for the Data Quality Objective (DQO) / Project Quality Objective process. Limited background information, including site location and description, site history, and a brief summary of the assumed site geology and hydrogeology are included below. No previous environmental restoration investigations have occurred at either site; however, information related to NSF-IH Activity (i.e., facility) pre-demolition sampling and decontamination efforts are summarized below and provided in Appendix A.

4.1 Site Description and History

Naval Support Facility Indian Head (NSF-IH) is located approximately 25 miles southwest of Washington, D.C., in northwestern Charles County, Maryland (Figure 1), positioned along the Potomac River at the confluence of Mattawoman Creek. NSF-IH has been active since 1890 and assumed its current name in 2005. As shown on Figures 1 and 2, the Main Area of the facility is bounded by the Potomac River on the northwest, west, and south, Mattawoman Creek to the south and east, and the Town of Indian Head to the northeast.

The Indian Head peninsula is located in the Atlantic Coastal Plain Physiographic Province, approximately 8 to 10 miles east of the Fall Line that marks the western extent of the physiographic province. Indian Head has gently rolling to undulating topography with elevations ranging from sea level to more than 100 feet (ft) above mean sea level (msl). The higher elevations are on the eastern portion of the facility, and the land surface generally slopes to the southwest and southeast. The portion of NSF-IH along the Potomac River is characterized by 20- to 100-ft bluffs. The portion along Mattawoman Creek is more gently sloping.

4.1.1 <u>Site 69</u>

Site 69 is located in the center of the Main Area (Figure 2), with a newly created site boundary extending from former Building 1018 (initially understood source area) to Town Gut Creek (receiving water body) (Figure 3a) measuring over 10 acres. The site topography slopes steeply from former Building 1018 (30 feet [ft] above mean sea level [msl]) to the creek (5 ft msl) (Figure 4a). The site contains many buildings, elevated walkways, and access roads associated with perchlorate processing and storage. Otherwise, the ground surface is mostly grassed with some eroded drainage paths, some creeks and grassed drainage swales, and several concrete-lined channels leading to Town Gut Creek. The loading dock at Building 1018 was the initial transfer location for perchlorate grains to be processed at the facility. The building was used for the grinding of ammonium perchlorate and potassium perchlorate into powder form, and the interior was washed out periodically onto the surrounding ground surface. Building 1018 and all its associated structures/features (e.g., hydraulic lift and loading dock) were demolished and removed by the Navy in 2012. No CERCLA risk evaluations have been performed to date.

Previous environmental investigations/efforts were related to compliance, pre-demolition safety and waste characterization, and spill response (related documentation is provided in Appendix A):

- **Wastewater Sampling** – A wastewater sample from pooled surface water beneath the hydraulic lift off the south corner of Building 1018 was sampled by NSF-IH Environmental Department in September 2006. Perchlorate was detected at 110 micrograms per liter (µg/L) (Appendix A).

- **Pre-Demolition Sampling** – Applied Environmental performed surface soil, subsurface soil, and surface water sampling around Building 1018 in 2010. The primary objective was to characterize the type and degree of contamination in order to develop health and safety protocols for the demolition

workers (Applied Environmental, 2011; Appendix A). Samples were analyzed for perchlorate and inorganics.

Limited geologic/hydrogeologic information was developed in the report. The subsurface soil "consisted of fine grained sand and clayey sand, silt, and mottled silty clay characteristic of natural undisturbed deposits." Groundwater was encountered at 5 feet bgs. Tadpoles and crayfish were observed in the pooled water under the hydraulic lift.

Perchlorate concentrations ranged from less than (<) 1 microgram per kilogram (µg/kg) (nondetect) to 220 µg/kg in surface soil and from < 1 µg/kg (nondetect) to 14,000 µg/kg in subsurface soil. These concentrations are below the EPA residential (55,000 ug/kg) and industrial (720,000 µg/kg) Regional Screening Levels (RSLs). There were no notable detections of inorganics. Perchlorate was detected at 620 µg/L in the surface water from the pit beneath the hydraulic lift. The DoD perchlorate action level, equivalent to the EPA Lifetime Health Advisory Level, is 15 µg/L.

The report recommended developing safety precautions for demolition workers due to elevated perchlorate concentrations in soil and surface water / shallow groundwater to be encountered during demolition/removal activities.

- **Pre-Cleanup Sampling** – Following a hydraulic oil spill at the "Trident Plant" [Buildings 1034, 1035, and 1032] in fall 2011, four surface soil samples were collected and analyzed for explosives compounds (i.e., RDX, HMX, TNT, TEGDN, PGDN, NG, BTTN, TMETN, NC) prior to excavation and cleanup (Appendix A). Results showed all nondetects (< 0.1 mg/kg to < 0.3 mg/kg depending on compound).

Based on the hydrogeology at surrounding NSF-IH sites, as well as the limited lithologic observations from Applied Environmental (2011), the following are assumed: The unconfined surficial aquifer occurs in alluvial soil resting on top of the Patapsco clay. The water table generally slopes similarly to the land surface topography. Upland areas serve as groundwater recharge areas and low areas and the creek serve as groundwater discharge areas. Groundwater flow follows the surface topography at the site. Based on the sloping topography and multiple drainage features, overland flow to Town Gut Creek would be a significant migration route for spills. Figure 5a provides a three-dimensional interpretive CSM for the site. Figure 6a provides an exposure route pathway CSM for the site, which will be utilized to conduct the screening-level human health risk assessment (HHRA) and screening-level ecological risk assessment (ERA).

4.1.2 AOC 31

AOC 31 is located in the north-central portion of the Main Area (Figure 2), with a newly created site boundary measuring 0.4 acre, surrounding former Building 259 (source), and extending over to the wooded habitat west of the building (potential runoff receiving area) (Figure 3b). The site topography is relatively flat with only 5 ft relief from east to west across the site (Figure 4b). Following demolition and restoration of the site by NSF-IH in 2012, the site contains no features. The ground surface is entirely grassed with a wooded area bounding the western side of the site. Former Building 259 was built in 1917 and used as a storehouse (NSF-IH, 2010; see Appendix A). During World War I, lead azide was produced outside the building and "cooled by water that ran through the trench outside." Prior to its demolition in 2012, the building inventory included heat exchangers, mills, reactors, ovens, and a fume hood. The building slab measured 320 square feet. The building, and the materials within the building prior to their removal, were decontaminated (from explosives) prior to demolition. No CERCLA risk evaluations have been performed to date.

Previous environmental investigations/efforts were related to pre-demolition safety and waste characterization (related documentation is provided in Appendix A). NSF-IH sampled within Building 259 and outside the building, especially in the trench, in 2010 to prepare for required decontamination efforts and demolition. No

lead azide was detected, but elevated levels of mercury (6.78 percent by weight [wt%]) and lead (0.722 wt%) were present in the soil/trench as expected.

Based on the hydrogeology at surrounding NSF-IH sites, the following are assumed: The unconfined surficial aquifer occurs in alluvial soil resting on top of the Patapsco clay. The water table should follow the land surface topography at the site (i.e., slight gradient from east to west. There are no particular drainage features or discharge points. Subsequently, any released contamination should not migrate far from the source area (former Building 259 and the trench). Figure 5b provides a three-dimensional interpretive CSM for the site. Figure 6b provides an exposure route pathway CSM for the site, which will be utilized to conduct the screening-level HHRA and screening-level ERA.

4.2 Potential Sources of Contamination

4.2.1 Site 69

Spilled perchlorate grains at the loading dock and historical discharges of former Building 1018 washout water directly onto the ground surface resulted in the current perchlorate contamination (Figure 5a). This process is thought to have resulted in the discharge of solid perchlorate and/or water containing perchlorate on the soil surface. Perchlorate present in the soils would then be carried vertically into the shallow water table aquifer by infiltrating rainwater. Sorption of perchlorate to the aquifer matrix is believed to be minimal, so perchlorate could be flushed from the aquifer relatively easily by ambient groundwater flow.

Ammonium perchlorate is used as an oxidizing agent for solid propellant rockets and missiles. Perchlorate (ClO_4^-) is composed of a chloride atom bonded to four oxygen atoms. Perchlorate is usually found as the anion component of a salt and is released when the solid salts of ammonium (NH_4ClO_4), sodium ($NaClO_4$), or potassium perchlorate ($KClO_4$) and perchloric acid ($HClO_4$) dissolve in water (ESTCP, 2008; Motzer, 2001).

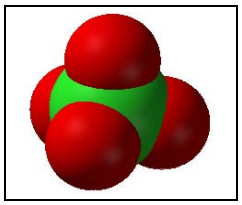

Exhibit: Perchlorate anion with green sphere representing chlorine atom and red spheres representing oxygen atoms (ITRC, 2005).

Perchlorate salts are highly soluble in water, dissociating completely to perchlorate anions that are nonvolatile, highly mobile, and chemically stable in aqueous systems (groundwater and surface water) under normal conditions. However, "solid perchlorate salts like ammonium perchlorate and highly concentrated solutions of perchlorate, known as brine, can behave similarly to dense non-aqueous phase liquid (DNAPL) when released into an aquifer system. As such, the perchlorate tends to sink through the water column until the mass reaches a low permeability confining layer (Motzer, 2001) where it persists causing secondary or recurring perchlorate contamination (ITRC, 2002; ESTCP, 2008)."

Therefore, perchlorate is the target analyte / contaminant for the SSP at Site 69.

Sediment is being sampled for perchlorate due to the perceived nature and size of the perchlorate release(s) at the site (sediment often forgoes perchlorate analysis otherwise). Sediment and at-depth surface water samples (at sediment horizon) will be collected to support the risk assessments. Ultimately no to low detections of perchlorate are expected in sediment and surface water.

4.2.2 AOC 31

The production of lead azide ($Pb[N_3]_2$) and potentially mercury fulminate ($Hg[ONC]_2$), as well as the storage/production of other detonators/primers and explosives at and outside of former Building 259, is believed to have resulted in contaminant releases to environmental media. These lead and mercury compounds are slightly soluble in water and alcohol, but highly soluble in diluted solutions of acid. Historical records and other research indicate the potential storage and/or production and testing of the following explosives at Building 259: 2,4-Dinitrotoluene; 2,6-Dinitrotoluene; HMX; RDX; Tetryl; 2,4,5-Trinitrotoluene; 2-Nitrotoluene; 3-Nitrotoluene; 4-Nitrotoluene; Nitrobenzene; 1,3-Dinitrobenzene; 4-Amino-2,6-Dinitrotoluene; 2-Amino-4,6-Dinitrotoluene; and 1,3,5-Trinitrobenzene. These explosives, lead, and mercury are the target analytes / expected contaminants for the SSP at AOC 31.

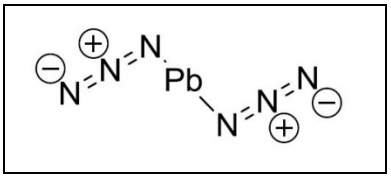

Exhibit: Lead Azide molecule (Encyclopedia Brittanica)

4.3 Potential Contaminant Migration Mechanisms

4.3.1 Site 69

Refer to Figure 5a and Figure 6a for primary and secondary contaminant sources, migration mechanisms, and exposure routes. Groundwater is believed to enter the unconfined shallow surficial aquifer as diffuse recharge in the upland area. Discharges to the soil of solid perchlorate and/or aqueous perchlorate solutions occurred from unloading and building washout activities at former Building 1018. Perchlorate in soils would be carried vertically to the surficial aquifer by infiltrating rainwater or snowmelt. Sorption of perchlorate to the aquifer matrix is believed to be minimal, so perchlorate could be flushed from the aquifer relatively easily by ambient groundwater flow (ESTCP, 2010a).

Perchlorate (an oxidizer) is relatively soluble compared to other environmental contaminants and generally does not adsorb strongly to soils or sediments. Vapor intrusion is not a concern at this site due to the [apparent] lack of volatile contaminants. Underground utilities (potable water, sewer, telecommunications, etc.) are present at the site and may offer preferential contaminant migration pathways.

4.3.2 AOC 31

Refer to Figure 5b and Figure 6b for primary and secondary contaminant sources, migration mechanisms, and exposure routes. Groundwater is believed to enter the unconfined shallow surficial aquifer as diffuse recharge in the upland areas. Discharges to the soil of metals and explosives contaminants occurred from detonator production and explosives storage at/in Building 259. Perchlorate in soils would be carried vertically to the surficial aquifer by infiltrating rainwater or snowmelt. Sorption of perchlorate to the aquifer matrix is believed to be minimal, so perchlorate could be flushed from the aquifer relatively easily by ambient groundwater flow (ESTCP, 2010a).

Perchlorate (an oxidizer) and explosives/energetics (e.g., nitramines) and some metal salts are relatively soluble compared to other environmental contaminants and generally do not adsorb strongly to soils or sediments. However, the metals used at this site tend to preferentially adsorb to soils and sediments rather than dissolve into water. Vapor intrusion is not a concern at this site due to the [apparent] lack of volatile contaminants. Few underground utilities (e.g., potable water, sewer, electricity, etc.) are present at the site, but might offer preferential contaminant migration pathways.

4.4 Land Uses and Potential Exposure

NSF-IH is a military facility with restricted access. Figures 6a and 6b present the potential exposure routes to be evaluated in the SSP for Site 69 and AOC 31, respectively.

4.4.1 Site 69

Current land use at Site 69 is commercial/industrial and is anticipated to remain as such for the foreseeable future. Process operations at Site 69 are based out of multiple buildings in the area. Building 1018 was demolished in 2012. The site is located almost entirely within a K-24 explosive arc and is within multiple K-18 explosive arcs.

4.4.2 AOC 31

There are no longer any operations at AOC 31, and Building 259 and the concrete trench have been demolished; however, the site remains as commercial/industrial with no changes in the foreseeable future. The site is not within any explosive arcs.

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5 DATA QUALITY OBJECTIVES / SYSTEMATIC PLANNING PROCESS STATEMENTS

(UFP-QAPP Manual Section 2.6.1 and UFP-QAPP Workbook WS #11)

5.1 Identification of Study Goals

Based on site history and past data collection, chemical releases are known to have occurred to soil from perchlorate grinding operations at Site 69. Ammonium and potassium perchlorate are the known chemicals released at Site 69. These releases occurred to soil directly and perchlorate contamination in the soil may have migrated into groundwater, surface water, and sediment.

At AOC 31, detonator production, storage, and/or testing activities resulted in releases of site-related chemicals outside of Building 259. Sampling and analysis of soil in in 2010 through 2011 to support the 2012 demolition activities indicated the presence of perchlorate, other energetic compounds, and metals related to detonator production. These contaminants may have migrated from soil into groundwater.

For both of these sites the presence or absence and magnitude of site-related chemical concentrations must be established to determine whether additional investigation or other action is necessary to characterize risks and protect human health and the environment. The receptors representing potentially exposed organisms, and their plausible exposure pathways, are identified in Section 4.

5.2 Information/Decision Inputs

To resolve the problem stated in the Study Goals above, concentrations of the following target analytes (site-related contaminants) must be measured in soil, sediment, surface water, and groundwater.

- Site 69 – Perchlorate.
- AOC 31 – Lead and mercury used in detonator production; perchlorate; nitramine and nitroaromatic explosives, impurities thereto, and significant degradation compounds thereof, used in detonator production.

A list of target analytes and analyte groups considered to be site-related or potentially site-related contaminants is provided in Section 4.2. Lists of individual target analytes are presented in Section 9. The analytical methods used to generate concentration data for these target analytes must be of sufficient sensitivity to allow detection and quantitation of the contaminants in support of project objectives. The analyses at an offsite fixed-base laboratory will be possible after sample collection in accordance with Section 7.4 and shipment to the laboratory.

Numerical screening criteria, or Project Screening Limits (PSLs), are needed to which measured chemical concentrations can be compared to establish the extent of contamination, to select suitable analytical methods, and to make initial estimates of human health and ecological risk for selecting chemicals of potential concern (COPCs) and Chemicals of Potential Ecological Concern (COPECs) that are evaluated further in the HHRA and ERA. These criteria, in addition to established NSF-IH background values, must be consistent with criteria used for other NSF-IH Environmental Restoration Program (ERP)[1] investigations. The criteria are presented in Section 9. The NSF-IH background data for soil and groundwater are available from the *NSF-IH Background Report* (Tt, 2002). Background values will be used to screen out concentrations of inorganics that are naturally occurring after the initial risk assessment is conducted. For the ERA, some of the PSLs can be considered Project Action Limits (PALs), because an exceedance requires performing the next ERA steps beyond this current effort (i.e., a baseline ERA); however, for simplicity they will be referred to as PSLs.

[1] The Navy ERP comprises both the Installation Restoration Program (IRP) and the Munitions Response Program (MRP).

PALs are needed by which human health and ecological risks can be estimated to determine whether mitigation of risks or additional investigation (e.g., Remedial Investigation [RI]) is necessary. The PSLs are utilized in the first step of the HHRA to determine COPCs, and PSLs/PALs are used for the ERA to determine initial COPECs. The PALs for the SSP are as follows:

- An Incremental Lifetime Cancer Risk (ILCR) of 1×10^{-6} for carcinogens, which, if exceeded in any of the environmental media, indicates potentially unacceptable level of human health risk to be evaluated further.
- A systemic Hazard Quotient (HQ) equal to 0.1 for non-carcinogens, which, if exceeded in any of the environmental media, indicates potentially unacceptable level of human health risk to be evaluated further.
- The ecological risk-related PSLs, which, if exceeded, indicates a baseline ERA may be necessary.

To conduct comparisons of site data to screening values for surface soil, subsurface soil, sediment, surface water, and groundwater and to complete initial delineation of contamination, the selected laboratory should be able to achieve Limits of Quantitation (LOQs) that are low enough to measure constituent concentrations that are less than the PSLs. Analytical data reported by the laboratory use the following reporting conventions: All results below the Detection Limit (DL) will be considered nondetects; positive results reported at concentrations between the DL and LOQ will be reported with a “J” qualifier; and analytes not found (not detected) in a sample will be reported at the Limit of Detection (LOD) with a "U" qualifier.

Several target analytes have PSLs that fall between the LOD and the LOQ. “J”-flagged data will be accepted to achieve project goals; however, greater scrutiny will be applied in these cases. Additionally, the inability to quantify select analytes to PSL levels with confidence will be addressed in the risk screening uncertainty analysis. In cases where the laboratory LODs are greater than the PSLs, consistent with the *EPA Risk Assessment Guidance for Superfund, Part A* (U.S. Environmental Protection Agency [EPA], 1989), if the analyte is not detected, the LOD will be reported and "U" qualified. An evaluation of these analytes also will be presented in the uncertainty section of the risk-ratio evaluation in the SSP Report.

For the HHRA, the exposure point concentration (EPC) will be statistically determined to summarize the data and support the risk-ratio evaluation. Chemical-specific upper confidence limits (UCLs) will be calculated using EPA’s latest ProUCL software. Typically, the EPC will be either the upper confidence level (UCL) of the mean chemical concentration or the EPC will be the maximum chemical concentration (depending on the number of samples and detections). For lead (target contaminant at AOC 31), the site-wide mean concentration in a medium will be the EPC—for use with the EPA lead risk models. Subareas can be established for evaluation at a site if warranted by the spatial distribution of the data. If the UCL is greater than the maximum detected concentration for that medium, the maximum detected concentration will represent the EPC. EPCs established in this manner represent a reasonable maximum exposure (RME). If fewer than 10 detections are observed (or fewer than 10 samples collected) for a particular target analyte in a particular environmental medium, the maximum observed concentration must be used as the EPC. Half the detection limit value will be used for a data point if the analyte is not detected.

For the ERA, the EPC in each medium is the maximum detected concentration for comparison to ecological screening levels. Half the detection limit value is used for the data point if the analyte is not detected.

Perchlorate Sampling. Perchlorate sample collection will be performed in accordance with Appendix F of the 2007 *DoD Perchlorate Handbook* (Appendix B). Groundwater samples will be field filtered prior to cold storage and shipment of the perchlorate samples (not required for surface water samples). Discrete soil samples will be collected instead of composite samples. Composite, multi-incremental samples will not be necessary for

soil or sediment, as perchlorate is expected to be distributed relatively homogeneously due to the nature of washout activities and incidental spillage, no propellant matrices are expected to be encountered (considering the building demolitions and re-grading at each site in 2012), and all perchlorate is expected to have immediately dissolved after previous release(s). Sediment samples will be analyzed for perchlorate because of the quantity of the historical release(s) and the evident elevated groundwater concentrations.

Perchlorate Action Levels. DoD's perchlorate action level in groundwater is 15 µg/L (Navy, 2010), based on EPA's Drinking Water Lifetime Health Advisory of 15 µg/L.

Metals. Both total and dissolved (field-filtered) samples will be collected for analysis of lead and mercury at AOC 31. Total metals results are used in the HHRA as a conservative measure. The filtered metals results provide a more reasonable exposure scenario (simulating a drinking well), and can be used for risk management decisions and discussed in the risk uncertainty section when metals results may be attributable to sample turbidity. Dissolved metals results are preferred over total metals results for the ERA.

Secondary Indicator Data. In addition to the target analytes, nitrate and nitrite will be included for groundwater media (also see Sample Details Table in Section 8.3). These data will be used to evaluate aquifer conditions and to support the risk assessments. Nitrate is a potential co-contaminant of perchlorate and nitrite is its breakdown product. Detailed rationale for each of these is provided in Section 7.5. The following aquifer condition indicators and well stabilization parameters will be measured: pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), specific conductance, temperature, and turbidity. These indicators/parameters will be measured in groundwater and surface water with a field water quality meter. For groundwater samples, the samples are not collected until these parameters stabilize.

Physical Data. The following physical data also must be collected:

- Horizontal and vertical location data for sampling locations and monitoring wells as described in Section 8.1.12.
    - Horizontal measurements (coordinates) shall be accurate to 0.1 ft.
    - Vertical elevation measurements shall be accurate to 0.01 ft.
    - Each of the locations must be surveyed in the North American Datum (NAD) of 1983, State Plane Coordinate System of Maryland (feet) relative to the coordinates of established site benchmarks or the nearest United States Geological Survey (USGS) benchmark.
- Depth to groundwater as described in Section 8.1.9 (used to compute groundwater elevations and flow direction)

Quality Assurance (QA) and Quality Control (QC) Samples. Selected QA/QC samples are required to ensure data quality. New disposable polyethylene tubing must be used to purge and sample each well. Therefore, no rinse/equipment blank is needed. One duplicate sample will be analyzed for all analyses (see Section 8.3). All sample containers must be new and supplied directly from the laboratory. They must be labeled immediately upon filling, preserved appropriately (see Section 8.4), stored on ice, and submitted to the laboratory under chain-of-custody (CoC) control.

5.3 Boundaries of the Study

Two populations of each medium (soil, sediment, surface water, and groundwater) are of interest. One population is the population of material contaminated by site operations. The other is the population of uncontaminated material that helps to bound the extent of contamination. Emphasis for this investigation is on the primary populations. Later investigations, if required, will more fully delineate the extent of contamination

as necessary. Data obtained during this investigation, however, will provide information suitable to delineating or partially delineating the extent of contamination at Site 69 and AOC 31. As shown in the CSMs (see Section 4), the extent of contamination at each site is not well known. A definitive contamination source area has not been identified in soil at either site.

Therefore, the investigative approach must be sufficient to establish whether an identifiable soil contaminant source area is likely to exist. The extent of the investigation is shown on Figure 7a for Site 69 and Figure 7b for AOC 31. Surface soil unit measures from 0 to 1 ft bgs. Subsurface soil measures from 1 ft bgs to the water table; subsurface soil samples will target the 1-ft interval above the encountered water table (possibly unique for each location). The maximum depth of interest in soil is the unsaturated depth to the water table. For delineating the extent of subsurface contamination and potential for contaminants leaching to groundwater, the maximum extent of investigation is currently assumed 10 ft bgs (to be confirmed during the SSP). At AOC 31, the subsurface soil beneath the former concrete trench is also of interest (see Figure 7b). Populations of interest are the surface soil and the soil between the former trench bottom (3 feet bgs) and above the water table that are potentially contaminated with site-related chemicals identified in Section 5.2.

Because this investigation is designed primarily to detect contamination, it is important that the potentially most contaminated sediment be targeted at Site 69. This is sediment in the bottoms of drainage channels, and especially in depositional area where sediment has accumulated. The maximum depth of sediment investigation is limited to 1 ft below the sediment surface to support the evaluations of human health and ecological risk and to estimate the extent of contamination.

For surface water in Town Gut Creek, the depth of investigation is limited to the 0 to 1 ft horizon above the sediment surface to support the evaluations of human health and ecological risk and to estimate the extent of contamination nearest the sediment pore water. For surface water in shallow drainage ditches and small creek(s), which empty to Town Gut Creek, the depth of the investigation is from the surface to the sediment (e.g., 6 inches depending on precipitation events). Surface water samples must be collected prior to collecting sediment samples to prevent entrainment of disturbed sediment in the surface water samples.

5.4 Analytic Approach

The following decision rules must be applied to the new and existing data to resolve the problem statement:

- If the maximum concentration of any chemical exceeds its corresponding screening level at a concentration that suggests an imminent threat to human health or the environment, the site will be recommended for a time-critical removal action.

- If the maximum concentration of any chemical exceeds its corresponding screening level at a concentration that suggests a potential threat to human health or the environment, the site will be recommended for further evaluation. Risk screening evaluations will be conducted in an SSP Report to determine the magnitude of the potential threats. The screening evaluations may include comparison of detected concentrations to NDW-IH background levels, comparison of detected concentrations to human health and ecological screening levels, estimation of cancer and non-cancer risks to human receptors, and estimation of ecological risks.

- If the maximum concentrations of all chemicals are below their corresponding screening levels, the site will be recommended for no further action.

5.5 Performance Criteria

Sampling locations were selected based on the need to confirm the presence and degree of contamination at each site and to support preliminary risk assessments. The data collected under this SAP are anticipated to be sufficient to achieve these goals. Particular scrutiny will be applied to analytical results less than the LOQ when PSLs/PALs are less than the LOQ. The data verification, validation, and usability evaluation processes are described in more detail in Section 12. These processes will be used to assess the data quality and whether the data meet project objectives

If any significant data gaps (i.e., quality deficiencies) are identified, the Project Team will document the deficiencies and determine the next appropriate step (e.g., additional data collection to fill the data gap).

5.6 Plan for Obtaining Data

The SSP sampling designs herein are judgmental, or biased, designs: sampling locations were selected to supplement the limited existing information about each site and to provide SSP-level results to indicate potential source areas and extent of contamination. In areas that have limited accessibility, the Project Team attempted to select sampling locations in accessible areas as close as possible to what would the team considered to be an ideal location for achieving project objectives. See Figures 7a and 7b and Section 7 for the detailed sampling design for each site.

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6 FIELD QUALITY CONTROL SAMPLES

(UFP-QAPP Manual Section 2.6.2 and UFP-QAPP Workbook WS #12)

Measurement Performance Criteria (MPC) Table – Field Quality Control (QC) Samples [(1)]

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling, Analytical, or Both
Equipment Rinsate Blanks	Energetics, Perchlorate, and Metals	One per day per matrix per sampling equipment.[(1)]	Accuracy/Bias/ Contamination	No analytes ≥ ½ Limit of Quantitation (LOQ), except common lab contaminants, which must be < LOQ.	Sampling and Analytical
Field Duplicate	All Fractions	One per 10 field samples collected for fixed-base laboratory analysis.	Precision	Values > 5X LOQ: Relative Percent Difference (RPD) ≤ 30%[(2)] (aqueous); ≤ 50%[(2)(3)] (solid).	Sampling
Cooler Temperature Blank	All Fractions	One per cooler.	Representativeness	Temperature must be less than 6 degrees Celsius (°C).	Sampling

Notes:
1. Equipment rinsate blanks will be collected if non-dedicated sampling equipment is used. For disposable equipment, one sample per batch of disposable equipment will be collected for target analytes (site-related contaminants).
2. If duplicate values for non-metals are < 5x LOQ, the absolute difference should be < 2x LOQ.
3. If duplicate values for metals are < 5x LOQ, the absolute difference should be < 4x LOQ.
No ambient field blanks will be collected unless warranted (no volatiles analysis, site is not dusty, no nearby emissions, etc.).
No trip blanks will be collected (no volatiles analysis).

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7 SAMPLING DESIGN AND RATIONALE

(UFP-QAPP Manual Section 3.1.1 and UFP-QAPP Workbook WS #17)

7.1 Sampling Schedule

Due to explosives operations within or near each site, fieldwork likely will be conducted on weekends, only. The sampling schedule likely will vary and will be determined on a weekly basis.

7.2 Sample Selection

The biased sample locations proposed by the Team are shown on Figure 7a and Figure 7b for Site 69 and AOC 31, respectively. Data from these locations and media will supplement existing information and allow for evaluating the SSP-level nature and extent of contamination, and completing initial screening-level human health and ecological risk assessments. Sample locations and analyses were selected by consensus by the Tier 1 Partnering Team to fill data gaps from previous investigations and to provide ample information to complete the risk assessments and SSP (Section 7.4). Detailed sample rationale is summarized/tabulated in the subsections/tables below.

7.3 Sample Collection

Sampling for each analysis/matrix will be performed in accordance with Section 7.4 (Sample Rationale), Section 8.1 (Field Project Tasks), Section 8.3 (Sample Details), and the field Standard Operating Procedures (SOPs) provided in Appendix B. Notable information also is summarized in Section 5.2.

7.4 Sample Rationale Tables

7.4.1 Site 69 Sample Rationale Tables

Matrix: Monitoring well groundwater (Site 69)
Depth of Samples: Middle of well screen
Refer to Figure 7a for wells and other sample locations.

Analysis	Method	No. of Samples	Monitoring Well	Rationale	Sampling Strategy
Perchlorate	SW846 6850	3 monitoring wells *(3 groundwater samples not including QA/QC)*	To be installed wells S69MW01 through MW03	***Target analyte / site contaminant*** • MW01 placed at the presumed source area (Building 1018). • MW02 and MW03 placed downgradient along the presumed groundwater flow path to Town Gut Creek (based on topography) to determine the extent of perchlorate groundwater contamination from the source area to the creek. • Determine current conditions (concentrations). • Use data for human health risk and ecological risk screening evaluations.	Also see Section 8. Fieldwork SOPs are provided in Attachment B. To-be-installed monitoring wells are shown on Figure 7a. To-be-installed wells will be 2-inch inner-diameter, Schedule 40 PVC with 0.010-inch slot 10-ft well screens. The screens will be keyed into the underlying clay unit approximately 6 inches. Perchlorate groundwater sample will be field-filtered (0.2 micron [µm] and 0.45 µm pre-filter if necessary, due to high turbidity) prior to containerization.
Nitrate, Nitrite	EPA 353.2	*(same as above)*	*(same as above)*	Nitrate and nitrite can be a direct result of the perchlorate salts release(s) if part of the salt (i.e., if the perchlorate itself was contaminated with nitrate/nitrite). Potential contaminants.	*(same as above)*
Dissolved Oxygen	CHEMetrics® Field Test Kit	*(same as above)*	*(same as above)*	***Indicator of Aquifer Conditions*** Evaluate aquifer characteristics for favorable reducing conditions. DO below 0.5 mg/L suggests ideal reducing conditions. Ferrous iron (iron II or iron^{2+}) concentrations help to indicate the prevailing anaerobic degradation process due to depletion of oxygen, nitrate, and manganese. Ferrous iron above 1 mg/L suggests ideal reducing conditions.	*(same as above)*
Ferrous Iron	HACH® Field Test Kit	*(same as above)*	*(same as above)*		

Matrix: Surface Water (Site 69)
Depth of Samples: 0-1 ft horizon above sediment bottom
Refer to Figure 7a for sample locations.

Analysis	Method	No. of Samples	Rationale	Sampling Strategy
Perchlorate	SW846 6850	8 locations *(8 surface water samples not including QA/QC)*	***Target analytes / site contaminants.*** • Surface water samples to be collected at depth in Town Gut Creek (at locations S14, S17, and S18) to obtain the most representative sample of any groundwater contaminant discharge into the creek (without performing pore water sampling). • Surface water samples to be collected in drainage ditches and creek(s) (at remaining locations S09, S12, S14, S15, and S16) leading to Town Gut Creek to evaluated perchlorate migration via surface runoff. • Use data for human health and ecological risk screening evaluations.	Also see Section 8. Fieldwork SOPs are provided in Attachment B. Surface water samples are collocated with sediment samples. In Town Gut Creek (locations S14, S17, and S18), surface water to be collected at depth using a pole-mounted sample tubing intake—at 0-1 ft above sediment horizon. In the shallow drainage ditches and small creek(s), surface water to be collected from surface. All sediment samples are to be collected at 0-1 ft beneath the sediment horizon (see next table).
Nitrate, Nitrite	EPA 353.2	*(same as above)*	***Potential contaminants resulting from release of ammonium perchlorate*** Nitrate and nitrite can be a direct result of the perchlorate salts release(s) if part of the salt (i.e., if the perchlorate itself was contaminated with nitrate/nitrite). Potential contaminants.	*(same as above)*

Matrix: Sediment (Site 69)
Depth of Samples: 0-1 ft below top of sediment
Refer to Figure 7a for sample locations.

Analysis	Method	No. of Samples	Rationale	Sampling Strategy
Perchlorate	SW846 6850	8 locations *(8 sediment samples not including QA/QC)*	***Target analytes / site contaminants.*** • Surficial sediment samples to be collected to obtain the most representative sample of any effects of surface overflow and/or groundwater contaminant discharge into creek. • Determine spatial distribution along shoreline in discharge zone for any contamination if detected in sediment. • Provide current conditions snapshot of perchlorate in sediment for risk screening evaluations.	Also see Section 8. Fieldwork SOPs are provided in Attachment B. Sediment samples are collocated with surface water samples. Sediment to be composited from the first 1 foot of sediments (benthic invertebrate habitat).

Matrix: Surface Soil (Site 69)
Depth of Samples: 0-1 ft bgs
Refer to Figure 7a for sample locations.

Analysis	Method	No. of Samples	Rationale	Sampling Strategy
Perchlorate	SW846 6850	10 locations *(10 surface soil samples not including QA/QC)*	***Target analytes / site contaminants.*** • Surface soil samples to be collected at locations S01 through S08, S11, and S13. Monitoring wells will be installed at locations S04 (MW01), S11 (MW02) and S13 (MW03). Determine spatial distribution of perchlorate in surface soil throughout site—and correlate with groundwater concentrations when examining spatial contaminant distributions—to confirm source area and locations of historical releases. Upgradient (background) and downgradient locations included. • Evaluate overland flow and/or erosive transport of contaminants when updating the CSM and evaluating future risks. • Provide current conditions snapshot of perchlorate and other probable site contaminants in surface soil for both human health and ecological risk screening evaluations.	Also see Section 8. Fieldwork SOPs are provided in Attachment B. Five of the surface soil samples are collocated with subsurface soil samples, three of them being new monitoring well locations, which will benefit the evaluation of the presence of continuing source(s). Remaining surface soil samples placed uniformly across topography to evaluate overland transport of perchlorate. Discrete sample locations (not multi-incremental). Soil to be composited from 0 to 1 ft bgs at each discrete location (ecological habitat and human health exposure unit).

Matrix: Subsurface Soil (Site 69)
Depth of Samples: Exposure unit ranges from 1 ft bgs to water table; Anticipate sample collection above water table at approximately 7 ft bgs.
Refer to Figure 7a for sample locations.

Analysis	Method	No. of Samples	Rationale	Sampling Strategy
Perchlorate	SW846 6850	5 locations *(5 subsurface soil samples not including QA/QC)*	***Target analytes / site contaminants.*** • Subsurface soil samples to be collected at locations S04, S07, S08, S11, and S13. Monitoring wells will be installed at S04 (MW01), S11 (MW02), and S13 (MW03). Determine spatial distribution throughout site—and correlate with groundwater concentrations when examining spatial contaminant distributions—to determine source area and locations of historical releases. • Provide current conditions snapshot of perchlorate and other probable site contaminants in subsurface soil for human health risk screening evaluations.	Also see Section 8. Fieldwork SOPs are provided in Attachment B. The five subsurface soil sample locations are collocated with surface soil samples. Three of them will be collected during soil boring installations for the three new monitoring wells. This (having groundwater data at the same location as subsurface soil data) will provide information on the accuracy of generic Soil Screening Level comparisons. Samples will be collected from the 1-ft interval above the water table (depth tbd). However, if staining or PID responses are encountered, the impacted soil must be sampled. A strong PID response would indicate unanticipated volatiles contamination. If this occurs, the Partnering Team will have to be consulted to scope new analyses, etc. Soil to be composited from the 1-ft interval above the water table at each location. This will provide representative concentrations for use in the human health risk assessment for the subsurface soil exposure unit.

7.4.2 AOC 31 Sample Rationale Table

Matrix: Monitoring well groundwater (AOC 31)
Depth of Samples: Middle of well screen
Refer to Figure 7b for wells and other sample locations.

Analysis	Method	No. of Samples	Monitoring Well	Rationale	Sampling Strategy
Perchlorate	SW846 6850	1 monitoring well *(1 groundwater sample not including QA/QC)*	To be installed well A31-MW01	***Target analyte / site contaminant*** • MW01 to be located at the end of the former cooling trench (presumed source area outside Building 259). • Determine current conditions (concentrations). • Use data for human health risk and ecological risk screening evaluations.	Also see Section 8. Fieldwork SOPs are provided in Attachment B. To-be-installed monitoring well is shown on Figure 7b. To-be-installed well A31-MW01 will be 2-inch inner-diameter, Schedule 40 PVC with 0.010-inch slot 10-ft well screens. The screen will be keyed into the underlying clay unit approximately 6 inches. Perchlorate groundwater sample will be field-filtered (0.2 micron [µm] and 0.45 µm pre-filter if necessary, due to high turbidity) prior to containerization.
Select Metals (Total & Dissolved) (see Section 9)	SW846 3010A / 6020A	*(same as above)*	*(same as above)*	***Target analytes / site contaminants.*** *(same as above)*	*(same as above)* Dissolved metals samples will be field-filtered (0.45 µm) prior to preservation.
Select Energetics (see Section 9)	SW846 8330B	*(same as above)*	*(same as above)*	***Target analytes / site contaminants.*** *(same as above)*	*(same as above)*
Nitrate, Nitrite	EPA 353.2	*(same as above)*	*(same as above)*	Nitrate and nitrite can be a direct result of the perchlorate salts release(s) if part of the salt (i.e., if the perchlorate itself was contaminated with nitrate/nitrite). Potential contaminants.	*(same as above)*
Dissolved Oxygen	CHEMetrics® Field Test Kit	*(same as above)*	*(same as above)*	Evaluate aquifer characteristics for favorable reducing conditions. DO below 0.5 mg/L suggests ideal reducing conditions. Ferrous iron (iron II or iron^{2+}) concentrations help to indicate the prevailing anaerobic degradation process due to depletion of oxygen, nitrate, and manganese. Ferrous iron above 1 mg/L suggests ideal reducing conditions.	*(same as above)*
Ferrous Iron	HACH® Field Test Kit	*(same as above)*	*(same as above)*		

Matrix: Surface Soil (AOC 31)
Depth of Samples: 0-1 ft bgs
Refer to Figure 7b for sample locations.

Analysis	Method	No. of Samples	Rationale	Sampling Strategy
Perchlorate	SW846 6850	6 locations *(6 surface soil samples not including QA/QC)*	***Target analytes / site contaminants.*** • Determine spatial distribution of contaminant in surface soil throughout site—and correlate with groundwater concentration(s) when examining spatial contaminant distributions—to confirm source area and locations of historical releases (e.g., former detonator production cooling trench). • Evaluate overland flow and/or erosive transport of contaminants when updating the CSM and evaluating future risks. • Provide current conditions snapshot of perchlorate and other probable site contaminants in surface soil for both human health and ecological risk screening evaluations.	Also see Section 8. Fieldwork SOPs are provided in Attachment B. Four of the surface soil samples are collocated with subsurface soil samples, one of them at the location of to-be-installed monitoring well A31-MW01, which will benefit the evaluation of the presence of continuing source(s). Remaining surface soil samples placed judgmentally at locations of likely overland flow and erosive transport of contaminants from the ditch across the site, and at a drain spout location on the west side of Building 259. Discrete sample locations (not multi-incremental). Soil to be composited from 0 to 1 ft bgs at each discrete location (ecological habitat and human health exposure unit).
Select Metals (see Section 9)	SW846 3050B / 6020A	*(same as above)*	***Target analytes / site contaminants.*** *(same as above)*	*(same as above)*
Select Energetics (see Section 9)	SW846 8330B (no grinding)	*(same as above)*	***Target analytes / site contaminants.*** *(same as above)*	*(same as above)*

Matrix: Subsurface Soil (AOC 31)
Depth of Samples: Exposure unit ranges from 1 ft bgs to water table; Anticipate sample collection above water table at approximately 7 ft bgs.
Refer to Figure 7b for sample locations.

Analysis	Method	No. of Samples	Rationale	Sampling Strategy
Perchlorate	SW846 6850	4 locations *(4 subsurface soil samples not including QA/QC)*	***Target analytes / site contaminants.*** • Determine spatial distribution throughout presumed source area and elsewhere at site to correlate with groundwater concentrations when examining spatial contaminant distributions—to determine former trench source area and locations of historical releases. Upgradient (background) and downgradient locations included. • Provide current conditions snapshot of perchlorate and other probable site contaminants in subsurface soil for human health risk screening evaluations.	Also see Section 8. Fieldwork SOPs are provided in Attachment B. The four subsurface soil sample locations are collocated with surface soil samples (new monitoring well A31-MW01 will be installed at S04 after the soil boring is complete. This (having surface soil and groundwater data at the same location as subsurface soil data) will provide information on contaminant leaching and/or the accuracy of generic Soil Screening Level comparisons. Subsurface soil samples generally will be collected and composited from the 1-ft interval above the water table (depth tbd). This will provide representative concentrations for use in the human health risk screening for the subsurface soil exposure unit. However, if staining or PID responses are encountered, the impacted soil must be sampled. A strong PID response would indicate unanticipated volatiles contamination. If this occurs, the Partnering Team will have to be consulted to scope new analyses, etc. Subsurface soil samples at S01, S02, and S03 located along the former detonator production cooling trench (demolished and filled in), and at S04 at the end of the former trench, will be collected from a 1-ft interval starting at 3 ft bgs, the depth of the former concrete trench. Subsurface soil samples may also be collected at these locations below the former trench depth from the 1-ft interval above the water table.
Select Metals (see Section 9)	SW846 3050B / 6020A	*(same as above)*	***Target analytes / site contaminants.*** *(same as above)*	*(same as above)*
Select Energetics (see Section 9)	SW846 8330B (no grinding)	*(same as above)*	***Target analytes / site contaminants.*** *(same as above)*	*(same as above)*

8 FIELD PROJECT IMPLEMENTATION

(Field Project Instructions)

The field tasks are summarized below. A short description of each task is also provided.

- Mobilization/Demobilization
- Utility Clearance
- Field Monitoring / Equipment Calibration
- Surface Water Sampling
- Sediment Sampling
- Surface Soil Sampling
- Soil Borings and Subsurface Soil Sampling
- Monitoring Well Installation
- Water Level Measurements
- Monitoring Well Sampling
- IDW Management
- Surveying
- Field Equipment Decontamination Procedures
- Field Documentation Procedures
- Sample Custody and Shipment Tasks

Additional project-related tasks include:

- Analytical Tasks
- Data Management
- Project Reports

8.1 Field Project Tasks

(UFP-QAPP Manual Section 2.8.1 and UFP-QAPP Workbook WS #14)

This section provides a brief narrative for each field task, referencing the respective SOP(s) tabulated in Section 8.3 and provided in Appendix B. The SOPs are from the *Master UFP-SAP for NSF-IH* (Tt, 2009)—any deviations are marked on the SOPs (red-line edits). The SSP field efforts at Site 69 and AOC 31 will be performed concurrently during the same mobilization; therefore, activities are discussed below for one overall effort at both sites.

8.1.1 Mobilization/Demobilization

Mobilization shall consist of the delivery of all equipment, materials, and supplies to the site, the complete assembly in satisfactory working order of all such equipment at the site, and the satisfactory storage at the site of all such materials and supplies. Tt will coordinate with the facility to identify locations for the storage of equipment and supplies. Site-specific H&S training will be provided to all Tt subcontractors as part of the site mobilization.

The sample locations for Site 69 and AOC 31 are shown on Figures 7a and 7b, respectively. New monitoring well locations and sample locations will be placed according to their pre-determined GPS coordinates (e.g., Maryland State Plane, feet; see Physical Data subsection in Section 5.2) using a sub-foot accuracy GPS unit. All locations will be staked or pin-flagged during mobilization, and then reconciled with utilities (i.e., moved as necessary) during the follow-on utility clearance task.

Demobilization shall consist of the prompt and timely removal of all equipment, materials, and supplies from the site following completion of the work. Demobilization includes the cleanup and removal of IDW generated during the investigation.

8.1.2 Utility Clearance

Prior to the commencement of any intrusive activities, the Tt FOL will coordinate with the utility subcontractor to identify and mark-out utilities that may be present within the proposed drilling areas. Subsurface utilities also will be cleared by the drilling/DPT subcontractor by notifying the utility clearing service. See Facility SOP HS-1.0 for conducting subsurface soil investigations for further information.

8.1.3 Field Monitoring / Equipment Calibration / Inspection

Field equipment will be inspected and calibrated as indicated in the table below.

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	Facility SOP Reference (1)
PID	Visual Inspection, Calibration	Daily, before use	Manufacturer's Guidance	Replace	Tetra Tech (Tt) FOL or designee	SA-2.2, Manufacturer's Guidance
DPT/Drill Rig	Inspection	Daily	Equipment inspection sheet criteria	Replace	Tt FOL or designee	GH-1.3, GH-1.5, GH-2.8, SA-2.5
Disposable Hand Trowel	Inspection	Per use	N/A	Replace	Tt FOL or designee	SA-1.3
Water Level Meter	Visual Inspection	Daily	Manufacturer's Guidance	Replace	Tt FOL or designee	Manufacturer's Guidance
Multi-Parameter Water Quality Meter (pH, Temp., Sp. Cond., D.O., ORP)	Visual Inspection, Calibration	Daily, before use	Manufacturer's Guidance	Replace	Tt FOL or designee	SA-1.1, Manufacturer's Guidance
Turbidity Meter	Visual Inspection, Calibration	Daily, before use	Manufacturer's Guidance; Calibrations must bracket expected values. Initial Calibration Verification (ICV) must be ±10 Nephelometric Turbidity Units (NTUs) of target value.	Replace	Tt FOL or designee	SA-1.1, Manufacturer's Guidance
Groundwater sampling pumps and tubing	Inspect pumps, tubing and air/sample line quick-connects	Regularly	Maintained in good working order per manufacturer's recommendations	Replace	Tt FOL or designee	SA-1.1, Manufacturer's Guidance

8.1.4 Surface Water Sampling

Surface water samples will be collected at Site 69 prior to any site disturbance to minimize any impacts from runoff. Surface water samples also are to be taken prior to collecting the collocated sediment samples to eliminate potential effects of sediment particle entrainment. Samples are to be collected from downstream to upstream. Field personnel will access the Site 69 locations in Town Gut Creek via wading or using a boat if necessary.

The eight surface water samples will be collected as grab samples using a peristaltic pump with dedicated-per-location, disposable tubing. For the samples in Town Gut Creek, the tube intake will be attached to a pole (that can reach the sediment bottom) such that the surface water sample can be collected from the 0 to 1 ft horizon above the sediment. Upstream drainage swale and miscellaneous creek samples will be collected if surface water is present (will be shallow interval). Water quality measurements will be taken using a water quality meter with flow-through cell (same as used during groundwater sampling). Surface water sample procedures are discussed in Facility SOP SA-1.2.

8.1.5 Sediment Sampling

Field personnel will access the Site 69 locations in Town Gut Creek via wading or using a boat if necessary. The eight sediment samples will be taken following collection of all eight collocated surface water samples. A stainless steel Ekman or Ponar dredge (or similar device) will be utilized to collect sediment samples from 0 to 1 ft beneath the sediment horizon in accordance with Facility SOP SA-1.2. For the upstream drainage swale and miscellaneous creek samples, a disposable trowel likely will be appropriate for sample collection. Reusable equipment will be decontaminated between sample locations.

8.1.6 Surface Soil Sampling

Surface soil samples will be collected from 10 locations at Site 69 and 5 locations at AOC 31. The samples will be collected from 0 to 1 ft bgs in accordance with Facility SOP SA-1.3. Discrete grab samples are appropriate for all analyses at each location during these SSP investigations. Reusable equipment will be decontaminated between sample locations.

8.1.7 Soil Borings and Subsurface Soil Sampling

Subsurface soil samples will be obtained from soil borings during new monitoring well installations using DPT methods. The proposed soil boring and soil sample locations are presented for Site 69 and AOC 31 on Figures 7a and 7b, respectively. Three planned subsurface soil sample locations at Site 69 and one location at AOC 31 coincide with planned monitoring well locations. With a truck- or track-mounted DPT (depending on weather/terrain conditions), continuous soil cores will be obtained to the target depth at each location by advancing a macrocore (4- or 5-foot) to the basal clay layer/aquitard (expected at 15 ft bgs). The core barrel assembly will be withdrawn and the soils will be screened, described, and sampled.

The soil will be described by Tt field personnel and a boring log will be developed. Soil cores will be screened along their entire length with a photoionization detector (PID) for evidence of potential contamination. Any visual signs of potential contamination (such as soil staining) will be noted and [additional] samples will be collected.

Soil samples will be collected from the macrocores as described herein and outlined in Section 7.4. Soil sampling, soil logging, sample handling, and DPT/drilling work procedures are discussed in Facility SOPs GH-1.3, GH-1.4, GH-1.5, SAQ-1.3, and SA-2.5. The use of the PID is described in the manufacturer's instructions. Reusable equipment will be decontaminated between sample locations.

8.1.8 Monitoring Well Installation

The three new monitoring wells at Site 69 (Figure 7a) and one new monitoring well at AOC 31 (Figure 7b) will be constructed using the same materials and methods as other standard IRP monitoring wells. For these sites, a 10-ft screen will be installed approximately 1 ft into the basal clay layer at the bottom of the surficial aquifer (expected at 15 ft bgs). Each new well will be finished with a stick-up riser and protective bollards (unless flush-mount completion is requested by the facility at certain locations).

Soil borings will be drilled at the proposed monitoring well locations to confirm the subsurface lithology and depths to ensure proper depths for well installation (to be screened just above the clay layer). The soil cores will be screened visually and along their entire length with a PID in accordance with the PID manufacturer's instructions. The boring information will be recorded in accordance with Facility SOP SA-6.3. The monitoring wells will be installed using hollow-stem auger (HSA) drilling methods. Monitoring well installation procedures are discussed in Facility SOP GH-2.8 and each of the new monitoring wells will be developed in accordance with this SOP.

8.1.9 Water Level Measurements

Prior to groundwater sampling, a synoptic round of groundwater level measurements will be made. Depth to groundwater will be measured at each monitoring well, per Facility SOP GH-1.2. Along with the subsequent survey effort, this will provide for generation of groundwater elevation contour maps and provide information on groundwater flow patterns and gradients. Water-level measurements will be completed within the shortest time possible on the same day, and no sooner than 24 hours after a significant precipitation event to minimize the precipitation effects on the data. Water levels at Site 69 will be collected from the wells closest to the creek first so as to minimize tidal impacts (if any) on measurements. Water level measurements will be recorded to the nearest 0.01 foot and referenced to a top of casing notch or north side of the well casing. The measurement instrument will be decontaminated prior to conducting the measurement and between each monitoring well.

8.1.10 Monitoring Well Sampling

Groundwater sampling will be conducted at each monitoring well using low-flow sampling procedures, per Facility SOP SA-1.1. A peristaltic pump with dedicated-per-well, disposable tubing will be used for groundwater sample purging and collection activities, in combination with a continuous flow-through cell suitable for taking water quality measurements. Groundwater samples collected for perchlorate and dissolved metals will be field filtered. Reusable equipment will be decontaminated between sample locations

8.1.11 IDW Management

Based on studies at other NSF-IH sites, all IDW is assumed to be nonhazardous. However, all IDW will be tested for characterization.

Waste soils will be generated during the installation of the soil borings and monitoring wells. The soil IDW consists of the excess soil cuttings from the soil borings that were not collected for laboratory analyses, and the soils produced during the drilling of the boreholes for monitoring well installations. The waste soil will be collected and placed in 55-gallon drums for waste characterization sampling and analysis. Waste water will be generated during well installation, development, and sampling, and during all decontamination procedures for other sampling. Similar to waste soils, all aqueous IDW will be containerized in 55-gallon drums for waste characterization sampling and analysis.

All drums will be labeled and moved to be stored inside the diked area next to Building 289 that has secondary containment (near NSF-IH IRP Manager's office). The driller/DPT subcontractor is responsible for safely moving and handling the drums. Pending the results of the waste characterization(s), and upon Navy approval, the waste soil and water will be appropriately transported and disposed at a Navy-approved disposal facility(ies) by the IDW subcontractor.

8.1.12 Surveying

A surveyor subcontractor licensed in the state of Maryland will survey the horizontal location and vertical elevation of each of the monitoring wells (existing and to-be-installed). The horizontal measurements shall be accurate to 0.1 ft. The vertical elevation measurements shall be accurate to 0.01 ft at the top-of-riser at each

monitoring well. Each of the locations will be surveyed in the North American Datum (NAD) of 1983, State Plane Coordinate System of Maryland (feet) relative to the coordinates of established site benchmarks or the nearest United States Geological Survey (USGS) benchmark.

8.1.13 Field Equipment Decontamination Procedures

Decontamination of equipment will be conducted in accordance with Facility SOP SA-7.1. Decontamination fluids will be containerized and characterized for appropriate disposal with other IDW.

8.1.14 Field Documentation Procedures

Field documentation will be performed in accordance with Facility SOP SA-6.3. A summary of all field activities will be properly recorded in a bound logbook with consecutively numbered pages that cannot be removed. Logbooks will be assigned to field personnel and will be stored in a secured area when not in use. At a minimum, the following information will be recorded in the site logbook:

- Name of the person to whom the logbook is assigned.
- Project name.
- Project start date.
- Names and responsibilities of on-site project personnel including subcontractor personnel.
- Arrival/departure of site visitors.
- Arrival/departure of equipment.
- Sampling activities and sample log sheet references.
- Description of subcontractor activities.
- Sample pick-up information, including chain-of-custody (CoC) numbers, air bill numbers, carrier, time, and date.
- Description of borehole or monitoring well installation activities and operations.
- H&S issues.

All entries will be written in ink and no erasures will be made. If an incorrect entry is made, striking a single line through the incorrect information will make the correction; the person making the correction will initial and date the change. Boring logs, sampling forms, and other field forms will be used to document field activities.

8.1.15 Sample Custody and Shipment Tasks

Data management and sample tracking tasks are described in Section 8.5.2 and in Facility SOP CT-05. Sample nomenclature is detailed in Section 8.3.

8.2 Field SOPs Reference Table

(UFP-QAPP Manual Section 3.1.2 – Worksheet #21)

The SOPs tabulated below for the SSP effort are from Appendix D of the *NSF-IH Master SAP* (Tt, 2009). Project-specific versions of the SOPs are provided in Appendix B herein. Minor deviations (or exclusions of portions) of SOPs are indicated by direct mark-up of the SOP. This worksheet lists the SOPs to be used/referenced during the SSP effort. Partial exclusions are not noted as deviations. Note that the sampling SOPs for all media for perchlorate are supplemented by the DoD (2007) perchlorate sampling SOP(s) (also provided in Appendix B).

SOP Reference Number	Title/Author and Revision Date/Number	Equipment Type	Any planned deviation for Project Work
CT-04	Sample Nomenclature, 02/04, Rev. 0	N/A	Yes
GH-1.1	Site Reconnaissance, 02/04, Rev. 0	N/A	No
GH-1.2	Evaluation of Existing Monitoring Wells and Water Level Measurement, 02/04, Rev. 0	Water level indicator	No
GH-1.3	Soil and Rock Drilling Methods, 02/04, Rev. 0	Drilling rig and accessories	No
GH-1.5	Borehole and Sample Logging, 02/04, Rev. 0	N/A	No
GH-2.8	Groundwater Monitoring Well Installation, 02/04, Rev. 0	Drilling rig, accessories, and well supplies	No
SA-1.6	Natural Attenuation Parameter Collection, 03/08, Rev. 0	Water Quality Meter and Field test kits	No
SA-1.1	Groundwater Sample Acquisition and Onsite Water Quality Testing, 03/08, Rev. 1 **Also see included DoD (2007) Perchlorate Sampling SOP.*	Pump, tubing, water quality meter, and accessories	No
SA-1.2	Surface Water and Sediment Sampling, 03/08, Rev. 1 **Also see included DoD (2007) Perchlorate Sampling SOP.*	Pump, tubing, pole-mount, boat, water quality meter, Ponor dredge, and accessories	No
SA-1.3	Soil Sampling, 03/08, Rev. 1 **Also see included DoD (2007) Perchlorate Sampling SOP.*	Trowel, shovel, hand auger, and/or macrocore/split-barrel sampler	No
SA-2.5	Direct Push Technology (Geoprobe/Hydropunch), 02/04, Rev. 0	Drilling equipment and accessories	No
SA-2.2	Air Monitoring and Sampling, 02.04, Rev. 0	Air sampling pump and accessories, photoionization detector (PID), and/or flame ionization detector (FID)	No
SA-6.1	Non-Radiological Sample Handling, 02/04, Rev. 0	Sample bottleware, packaging material, shipping materials, field filtration equipment	No
SA-6.3	Field Documentation, 02/04, Rev. 0	Field logbook, field sample forms, boring logs	No
SA-7.1	Decontamination of Field Equipment, 03/08, Rev. 1	Decontamination equipment, phosphate-free detergent, deionized water	No
HS-1.0	Utility Locating and Excavation Clearance, 02/04, Rev. 0	Remote subsurface sensing equipment, magnetometer, ground-penetrating radar	No

8.3 Sample Details Table

(UFP-QAPP Manual Sections 3.1.1 and 3.5.2.3 – Worksheets #18, 19, 20 and 30)

The table below provides the sample IDs, analyses, and QA/QC for all samples to be collected during the SSP investigations at Site 69 and AOC 31. Also, see the Analytical SOP Requirements Table in Section 8.4 for bottleware and preservation requirements, etc.

Sample Details Table

Site	Station ID	Matrix	Sample ID	Depth/ Sampling Interval	Analyses [1]		
					Perchlorate	Nitrate/Nitrite	Comments
Site 69	S69S01	surface soil	S69-SS01-0001	0 - 1 foot	x		
	S69S02	surface soil	S69-SS02-0001	0 - 1 foot	x		
	S69S03	surface soil	S69-SS03-0001	0 - 1 foot	x		
	S69S04	surface soil	S69-SS04-0001	0 - 1 foot	x		
		subsurface soil	S69-SB04-xxyy	above water table	x		
		groundwater	S69-MW01-mmddyy	middle of screen; tbd	x	x	
		groundwater	S69-MW01P-mmddyy	middle of screen; tbd	x	x	Field Duplicate
	S69S05	surface soil	S69-SS05-0001	0 - 1 foot	x		
	S69S06	surface soil	S69-SS06-0001	0 - 1 foot	x		
		surface soil	S69-SS06P-0001	0 - 1 foot	x		Field Duplicate
	S69S07	surface soil	S69-SS07-0001	0 - 1 foot	x		
		subsurface soil	S69-SB07-xxyy	above water table	x		
	S69S08	surface soil	S69-SS08-0001	0 - 1 foot	x		
		subsurface soil	S69-SB08-xxyy	above water table	x		
	S69S09	sediment	S69-SD09-0001	0 - 1 foot	x		
		surface water	S69-SW09-mmddyy	at depth / just above sediment	x		
	S69S10	sediment	S69-SD10-0001	0 - 1 foot	x		
		surface water	S69-SW10-mmddyy	at depth / just above sediment	x		
	S69S11	surface soil	S69-SS11-0001	0 - 1 foot	x		
		surface soil	S69-SS11P-0001	0 - 1 foot	x		Field Duplicate
		subsurface soil	S69-SB11-xxyy	above water table	x		
		groundwater	S69-MW02-mmddyy	middle of screen; tbd	x	x	
	S69S12	sediment	S69-SD12-0001	0 - 1 foot	x		
		surface water	S69-SW12-mmddyy	at depth / just above sediment	x		
	S69S13	surface soil	S69-SS13-0001	0 - 1 foot	x		
		subsurface soil	S69-SB13-xxyy	above water table	x		
		groundwater	S69-MW03-mmddyy	middle of screen; tbd	x	x	
	S69S14	sediment	S69-SD14-0001	0 - 1 foot	x		
		sediment	S69-SD14P-0001	0 - 1 foot	x		Field Duplicate
		surface water	S69-SW14-mmddyy	at depth / just above sediment	x		
		surface water	S69-SW14P-mmddyy	at depth / just above sediment	x		Field Duplicate
	S69S15	sediment	S69-SD15-0001	0 - 1 foot	x		
		surface water	S69-SW15-mmddyy	at depth / just above sediment	x		
	S69S16	sediment	S69-SD16-0001	0 - 1 foot	x		
		surface water	S69-SW16-mmddyy	at depth / just above sediment	x		
	S69S17	sediment	S69-SD17-0001	0 - 1 foot	x		
		surface water	S69-SW17-mmddyy	at depth / just above sediment	x		
	S69S18	sediment	S69-SD18-0001	0 - 1 foot	x		
		surface water	S69-SW18-mmddyy	at depth / just above sediment	x		

Site	Station ID	Matrix	Sample ID	Depth/ Sampling Interval	Analyses (1)				
					Energetics	Perchlorate	Metals (total & dissolved)	Nitrate/ Nitrite	Comments
AOC 31	A31S01	surface soil	A31-SS01-0001	0 - 1 foot	x	x	x		
	A31S02	surface soil	A31-SS02-0001	0 - 1 foot	x	x	x		
	A31S03	surface soil	A31-SS03-0001	0 - 1 foot	x	x	x		
	A31S04	surface soil	A31-SS04-0001	0 - 1 foot	x	x	x		
		subsurface soil	A31-SB04-xxyy	above water table	x	x	x		
		groundwater	A31-MW01-mmddyy	middle of screen; tbd	x	x	x	x	
		groundwater	A31-MW01P-mmddyy	middle of screen; tbd	x	x	x	x	Field Duplicate
	A31S05	surface soil	A31-SS05-0001	0 - 1 foot	x	x	x		
		surface soil	A31-SS05P-0001	0 - 1 foot	x	x	x		Field Duplicate
	A31S06	surface soil	A31-SS06-0001	0 - 1 foot	x	x	x		

Notes:
tbd – to be determined
mmddyy – two-digit month, two-digit date, two-digit year of sample collection.
xxyy – two-digit top depth and two-digit bottom depth of sample interval.
1. See specific analytes in Section 9 (e.g., individual analytes for energetics and metals).
2. See field QA/QC details in Section 6. Equipment blank IDs shall be as follows: S69-EB01-mmddyy and A31-EB01-mmddyy. MS/MSDs will retain same sample ID as parent sample ("do MS/MSD" will be noted on the chain-of-custody form).

8.4 Analytical SOP Requirements Table

(UFP-QAPP Manual Section 3.1.1)

Laboratory point of contact, e-mail address, and phone number: Bette Premo, bette.premo@white-water-associates.com, (906) 822-7889
Laboratory Name and Address: Test America Laboratories | 30 Community Drive, Suite 11 | South Burlington, VT 05403 | (802) 660-1990
For Nitrate/Nitrite Analysis: Test America Laboratories | 5102 LaRoche Avenue | Savannah, GA 31404 | (912) 354-7858
Data Package Turnaround Time (TAT): 21 days
Tentative Sampling Dates: Winter 2012 (tbd)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference (1)	Sample Size	Containers (2) (number, size, and type)	Preservation Requirements	Maximum Holding Time (3) (preparation / analysis)
Soil	Select Energetics (4)	SW-846 8330B no grinding TA SOP- BR-EX-010 & BR-LC-003	30 grams (g)	One 4-ounce (oz) glass jar	Cool to 0 to 6 °C	14 days until extraction, 40 days to analysis
Groundwater	Select Energetics (4)	SW-846 8330B TA SOP- BR-EX-010 & BR-LC-003	500 milliliter (mL)	Two 1 – liter (L) glass amber bottles	Cool to 0 to 6 °C	7 days until extraction, 40 days to analysis
Soil and Sediment	Perchlorate	SW-846 6850 TA SOP- BR-LC-004	30g	One 4-oz glass jar	Cool to 0 to 6 °C	28 days to analysis
Groundwater and Surface Water	Perchlorate	SW-846 6850 TA SOP- BR-LC-004	10mL	250 mL plastic ONLY (fill to ½-¾ full)	Cool to 0 to 6 °C	28 days to analysis
Soil	Select Metals – Lead and Mercury	SW-846 3050B/ 6020A/7471B, TA SOP- BR-ME-011, BR-ME-003, & BR-ME-004	1 to 2 g	One 4-oz glass jar	Cool to 0 to 6 °C	180 days to analysis except mercury, 28 days for mercury
Groundwater	Select Metals – Lead and Mercury (total and dissolved)	SW-846 3010A/ 6020A/7471A, TA SOP- BR-ME-009, BR-ME-003, & BR-ME-015	100mL	One 500-mL plastic bottle (per total and dissolved)	Nitric acid to pH <2; Cool to 0 to 6 °C	180 days to analysis except mercury, 28 days for mercury
Groundwater	Nitrate/Nitrite	EPA 353.2, TA SOP- SA-GE-208	5 mL for each analyte	One 500-mL plastic bottle	Cool to 0 to 6 °C	Nitrate & Nitrite – 48 hours from sampled time to analysis.

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference (1)	Sample Size	Containers (2) (number, size, and type)	Preservation Requirements	Maximum Holding Time (3) (preparation / analysis)
Solid IDW (5)	TCLP – Metals	SW-846 1311, 6010C & 7470A	100 g	One 8-oz wide-mouth glass jar	Cool to 0 to 6 °C	28 days from sampled date to leaching, 28 days from leaching to analysis
Aqueous IDW (5)	TCLP – Metals	SW-846 1311, 6010C & 7470A	500 mL	One 1-L HDPE bottle	Cool to 0 to 6 °C	28 days from sampled date to leaching, 28 days from leaching to analysis
Aqueous IDW (5)	Corrosivity (towards steel)	SW-846 1110A	425mL	One 1-L HDPE bottle	Cool to 0 to 6 °C	As soon as possible after laboratory receipt
Solid IDW (5)	Ignitibility	SW-846 1010	20 g	One 4-oz wide-mouth glass jar	Cool to 0 to 6 °C	As soon as possible after laboratory receipt
Aqueous IDW (5)	Ignitibility	SW-846 1010	100 mL	One 100-mL HDPE bottle	Cool to 0 to 6 °C	As soon as possible after laboratory receipt

Notes:
TA – Test America [Lab] mL – milliliter g – gram L – liter oz – ounce °C – Degrees Celsius TCLP – Toxicity Characteristic Leaching Procedure
1. Laboratory SOPs are subject to revision and updates during duration of the project, the laboratory will use the most current revision of the SOP at the time of analysis.
2. Sample size is a minimum; the containers listed will be filled to compensate for any required re-analysis or re-extractions. For samples requiring Matrix Spike (MS)/Matrix Spike Duplicate (MSD), containers listed should be tripled.
3. Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.
4. Select Energetics to be analyzed at AOC 31 consist of the following: 2,4-Dinitrotoluene; 2,6-Dinitrotoluene; HMX; RDX; Tetryl; 2,4,5-Trinitrotoluene; 2-Nitrotoluene; 3-Nitrotoluene; 4-Nitrotoluene; Nitrobenzene; 1,3-Dinitrobenzene; 4-Amino-2,6-Dinitrotoluene; 2-Amino-4,6-Dinitrotoluene; 1,3,5-Trinitrobenzene.
5. IDW sample analyses are presented on this worksheet for the utilization of field personnel. Quality control information is not presented in any of the remaining WSs for these samples.

8.5 Additional Project-Related Tasks

Additional project-related tasks include the following:

- Analytical tasks
- Data management
- Assessment and oversight
- Data review
- Project reports

8.5.1 Analytical Tasks

Chemical analyses will be performed by Test America (laboratories in Savannah, Georgia, and/or South Burlington, Vermont). Test America is Department of Defense (DoD) Environmental Laboratory Program (ELAP)-accredited. A copy of the laboratory accreditation is located in Appendix C. Analyses will be performed in accordance with the analytical methods specified in Section 8.2. Test America will meet most of the PSLs/PALs as shown in Section 9. Test America will perform chemical analysis following laboratory-specific SOPs (Section 10).

All soil results will be reported by the laboratory on a dry-weight basis. Results of percent moisture will be reported in each analytical data package and electronic data deliverable (EDD). This information also will be captured in the project database, which will eventually be uploaded to Naval Installation Restoration Information Solution (NIRIS).

The analytical data packages provided by Test America will be in a Contract Laboratory Program (CLP)-like format, contain raw data capable of full data validation, contain summary forms for all sample and laboratory method blank data, and contain summary forms showing all method-specific QC information (results, recoveries, relative percent differences [RPDs], relative standard deviation [RSDs], and/or percent differences [%Ds], etc.).

8.5.2 Data Management

The principal data generated for this project will be from field and laboratory analytical data. Field sampling log sheets will be organized by date and medium, and filed in the project files. The field logbooks for this project will be used only for this site and will also be categorized and maintained in the project files after the completion of the field program. Project personnel completing concurrent field sampling activities may maintain multiple field logbooks. When possible, logbooks will be segregated by sampling activity. The field logbooks will be titled based on date and activity.

The data handling procedures to be followed by Test America will meet the requirements of the technical specifications. Electronic data results will be automatically downloaded into the Tetra Tech database in accordance with the proprietary Tt processes.

The Tetra Tech PM (or designee) is responsible for the overall tracking and control of data generated for the project.

Data Tracking. Data are tracked from generation to archiving in the Tt project-specific files. The Tt Project Chemist (or designee) is responsible for tracking the samples collected and shipped to Test America. Upon receipt of the data packages from Test America, the Tt Project Chemist will monitor the data validation effort,

which includes verifying that the data packages are complete and results for all samples have been delivered by Test America.

Data Storage, Archiving, and Retrieval. The data packages received from Test America are tracked in the data validation logbook. After the data are validated, the data packages are entered into the Tt Navy CLEAN file system and archived in secure files. The field records, including field log books, sample logs, chain-of-custody records, and field calibration logs, will be submitted by the Tt FOL to be entered into the Navy CLEAN file system prior to archiving in secure project files. Project files are audited for accuracy and completeness. At the completion of the Navy contract, the records will be stored by Tt.

Data Security. Access to Tt project files is restricted to designated personnel only. Records can only be borrowed temporarily from the project file using a sign-out system. The Tt Data Manager maintains the electronic data files, and access to the data files is restricted to qualified personnel only. File and data backup procedures are routinely performed.

Electronic Data. All electronic data will be compiled into a NIRIS Electronic Data Deliverable (NEDD) and loaded into NIRIS.

Data Review. This review comprises data verification, validation, and usability assessment. The data verification and validation processes and requirements are described in Section 12. The data usability assessment will, at a minimum, constitute evaluation of the following characteristics to ensure that the amount, type, and quality of data are sufficient to achieve project objectives. The means of conducting these evaluations will vary depending on the nature of the data. For example, soil borings and well construction logs will generally be evaluated qualitatively or semi-quantitatively whereas precision, accuracy, and sensitivity of analytical data will generally be evaluated quantitatively and may be based on, or may supplement, data validation findings. Examples include the following:

- Comparing actual to intended sampling locations and verifying that the correct datum was used to delineate contamination.
- Looking for trends across sample delivery groups or sampling events.
- Identifying potential errant or outlier data points.
- Assessing planning assumption validity.
- Evaluating the potential for contamination of samples by samplers.

Data quality indicators to be evaluated during this assessment include the following:

1. **Precision.** A semi-quantitative estimate of the uncertainty in contaminant concentrations as a function of location will be made.

2. **Accuracy.** Accuracy data will be evaluated to ensure sampling and measurement accuracy is within or exceeds analytical method specifications and may depend in part on the data validation findings.

3. **Representativeness.** This evaluation will assess whether the data are adequately representative of intended populations based on the sample collection and data generation requirements specified in this SAP.

4. **Completeness.** Failure to obtain critical data from planned locations will be documented. Minor variations in actual versus intended sampling locations (or depths) that do not adversely affect the attainment of project objectives will not be documented.

5. **Comparability.** This will be accomplished by verifying that the planned analysis was used and that the data quality indicators reviewed during data validation indicate no significant data quality deficiencies.

6. **Sensitivity.** The Tt Project Chemist will determine whether project sensitivity goals were achieved by comparing non-detect values to PSLs/PALs.

7. **Other quantitative characteristics.** These may include quantities such as verification of soil volume calculations, soil disposal cost estimates, etc., that are used to determine whether the contaminants are sufficiently well delineated to estimate remediation costs.

If significant data quality deficiencies are detected that prevent the attainment of project objectives, the limitations on the affected data will be described in the project report. The Tt PM will bring these deficiencies to the attention of the project team for their evaluation and the team will determine an appropriate corrective action depending on the circumstances.

8.5.3 Project Reports

A Draft SSP Report will be prepared and submitted to the Navy and regulators (i.e., the Partnering Team) for review. The report will include a summary of the work performed in the approved UFP-SAP, field modifications as documented by the Tt FOL, summary and analysis of the analytical results, updated CSM, human health and ecological risk screening evaluations, and conclusions and/or recommendations for the sites. Tt will respond to comments received on the draft report. The final version of the report will be submitted in hardcopy and electronic format to the project stakeholders.

The report will contain a *results and data quality* section (or equivalent contained within data validation memoranda), which will present the analytical data and identify site-related contamination, and include an evaluation of the data as they relate to the nature and extent of contamination and both human health and ecological risk screening evaluations. It also will include a summary of quantitative analytical performance indicators such as completeness, precision, bias, and sensitivity and qualitative indicators such as representativeness and comparability. There will be a reconciliation of project data with the DQOs and an identification of deviations from this UFP-SAP. A data usability assessment will be used to identify significant deviations in analytical performance that could affect the ability to meet project objectives.

The Partnering Team will be updated throughout the SSP investigation fieldwork via email, conference call, and/or Partnering meetings. At least one summary presentation will provided at a Partnering meeting prior to or just after submission of the draft report.

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9 REFERENCE LIMITS AND EVALUATION TABLES

(UFP-QAPP Manual Section 2.8.1 and UFP-QAPP Workbook WS #15)

Matrix: Soil - *Applies to both Site 69 (perchlorate, only) and AOC 31*

Chemical / Analyte	CAS Number	PSL/PAL (mg/kg)	PSL/PAL Reference (1)	PQLG (mg/kg) (2)	Test America		
					LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Metals – 6020A							
Lead	7439-92-1	11	Eco SSL	3.67	0.2	0.018	0.0048
Mercury	92786-62-4	0.1	Eco SSL	0.033	0.033	0.0038	0.0022
Select Energetics – 8330B							
2,4-DINITROTOLUENE	**121-14-2**	**0.00028**	**EPA SSL**	**0.000093**	**0.1**	**0.03**	**0.016**
2,6-DINITROTOLUENE	**606-20-2**	**0.02**	**EPA SSL**	**0.0067**	**0.1**	**0.015**	**0.0062**
HMX	2691-41-0	0.99	EPA SSL	0.33	0.1	0.015	0.0062
TETRYL	479-45-8	0.59	EPA SSL	0.2	0.1	0.03	0.016
RDX	**121-82-4**	**0.00023**	**EPA SSL**	**0.000077**	**0.1**	**0.024**	**0.011**
2,4,6-TRINITRITOLUENE	**118-96-7**	**0.013**	**EPA SSL**	**0.0043**	**0.1**	**0.015**	**0.0066**
2-NITROTOLUENE	**88-72-2**	**0.00025**	**EPA SSL**	**0.000083**	**0.1**	**0.03**	**0.028**
3-NITROTOLUENE	**99-08-1**	**0.0012**	**EPA SSL**	**0.0004**	**0.1**	**0.03**	**0.026**
4-NITROTOLUENE	**99-99-0**	**0.0034**	**EPA SSL**	**0.0011**	**0.1**	**0.03**	**0.025**
NITROBENZENE	**98-95-3**	**0.000079**	**EPA SSL**	**0.000026**	**0.1**	**0.03**	**0.013**
1,3-DINITROBENZENE	**99-65-0**	**0.0014**	**EPA SSL**	**0.00047**	**0.1**	**0.024**	**0.0084**
4-AMINO-2,6-DINIUTROTOLUENE	**19406-51-0**	**0.023**	**EPA SSL**	**0.0077**	**0.1**	**0.024**	**0.01**
2-AMINO-4,6-DINITROTOLUENE	**35572-78-2**	**0.023**	**EPA SSL**	**0.0077**	**0.1**	**0.024**	**0.007**
1,3,5-TRINITROBENZENE	99-35-4	0.376	NOAA	0.13	0.1	0.024	0.0089
Oxidizer							
PERCHLORATE - 6850	14797-73-0	5.5	EPA RSL	1.83	0.0008	0.00016	0.000076

Notes:
Bold rows indicate that the Project Screening Limit (PSL) and/or Project Action Limit (PAL) is between the laboratory Limit of Quantitation (LOQ) and the Limit of Detection (LOD).
Bold and shaded rows indicate that the PSL/PAL is less than the LOD.
1. Selected PSL/PAL is the lowest (most conservative) of the evaluated PSLs/PALs. 2. Project Quantitation Limit Goal (PQLG) is set at 1/3 the PSL/PAL.
CAS – Chemical Abstract Service DL – Detection Limit mg/kg – milligrams per kilogram LOQ – Limit of Quantitation LOD – Limit of Detection
HMX - His/Her Majesty's Explosive (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine) RDX - Royal Demolition Explosive (Hexahydro-1,3,5-trinitro-1,3,5-triazine)

PAL References:

- EPA RSL – EPA (May 2012) residential soil RSL. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents. The residential screening level for carcinogens (not adjusted) is equivalent to an Incremental Lifetime Cancer Risk (ILCR) of 1×10^{-6}.
- EPA SSL – EPA (May 2012) SSL using a Dilution Attenuation Factor (DAF) of 20.
- Eco SSL – Ecological Soil Screening Level. EPA (2005) *Guidance for Developing Ecological Soil Screening Level.* Office of Solid Waste and Emergency and Response. OSWER Directive 92857-55. February. Separate documents are available for each chemical at http://www.epa.gov/ecotox/ecossl.
- NOAA (National Oceanic and Atmospheric Administration) – Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 pages. http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html.

Matrix: Sediment - *Applies to Site 69, only*

Chemical / Analyte	CAS Number	PSL/PAL (mg/kg)	PSL/PAL Reference (1)	PQLG (mg/kg) (2)	Test America		
					LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Oxidizer							
PERCHLORATE - 6850	14797-73-0	5.5	EPA RSL	1.83	0.0008	0.00016	0.000076

Notes:
1. Selected PSL/PAL is the lowest (most conservative) of the evaluated PSLs/PALs. 2. Project Quantitation Limit Goal (PQLG) is set at 1/3 the PSL/PAL.
CAS – Chemical Abstract Service DL – Detection Limit mg/kg – milligrams per kilogram LOQ – Limit of Quantitation LOD – Limit of Detection
PAL Reference: EPA RSL – EPA (May 2012) residential soil RSL. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

Matrix: Surface Water - *Applies to Site 69, only*

Chemical / Analyte	CAS Number	PSL/PAL (µg/L)	PSL/PAL Reference (1)	PQLG (µg/L) (2)	Test America		
					LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Oxidizer							
PERCHLORATE - 6850	14797-73-0	1.1	EPA RSL	0.4	0.2	0.04	0.017

Notes:
1. Selected PSL/PAL is the lowest (most conservative) of the evaluated PSLs/PALs. 2. Project Quantitation Limit Goal (PQLG) is set at 1/3 the PSL/PAL.
CAS – Chemical Abstract Service µg/L – micrograms per Liter LOQ – Limit of Quantitation LOD – Limit of Detection DL –Detection Limit
PAL Reference: EPA RSL – U.S. EPA (May 2012) tap water RSL. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents.

Matrix: Groundwater - *Applies to Site 69 (perchlorate and nitrate/nitrite, only) and AOC 31*

Chemical / Analyte	CAS Number	PSL/PAL (µg/L)	PSL/PAL Reference (1)	PQLG (µg/L) (2)	Test America		
					LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Metals – 6020A							
Lead	7439-92-1	15	EPA MCL	5	2	0.093	0.024
Mercury	92786-62-4	0.43	EPA RSL	0.14	0.2	0.18	0.066
Select Energetics – 8330B							
2,4-DINITROTOLUENE	121-14-2	0.2	EPA RSL	0.067	0.2	0.06	0.059
2,6-DINITROTOLUENE	606-20-2	1.5	EPA RSL	0.5	0.2	0.048	0.019
HMX	2691-41-0	78	EPA RSL	26.0	0.2	0.024	0.0087
TETRYL	479-45-8	6.3	EPA RSL	2.1	0.2	0.06	0.059
RDX	121-82-4	0.61	EPA RSL	0.2	0.2	0.048	0.023
2,4,6-TRINITRITOLUENE	118-96-7	0.76	EPA RSL	0.25	0.2	0.048	0.012
2-NITROTOLUENE	88-72-2	0.27	EPA RSL	0.09	0.2	0.048	0.032
3-NITROTOLUENE	**99-08-1**	**0.13**	**EPA RSL**	**0.043**	**0.2**	**0.06**	**0.057**
4-NITROTOLUENE	99-99-0	3.7	EPA RSL	1.2	0.2	0.06	0.055
NITROBENZENE	**98-95-3**	**0.12**	**EPA RSL**	**0.04**	**0.2**	**0.048**	**0.03**
1,3-DINITROBENZENE	**99-65-0**	**0.15**	**EPA RSL**	**0.05**	**0.2**	**0.048**	**0.025**
4-AMINO-2,6-DINIUTROTOLUENE	19406-51-0	3	EPA RSL	1	0.2	0.048	0.022
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	3	EPA RSL	1	0.2	0.048	0.021
1,3,5-TRINITROBENZENE	99-35-4	46	EPA RSL	15.3	0.2	0.048	0.015
Oxidizer							
PERCHLORATE - 6850	14797-73-0	1.1	EPA RSL	0.4	0.2	0.04	0.017
Miscellaneous							
Nitrate	14797-55-8	500	Other	167	50	25	10
Nitrite	14797-65-0	500	Other	167	50	10	10

Notes:
Bold rows indicate that the Project Screening Limit (PSL) and/or Project Action Limit (PAL) is between the laboratory LOQ and the LOD.
1. Selected PSL/PAL is the lowest (most conservative) of the evaluated PSLs/PALs. 2. Project Quantitation Limit Goal (PQLG) is set at 1/3 the PSL/PAL.
CAS – Chemical Abstract Service µg/L – micrograms per Liter LOQ – Limit of Quantitation LOD – Limit of Detection DL –Detection Limit
HMX - His/Her Majesty's Explosive (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine) RDX - Royal Demolition Explosive (Hexahydro-1,3,5-trinitro-1,3,5-triazine)

PAL References:

- EPA RSL – EPA (May 2012) tap water RSL. RSLs based on non-carcinogenic effects have been divided by 10 to account for exposure to multiple constituents. The residential screening level for carcinogens (not adjusted) is equivalent to an incremental lifetime cancer risk (ILCR) of 1×10^{-6}. *Mercuric chloride (and other mercury salts)* RSL used for mercury.
- EPA MCL – EPA (April 2012) Drinking Water Standards & Health Advisories. EPA 822-S-12-001. Office of Water. Washington, D.C.
- Other – Less than the Federal Maximum Contaminant Level (MCL) for nitrate (10,000 µg/L as nitrogen). Lead MCL (i.e., "action level") is 15 µg/L.

10 ANALYTICAL SOP REFERENCES

(UFP-QAPP Manual Section 3.2.1 and UFP-QAPP Workbook WS #23)

Laboratory point of contact, e-mail address, and phone number: Bette Premo, bette.premo@white-water-associates.com, (906) 822-7889
Laboratory Name and Address: Test America Laboratories | 30 Community Drive, Suite 11 | South Burlington, VT 05403 | (802) 660-1990
For Nitrate/Nitrite Analysis: Test America Laboratories | 5102 LaRoche Avenue | Savannah, GA 31404 | Phone: (912) 354- 7858
Data Package Turnaround Time: 21 days
Tentative Sampling Dates: Winter 2012 (tbd)

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Variance to QSM? Y/N	Modified for Project Work? (1)
TA-SOP BR-EX-010	Extraction of Explosives in Water and Soil, 12/28/10, Rev. 6	Extraction	Soil, Groundwater, and Aqueous QC samples / Energetics Extraction	NA	TA - Burlington	NA	N
TA-SOP BR-LC-003	Nitroaromatics & Nitroamines, 04/04/11, Rev. 16	Definitive	Soil, Groundwater, and Aqueous QC samples / Energetics	High Performance Liquid Chromatography (HPLC)	TA - Burlington	N	N
TA SOP-BR-LC-004	Perchlorate in Waters and Soils, 07/28/11, Rev. 4	Definitive	Soil, Surface Water, Sediment, Groundwater, and Aqueous QC samples / Perchlorates	Liquid Chromatography / Mass Spectrometry / Mass Spectrometry (LC/MS/MS)	TA - Burlington	N	N
TA-SOP BR-ME-011	Acid Digestion of Soils, 03/21/11, Rev. 11	Digestion	Soil and Sediment / Metals Digestion	NA	TA - Burlington	NA	N
TA-SOP BR-ME-009	Acid Digestion of Waters, 04/04/11, Rev. 16	Digestion	Surface Water, Groundwater and Aqueous QC samples / Metals Digestion	NA	TA - Burlington	NA	N
TA-SOP BR-ME-003	ICP-MS for Trace Element Analysis, 04/01/11, Rev. 7	Definitive	Soil, Groundwater, and Aqueous QC samples / Metals	Inductively Coupled Plasma / Mass Spectrometry (ICP/MS)	TA - Burlington	N	N
TA-SOP BR-ME-004	Mercury by Cold Vapor Analysis (Soils/Sediments), 04/01/11, Rev. 13	Definitive	Soil / Mercury	Cold Vapor Atomic Absorption (CVAA)	TA - Burlington	N	N
TA-SOP BR-ME-015	Mercury by Cold Vapor Analysis (Aqueous), 11/02/10, Rev. 14	Definitive	Groundwater and Aqueous QC samples / Mercury	CVAA	TA - Burlington	N	N
TA-SOP SA-GE-208, Rev.1	Nitrite and Nitrate Lachat Procedure, 04/04/2011	Definitive	Groundwater and Aqueous QC samples / Nitrate-Nitrite	Lachat	TA - Savannah	NA	N

Notes:
TA – Test America
Lab Accreditation or Certification requirements for the work of this project have been verified. Copies are provided in Appendix C.
Energetics to be analyzed at AOC 31 consist of the following: 2,4-Dinitrotoluene; 2,6-Dinitrotoluene; HMX; RDX; Tetryl; 2,4,5-Trinitrotoluene; 2-Nitrotoluene; 3-Nitrotoluene; 4-Nitrotoluene; Nitrobenzene; 1,3-Dinitrobenzene; 4-Amino-2,6-Dinitrotoluene; 2-Amino-4,6-Dinitrotoluene; 1,3,5-Trinitrobenzene.

11 LABORATORY QC SAMPLES TABLE

(UFP-QAPP Manual Section 3.4 and UFP-QAPP Workbook WS #28)

Matrix: Soil, Groundwater, and Aqueous QC Blanks
Analytical Group: Energetics
Analytical Method/SOP Reference: SW-846 8330B / TA SOP- BR-EX-010 & BR-LC-003

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	DQI	MPC
Method Blank	One per preparation batch of 20 or fewer samples of similar matrix.	All target analytes must be ≤ ½ LOQ.	(1) Investigate source of contamination (2) Re-prepare and analyze method blank and all samples processed with the contaminated blank. (3) Qualify results if re-extraction/re-analysis not feasible.	Analyst, Supervisor	Contamination / Bias	Same as Method/SOP QC Acceptance Limits.
Soil sample triplicate	At the subsampling step, one sample per batch.	The %RSD for results above the LOQ must not exceed 20%.	Corrective action must be taken if this is not met. The grinding process must be investigated to make sure the samples are being reduced to the appropriate particle size.	Analyst, Supervisor	Accuracy/ Bias Precision	Same as QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch of 20 or fewer samples of similar matrix.	%Rs must meet the DoD Quality Systems Manual (QSM) Version 4.2 limits as per Appendix G of the DoD QSM.	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Contact Client if samples cannot be reanalyzed within hold time.	Analyst, Supervisor	Accuracy / Bias	Same as Method/SOP QC Acceptance Limits.
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix.	%Rs must meet the DoD QSM Version 4.2 limits as per Appendix G of the DoD QSM. The RPD between MS and MSD should be ≤ 30%.	Corrective action will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met, unless RPDs indicate obvious extraction/ analysis difficulties, then re-prepare and reanalyze MS/MSD.	Analyst, Supervisor	Accuracy / Precision	Same as Method/SOP QC Acceptance Limits.
Surrogate Spikes	All field and QC samples - one per sample. One surrogate added: 1,2-Dinitrobenzene	%Rs must meet the DoD QSM Version 4.2 limits as per Appendix G of the DoD QSM.	If surrogate recovery falls outside acceptance criteria, the sample should be re-extracted and re-analyzed.	Analyst, Supervisor	Accuracy / Bias	Same as Method/SOP QC Acceptance Limits.
Second Column Confirmation	All positive results must be confirmed.	RPD must be <40% from primary concentration.	None. Apply flag if RPD >40% and discuss in the case narrative.	Analyst, Supervisor	Presence/ precision	Same as Method/SOP QC Acceptance Limits.
Results between DL and LOQ	NA.	Apply "J" qualifier to results detected between DL and LOQ.	NA	Analyst, Supervisor	Accuracy	Same as QC Acceptance Limits.

Notes:
Energetics to be analyzed at AOC 31 consist of the following: 2,4-Dinitrotoluene; 2,6-Dinitrotoluene; HMX; RDX; Tetryl; 2,4,5-Trinitrotoluene; 2-Nitrotoluene; 3-Nitrotoluene; 4-Nitrotoluene; Nitrobenzene; 1,3-Dinitrobenzene; 4-Amino-2,6-Dinitrotoluene; 2-Amino-4,6-Dinitrotoluene; 1,3,5-Trinitrobenzene

Matrix: Soil, Sediment, Surface Water, Groundwater, and Aqueous QC Blanks
Analytical Group: Perchlorate
Analytical Method/SOP Reference: SW-846 6850 / TA SOP- BR-LC-004

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	DQI	MPC
Isotope Ratio $^{35}Cl/^{37}Cl$	Every sample, batch QC sample, and standard.	Monitor for the daughter ion at masses 83/85. Theoretical ratio ~3.06. Ratio must be within 2.3 to 3.8.	If criteria are not met, the sample must be rerun. If the sample was not pretreated, the sample should be re-extracted using cleanup procedures. If, after cleanup, the ratio still fails, use alternative techniques to confirm presence of perchlorate.	Analyst, Supervisor	Accuracy/ Bias	Same as Method/SOP QC Acceptance Limits.
IS	Every sample, batch QC sample, standard, instrument blank, and method blank.	Measured ^{18}O IS area must be within 50% to 150% of the average IS area counts of the ICAL. RRT of the perchlorate ion must be within 0.98 to 1.02.	Rerun the sample at increasing dilutions until the 50-150% acceptance criteria is met. If criteria cannot be met with dilution, interference is suspected - use additional pretreatment steps.	Analyst, Supervisor	Accuracy/ Bias	Same as Method/SOP QC Acceptance Limits.
Interference Check Sample (ICS)	One per batch to verify method performance at the matrix conductivity threshold (MCT). At least one ICS must be analyzed daily.	The %R must be within 70% to 130% of true value.	Correct problem and re-analyze all samples in that batch. Replace cleanup filters or column if necessary. No samples may be reported that are associated with a failing ICS.	Analyst, Supervisor	Accuracy/ Bias	Same as Method/SOP QC Acceptance Limits.
Reagent Blank	Prior to calibration, after over-range samples, and at the end of the analytical sequence.	No perchlorate detected > ½ LOQ.	Re-analyze reagent blank (until no carryover is observed) and all samples processed since the contaminated blank. Results may not be reported without a valid reagent blank.	Analyst, Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits.
Method Blank	One per preparatory batch of 20 or fewer samples.	Perchlorate must be ≤ ½ LOQ.	Investigate source of contamination and evaluate the samples and associated QC: i.e. If the blank results are above ½ LOQ, then report sample results which are non-detect. Otherwise, re-prepare blank and associated samples.	Analyst, Supervisor	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits.

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	DQI	MPC
LCS (LCSD not required)	One per preparatory batch of 20 or fewer samples. LCS must be spiked at the LOQ.	%Rs must be between 80% and 120%. RPD should be ≤15%, if LCSD is analyzed.	If the %R of a target analyte in the LCS is greater than the upper control limit, and there are no positive findings for that compound, no further action is taken. Otherwise, re-analyze the LCS and affected samples or flag the results. If the %R of any target analyte is below the lower control limit, re-analyze the LCS and affected samples.	Analyst, Supervisor	Accuracy/ Bias Precision also, if LCSD is analyzed	Same as Method/SOP QC Acceptance Limits.
MS/MSD	One per preparatory batch of 20 or fewer samples per matrix. The MS and MSD must be spiked at the LOQ.	%Rs should be between 80% and 120%. RPD should be ≤15%	Flag the parent sample for failed analytes, which exceed the acceptance criteria.	Analyst, Supervisor	Accuracy/ Bias/ Precision	Same as Method/SOP QC Acceptance Limits.

Matrix: Groundwater and Aqueous QC Blanks
Analytical Group: Nitrate/Nitrite
Analytical Method/SOP Reference: EPA 353.5 / TA SOP- SA-GE-208

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	DQI	MPC
Method Blank	One per batch of up to 20 samples	Analyte concentration must be < ½ LOQ.	Correct problem, re-prepare and reanalyze along with associated samples.	Analyst, Supervisor	Contamination/ Bias	Same as QC Acceptance Limits.
LCS	One per batch of up to 20 samples	%R must be within 90% to 110%.	Correct problem, re-prepare, and reanalyze along with associated samples.	Analyst, Supervisor	Accuracy/ Bias	Same as QC Acceptance Limits.
MS/MSD	One set is performed for each batch of up to 20 samples of the same matrix.	%R must be between 90% and 110%, MS/MSD %RPD must be < 20%.	Failure to meet the control limits shall be discussed in the case narrative. If both the LCS and MS are unacceptable, all associated samples must be re-analyzed.	Analyst, Supervisor	Precision/ Accuracy	Same as Method/SOP QC Acceptance Limits.

Matrix: Soil, Groundwater, and Aqueous QC Blanks
Analytical Group: Metals - Lead and Mercury
Analytical Method/SOP Reference: SW-846 6020A, 7470A, & 7471A/ TA SOP- BR-ME-011, BR-ME-003, & BR-ME-004

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for CA	DQI	MPC
Method Blank	One per preparatory batch of 20 or fewer samples of similar matrix	All target analytes must be ≤ ½ LOQ.	Re-analyze to confirm the positive value. Notify the PM for further action. Re-prepare the samples associated with the Blank. Noncompliance report will be required for data reported	Analyst, Supervisor	Bias/ Contamination	Same as QC Acceptance Limits
IS (applies to SW-846 6020A, only)	Every sample.	For each sample, IS intensity must be within 70% to 130% of initial calibration standard.	Dilute the sample 5-fold and reanalyze with the appropriate amounts of internal standard. If internal standard recovery still fails, dilute an addition 5-fold. Report the result when the internal standard recovery is within range.	Analyst, Supervisor	Precision	Same as QC Acceptance Limits.
LCS	One per preparatory batch of 20 or fewer samples of similar matrix	%R must be within 80% to 120%.	Evaluate and reanalyze, if possible. If the LCS recoveries are high, but the sample results are < LOQ, then narrate. Otherwise, re-digest and reanalyze all associated samples for failed target analyte(s).	Analyst, Supervisor	Accuracy/Bias	Same as QC Acceptance Limits
MS	One per preparatory batch of 20 or fewer samples of similar matrix	%R should be within 80% to 120% (if sample is <4x spike added).	Flag results for affected analytes for all associated samples with "N".	Analyst, Supervisor	Accuracy/Bias	Same as QC Acceptance Limits
Sample Duplicate	One per preparatory batch of 20 or fewer samples of similar matrix	The RPD should be ≤20% for duplicate samples for both water and soils.	Narrate any results that are outside control limits.	Analyst, Supervisor	Precision	Same as QC Acceptance Limits
Serial Dilution	One per preparatory batch with sample concentration(s) >50x LOD	The 5-fold dilution result must agree within ±10% difference of the original sample result if result is >50x LOD.	Perform post-spike addition.	Analyst, Supervisor	Accuracy/Bias	Same as QC Acceptance Limits
Post Digestion Spike (does not apply to mercury)	One is performed when serial dilution fails or target analyte concentration(s) in all samples are < 50x LOD	The %R must be within 75 to 125% of expected value to verify the absence of an interference. Spike addition should produce a concentration of 10x to 100x LOQ.	Flag results for affected analytes for all associated samples with "J".	Analyst, Supervisor	Accuracy/Bias	Same as QC Acceptance Limits
Results between DL and LOQ	Not known at this time	Apply "J" qualifier to results between DL and LOQ.	None	Analyst, Supervisor	Accuracy	Same as QC Acceptance Limits

12 DATA VERIFCATION AND VALIDATION (STEPS I AND IIa/IIb) PROCESS TABLE

(UFP-QAPP Manual Section 5.2.1, Section 5.2.2, Table 9, and Figure 37; and UFP-QAPP Workbook WS #34, #35, and #36)

Data Review Input	Description	Responsible for Verification	Internal/ External
Chain-of-Custody (CoC) Forms	The Tt FOL or designee will review and sign the CoC form to verify that all samples listed are included in the shipment to the laboratory and the sample information is accurate. The forms will be signed by the sampler and a copy will be retained for the project file, the Tt PM, and the Tt Data Validators. The Tt FOL or designee will review the chain-of-custody form to verify that all samples listed in the SAP have been collected. All deviations should be documented in the report.	Sampler and FOL, Tt	Internal
CoC Forms	1. The Laboratory Sample Custodian will review the sample shipment for completeness and integrity, and sign accepting the shipment. 2. The Tt Data Validators will check that the chain-of-custody form was signed and dated by the Tt FOL or designee relinquishing the samples and also by the Laboratory Sample Custodian receiving the samples for analyses.	1 - Laboratory Sample Custodian, Test America 2 - Data Validators, Tt	External
CoC Forms and SAP	Ensure that the custody and integrity of the samples was maintained from collection to analysis and the custody records are complete and any deviations are recorded. Review that the samples were shipped and stored at the required temperature and preservation conditions for chemically-preserved samples meet the requirements listed in the SAP. Ensure that the analyses were performed within the holding times listed in the SAP.	Data Validators, Tt	External
Sample Log Sheets, CoC Forms, SAP, and Laboratory sample login documentation	Verify that information recorded in the log sheets is accurate and complete. Verify that samples were correctly identified, that sampling location coordinates are accurate, and that documentation establishes an unbroken trail of documented CoC from sample collection to report generation. Verify that the correct sampling and analytical methods/SOPs were applied. Verify that the sampling plan was implemented and carried out as written and that any deviations are documented. Document any discrepancies in the final report.	PM, FOL, or designee, Tt	Internal
SAP, Analytical SOPs, and Analytical Data Packages	Ensure that all laboratory SOPs were followed. Verify that the correct analytical methods/SOPs were applied. 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 the Tt PM verbally or via e-mail for guidance prior to report preparation.	Laboratory QAM, Test America	External
SAP/ CoC Forms	Check that all field QC samples determined necessary were collected as required.	FOL or designee, Tt	Internal
Analytical Data Package	Verify all analytical data packages for completeness. The Laboratory QAM will sign the case narrative for each data package.	Laboratory QAM, Test America	External
Electronic Data Deliverables (EDDs)/ Analytical Data Packages	Check each EDD against the CoC and hard copy data package for accuracy and completeness. Compare laboratory analytical results to the electronic analytical results to verify accuracy. Evaluate sample results for laboratory contamination and qualify false detections using the laboratory method/preparation blank summaries. Qualify analyte concentrations between the DL and the LOQ as estimated. Remove extraneous laboratory qualifiers from the validation qualifier.	Data Validators, Tt	External
Analytical Data Package	Verify each data package for completeness. Request missing information from the Laboratory PM.	Data Validators, Tt	External
SAP/ Laboratory Data Packages/ EDDs	Ensure that the laboratory QC samples were analyzed and that the MPCs listed in were met for all field samples and QC analyses. Check that specified field QC samples were collected and analyzed and that the analytical QC criteria set up for this project were met.	Data Validators, Tt	External
SAP/ Laboratory Data Packages/ EDDs	Check the field sampling precision by calculating RPDs for field duplicate samples. Check laboratory precision by reviewing the RPD or percent difference values from laboratory duplicate analyses; MS/MSDs; and LCS/LCSD, if available. Ensure compliance with the methods and project MPCs accuracy goals listed in the SAP.	Data Validators, Tt	External
SAP/ Laboratory Data Packages/ EDDs	Check that the laboratory recorded the temperature at sample receipt and the pH of samples preserved with acid or base to ensure sample integrity from sample collection to analysis.	Data Validators, Tt	External

Data Review Input	Description	Responsible for Verification	Internal/ External
SAP/ Laboratory Data Packages/ EDDs	Review the CoC forms generated in the field to ensure that the required analytical samples have been collected, appropriate sample identifications have been used, and correct analytical methods have been applied. The Tt 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. Check that all data have been transferred correctly and completely to the Tt database.	Data Validators, Tt	External
SAP/ Laboratory Data Packages/ EDDs	Ensure that the project LOQs listed in SAP were achieved.	Data Validators, Tt	External
SAP/ Laboratory Data Packages/ EDDs	Discuss the impact on DLs that are elevated because of matrix interferences. Be especially cognizant of and evaluate the impact of sample dilutions on low-concentration analytes when the dilution was performed because of the high concentration of one or more other contaminants. Document this usability issue and inform the Tt PM. Review and add PALs to the laboratory EDDs. Flag samples and notify the Tt PM of samples that exceed PALs listed in SAP.	Data Validators, Tt	External
SAP/ Laboratory Data Packages/ EDDs	Ensure that all QC samples specified in the SAP were collected and analyzed and that the associated results were within prescribed SAP acceptance limits. Ensure 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 Tt PM.	Data Validators, Tt	External
SAP/ Laboratory Data Packages/ EDDs	Summarize deviations from methods, procedures, or contracts in the Data Validation Report. Determine the impact of any deviation from sampling or analytical methods and SOPs requirements and matrix interferences effect on the analytical results. Qualify data results based on method or QC deviation and explain all the data qualifications. Print a copy of qualified data stored the project database to depict data qualifiers and data qualifier 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 Validators, Tt	External

12.1 Validation Summary

Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
Explosives and Perchlorate	Full validation will be performed using criteria for SW-846 Methods 8330B and 6850 listed in this SAP and the current DoD QSM. The logic outlined in the Region 3 Modifications to the National Functional Guidelines for Organic Data Review (EPA, 1994) should be used to apply qualifiers to data.	Data Validation Specialist, Tt
Metals	Full validation will be performed using criteria for SW-846 Method 6020A/7470A/7471B listed in this SAP and the current DoD QSM. The logic outlined in the Region 3 Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses (EPA, 1993) should be used to apply qualifiers to data.	Data Validation Specialist, Tt
Nitrate/Nitrite	Validation will be performed using the method specific criteria listed in this SAP and the current DOD QSM to the extent possible will be used.	Data Validation Specialist, Tt

Full data validation is defined as in-depth examination of data to check for adherence to method requirements, technical quality, analyte identification, and result quantitation. It is conducted to support risk assessments and to propose No Further Action scenarios. A formal report (or memorandum) is prepared which details technical findings, presents qualified analytical data and results as reported by the laboratory prior to validation, and includes laboratory quality control summaries and calculation verifications as supporting documentation. IDW analyses will not be validated.

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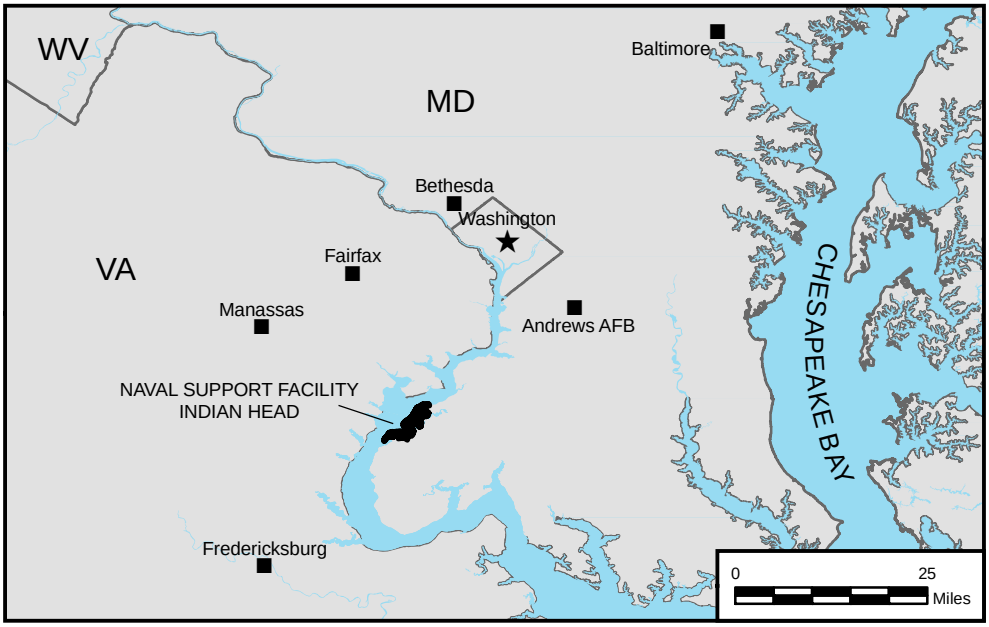

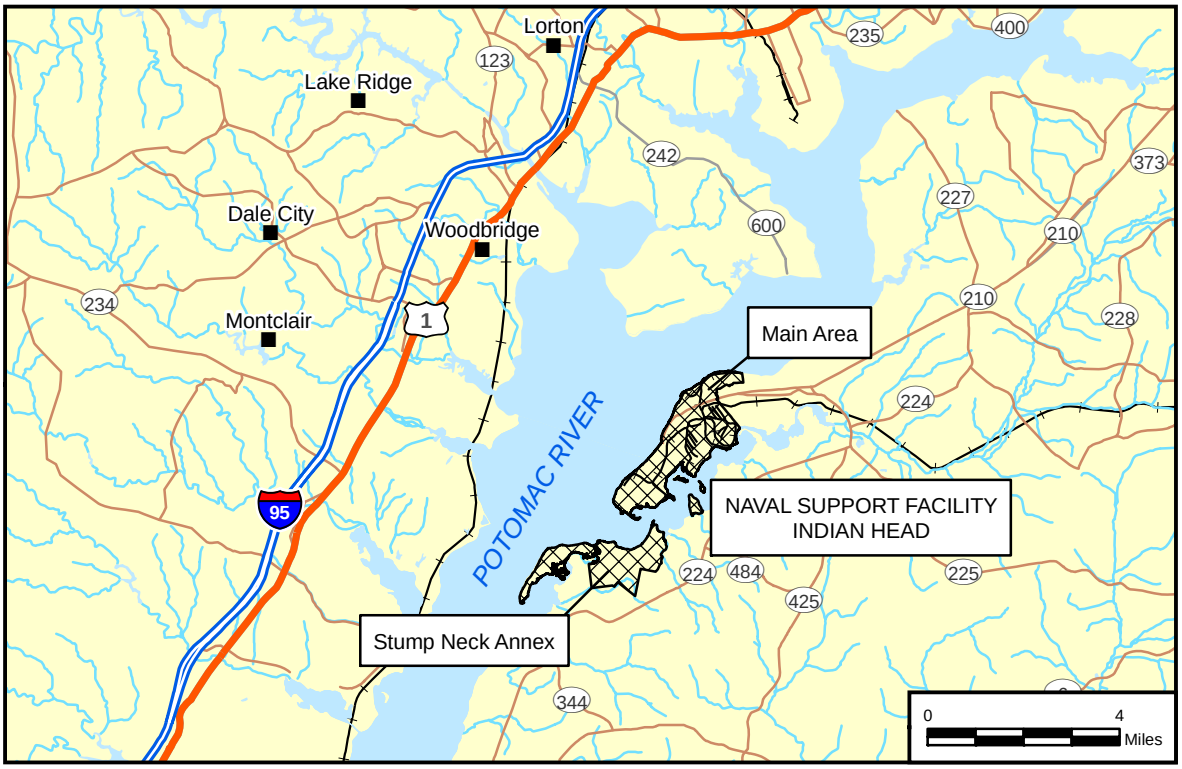

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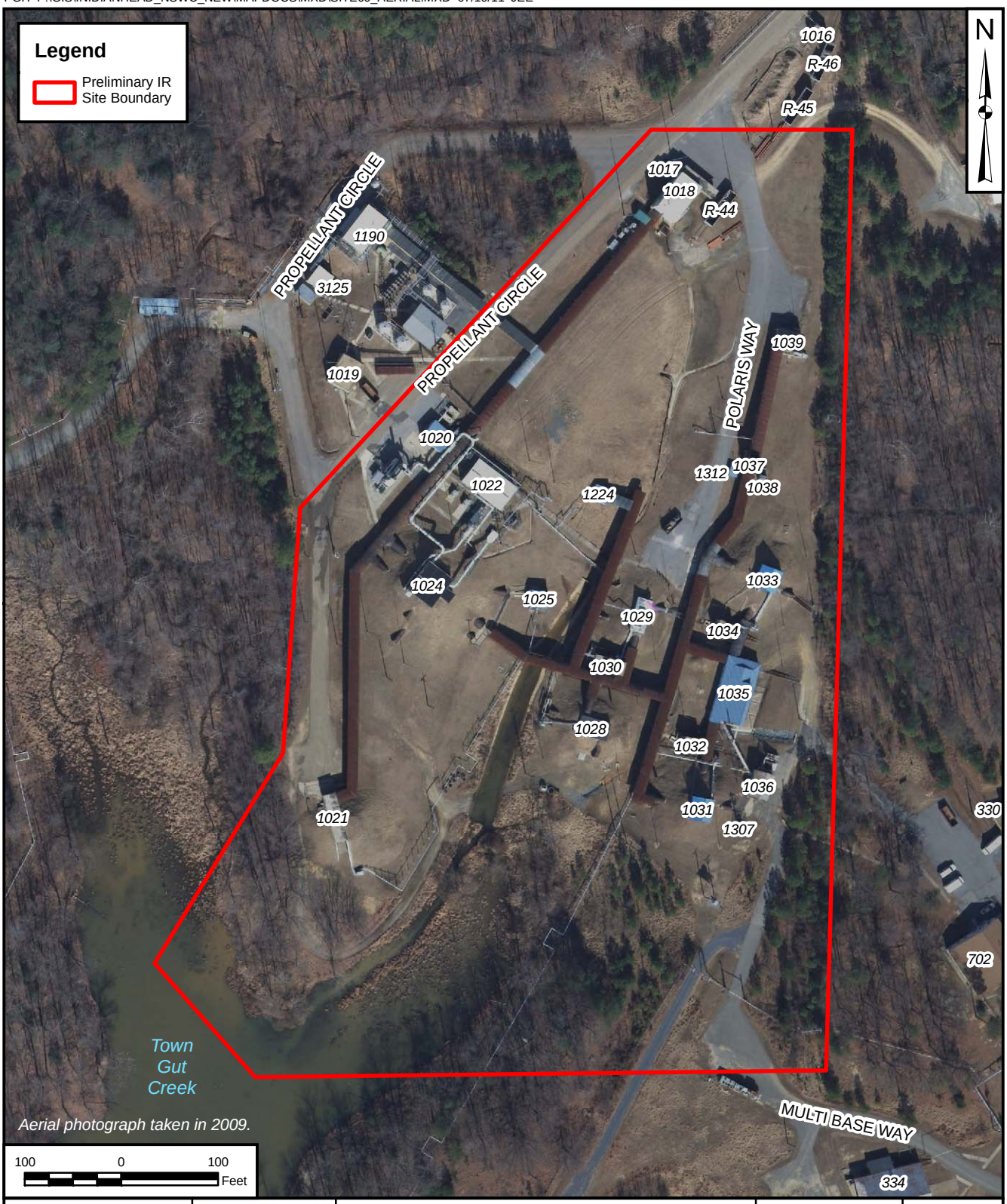

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AOC 31 - AERIAL
SITE SCREENING PROCESS WORK PLAN
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

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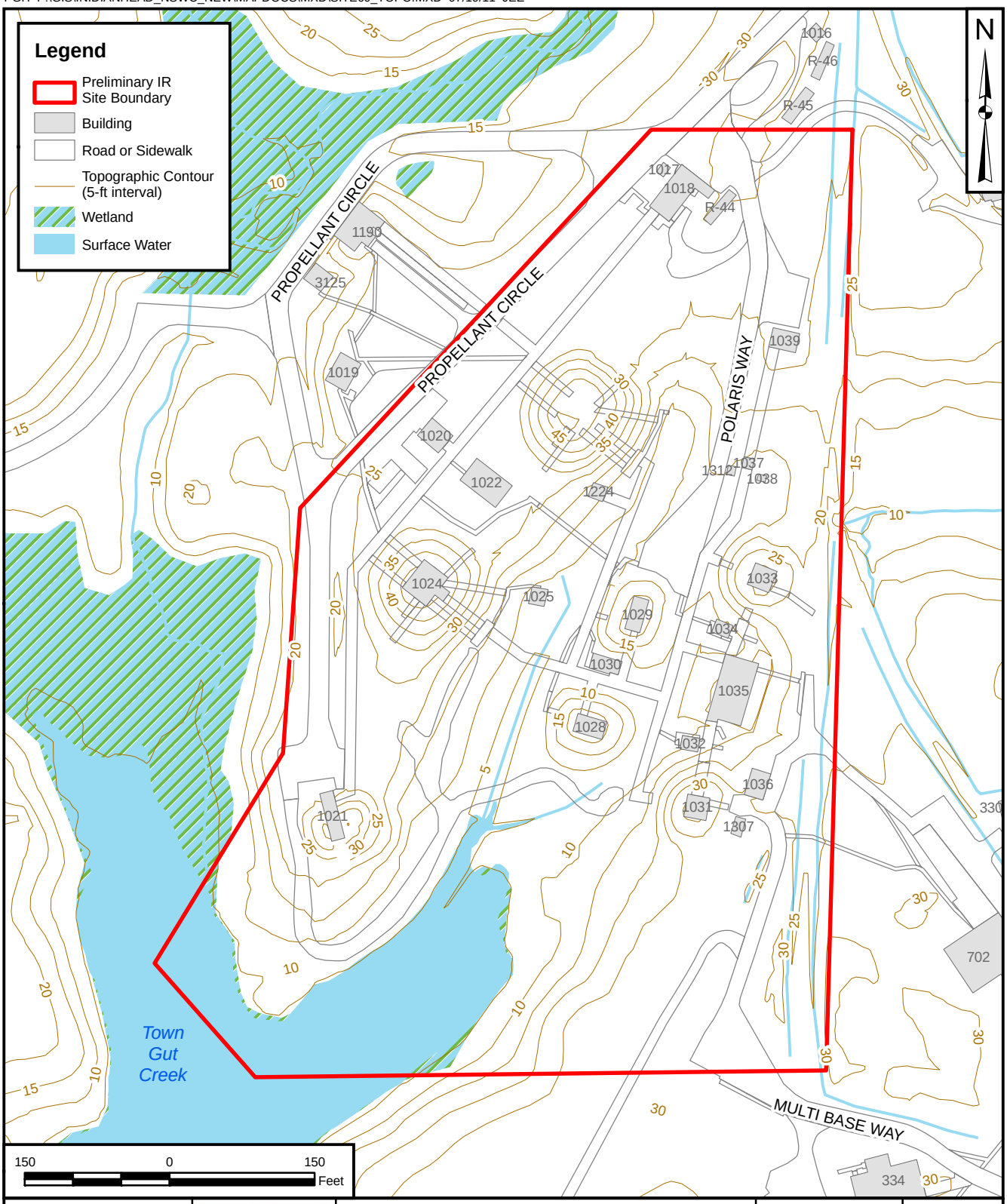

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SITE 69 - TOPOGRAPHY
SITE SCREENING PROCESS WORK PLAN
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

CONTRACT NUMBER	CTO NUMBER
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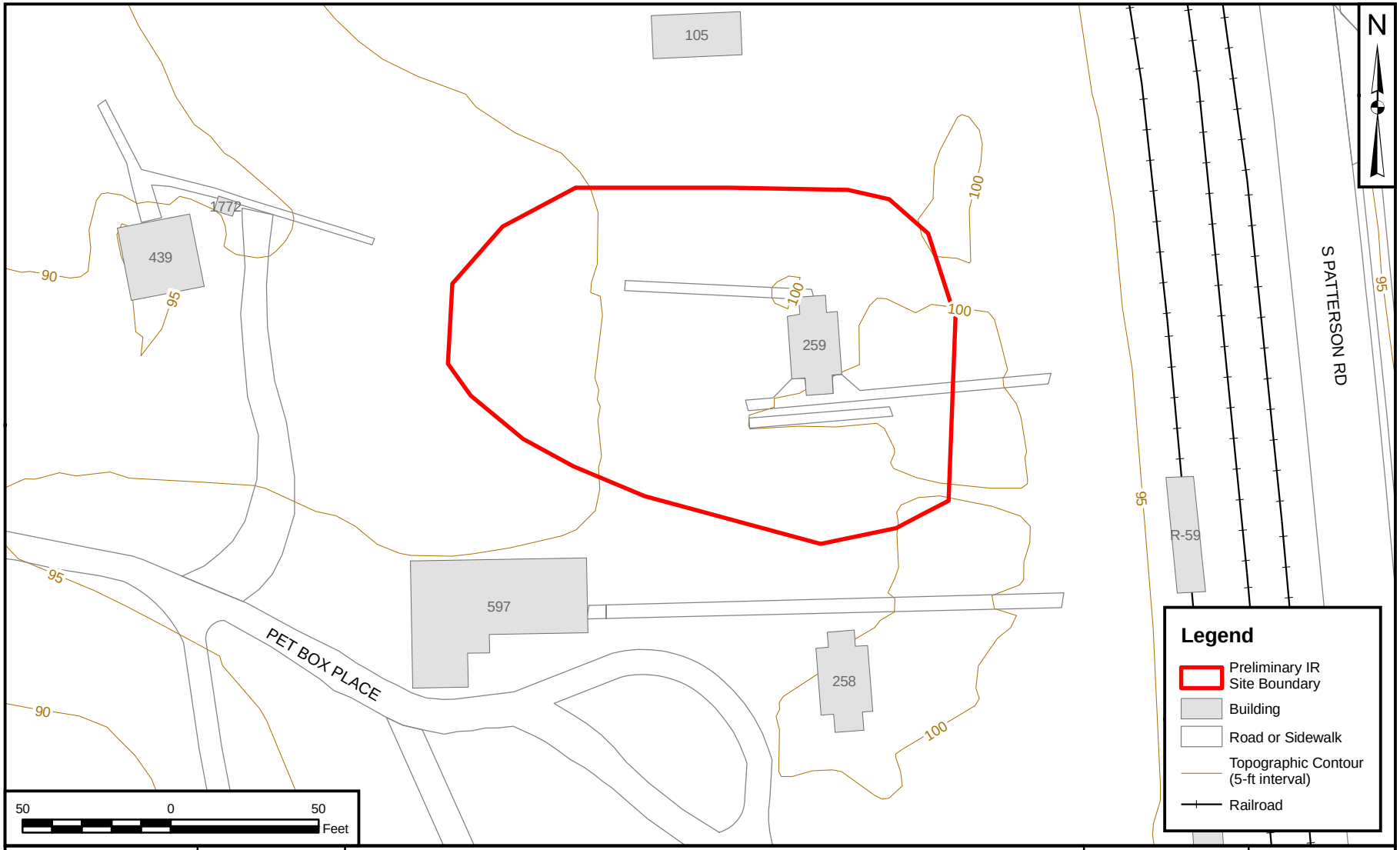

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AOC 31 - TOPOGRAPHY
SITE SCREENING PROCESS WORK PLAN
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

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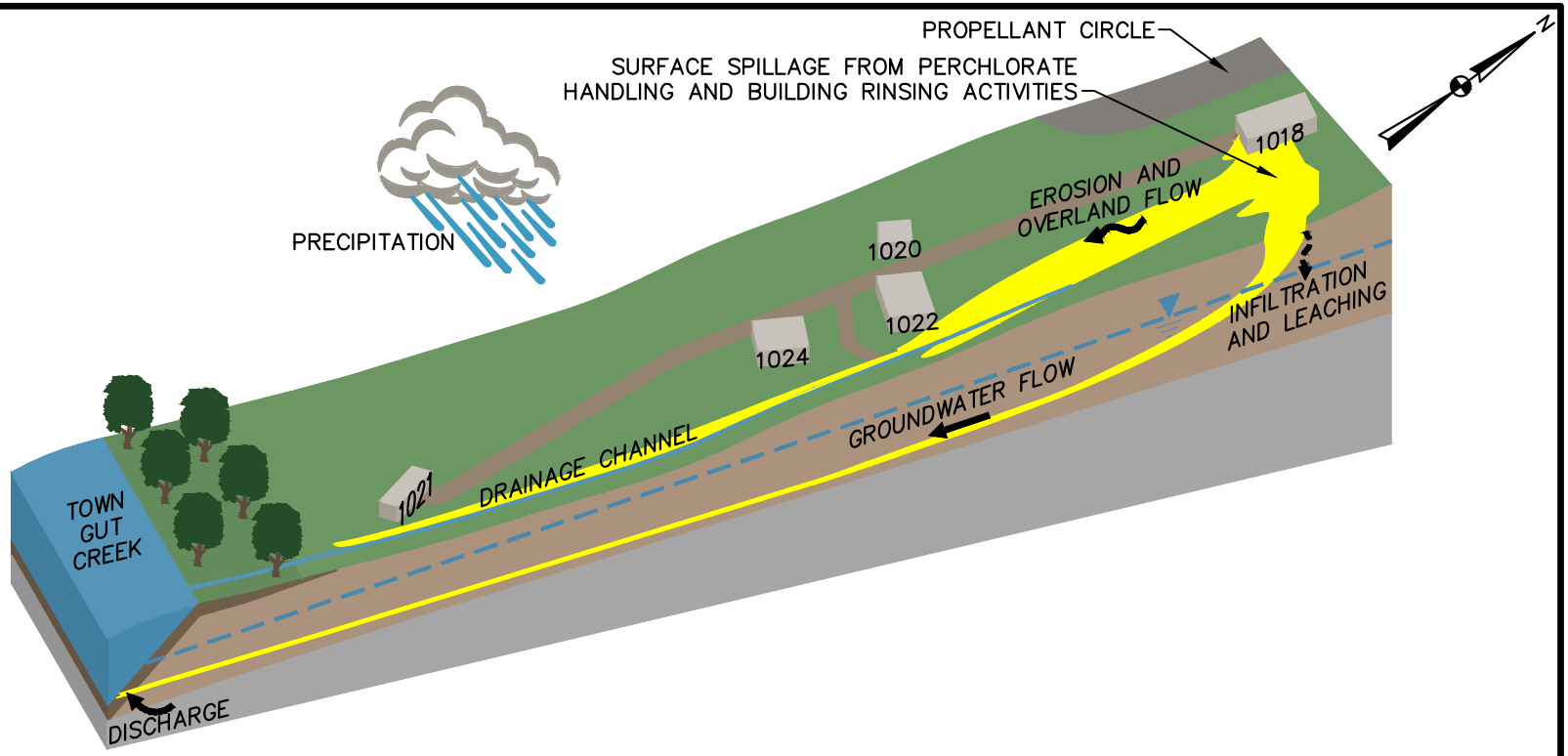
FIGURE 4B	0



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- CONTAMINANT
- WATER TABLE
- SEDIMENT
- SILTY SANDS
- SILTY CLAYS AND CLAY

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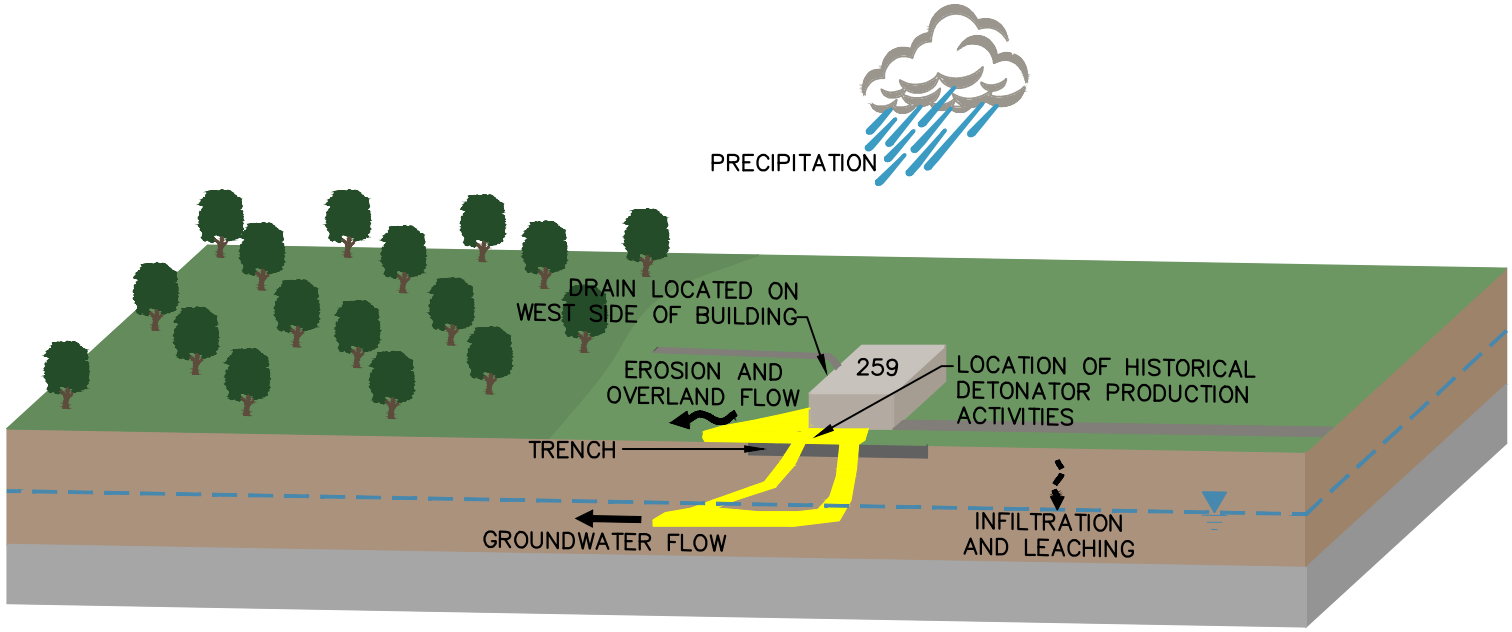

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- WATER TABLE
- SILTY SANDS
- SILTY CLAYS AND CLAY

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FIGURE 6A
EXPOSURE PATHWAY ANALYSIS
SITE 69 - BUILDING 1018
NSF INDIAN HEAD
INDIAN HEAD, MARYLAND

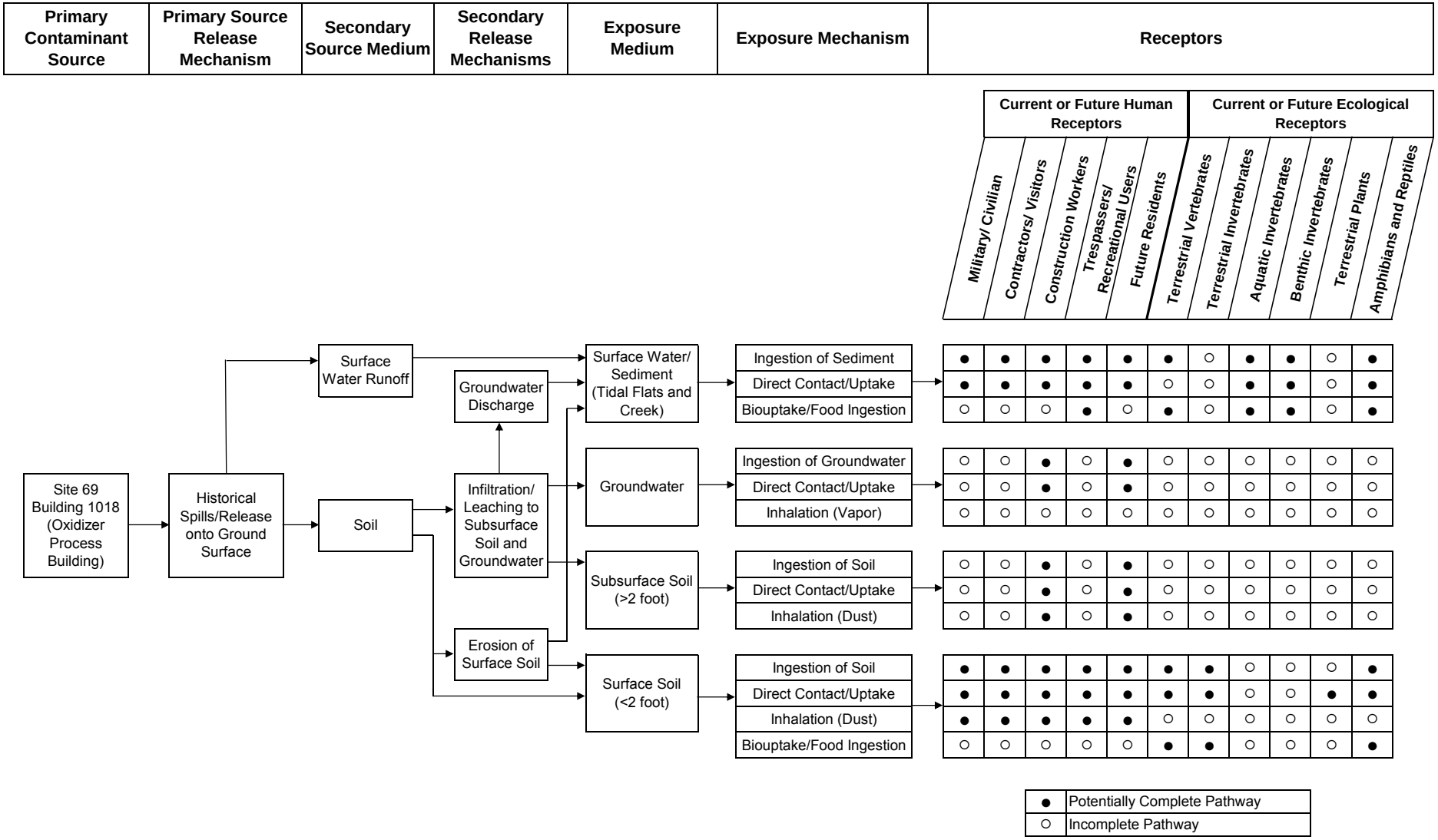

FIGURE 6B
EXPOSURE PATHWAY ANALYSIS
AOC 31 - BUILDING 259
NSF INDIAN HEAD
INDIAN HEAD, MARYLAND

Primary Contaminant Source	Primary Source Release Mechanism	Secondary Source Medium	Secondary Release Mechanisms	Exposure Medium	Exposure Mechanism	Receptors										
						Current or Future Human Receptors					Current or Future Ecological Receptors					
						Military/ Civilian	Contractors/ Visitors	Construction Workers	Trespassers/ Recreational Users	Future Residents	Terrestrial Vertebrates	Terrestrial Invertebrates	Aquatic Invertebrates	Benthic Invertebrates	Terrestrial Plants	Amphibians and Reptiles
AOC 31 Building 259 (Detonator Production/ Storehouse)	Historical Spills/Release onto Ground Surface	Soil	Infiltration/ Leaching to Subsurface Soil and Groundwater	Groundwater	Ingestion of Groundwater	○	○	●	○	●	○	○	○	○	○	○
					Direct Contact/Uptake	○	○	●	○	●	○	○	○	○	○	○
					Inhalation (Vapor)	○	○	○	○	○	○	○	○	○	○	○
				Subsurface Soil (>2 foot)	Ingestion of Soil	○	○	●	○	●	○	○	○	○	○	○
					Direct Contact/Uptake	○	○	●	○	●	○	○	○	○	○	○
					Inhalation (Dust)	○	○	●	○	●	○	○	○	○	○	○
			Erosion of Surface Soil	Surface Soil (<2 foot)	Ingestion of Soil	●	●	●	●	●	●	●	○	○	○	●
					Direct Contact/Uptake	●	●	●	●	●	●	●	○	○	●	●
					Inhalation (Dust)	●	●	●	●	●	○	○	○	○	○	○
					Biouptake/Food Ingestion	○	○	○	○	○	●	●	○	○	○	●

●	Potentially Complete Pathway
○	Incomplete Pathway

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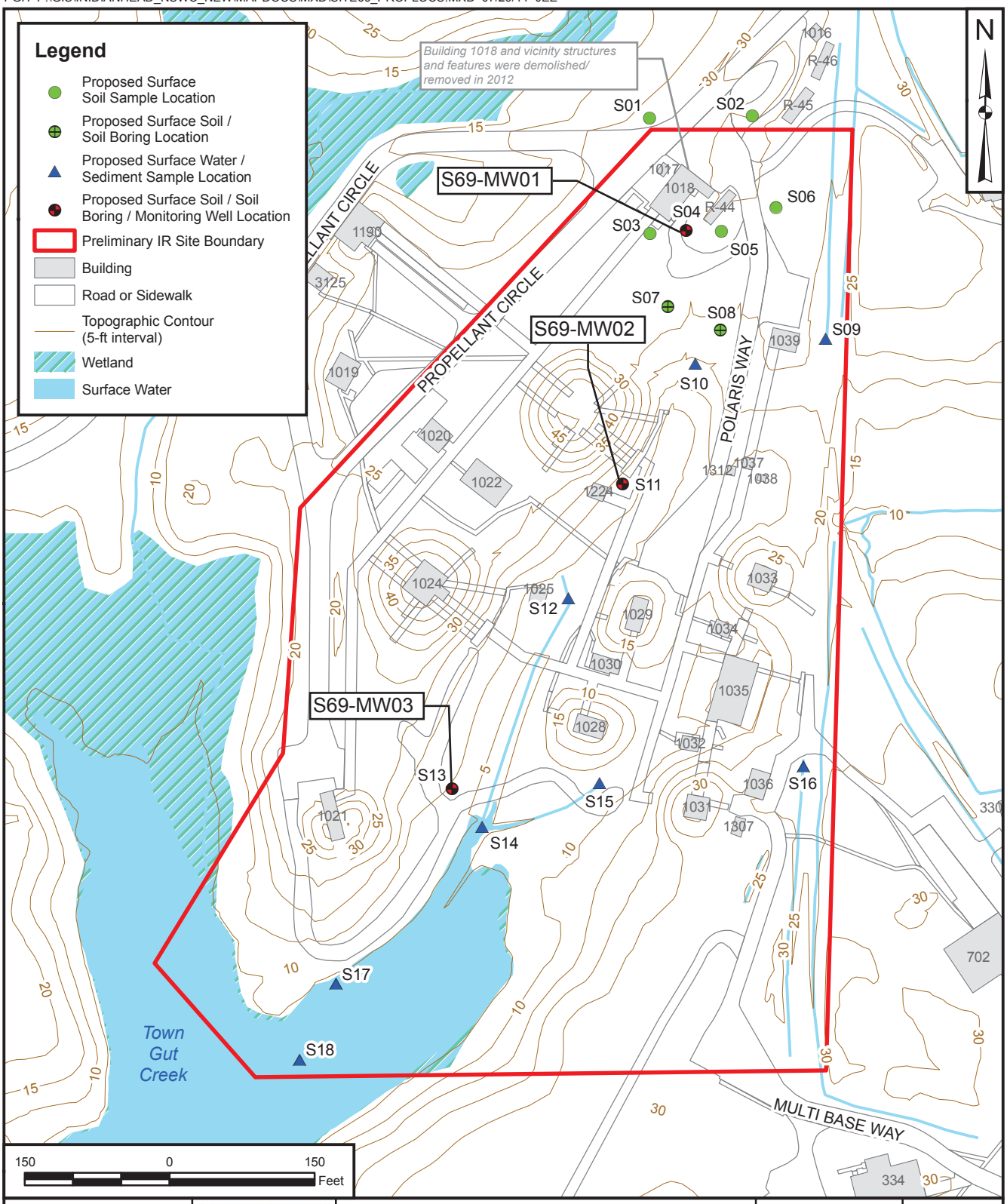

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SITE 69 PROPOSED SAMPLE LOCATIONS
SITE SCREENING PROCESS WORK PLAN
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

CONTRACT NUMBER	CTO NUMBER
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FIGURE NO. FIGURE 7A	REV 0

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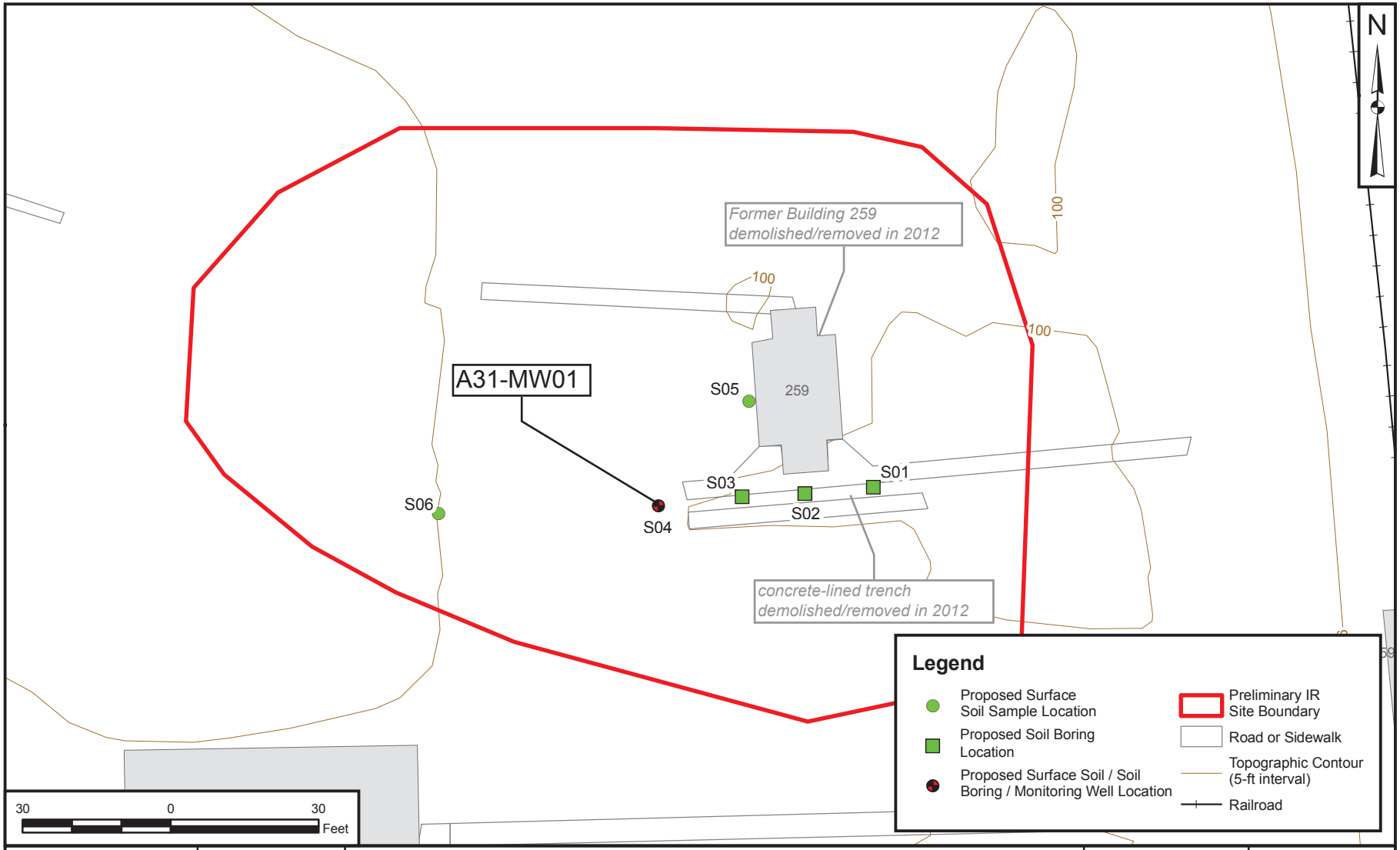

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NAVFAC

AOC 31 PROPOSED SAMPLE LOCATIONS
SITE SCREENING PROCESS WORK PLAN
NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

CONTRACT NUMBER	CTO NUMBER
03488	JU14
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FIGURE NO.	REV
FIGURE 7B	1

Appendix A

Supporting Information / Historical Documents

Redacted for inclusion as appendix
of environmental restoration investigation
work plan.

SEVERN TRENT STL

ANALYTICAL REPORT

Job Number: 680-20135-1

Job Description: NDW Perchlorate 090-25

For:
AH Environmental
804 Omni Blvd.
Suite 201
Newport News, VA 23606

Attention: Zeina Hinedi

Abbie Page
Project Manager I
apage@stl-inc.com

09/20/2006
Revision: 2

Project Manager: Abbie Page

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory. All questions regarding this report should be directed to the STL Project Manager who signed this report.

Severn Trent Laboratories, Inc.
STL Savannah 5102 LaRoche Avenue, Savannah, GA 31404
Tel (912) 354-7858 Fax (912) 351-3673 www.stl-inc.com

nelac

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METHOD / ANALYST SUMMARY

Client: AH Environmental

Job Number: 680-20135-1

Method	Analyst	Analyst ID
EPA 332.0	Salter, Bruce	BS

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SAMPLE SUMMARY

Client: AH Environmental

Job Number: 680-20135-1

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
680-20135-9	Bldg 1018	Wastewater	09/12/2006 1040	09/13/2006 0935

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Client: AH Environmental

Job Number: 680-20135-1

General Chemistry

Client Sample ID: Bldg 1018

Lab Sample ID: 680-20135-9
Client Matrix: Wastewater

Date Sampled: 09/12/2006 1040
Date Received: 09/13/2006 0935

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Perchlorate	110		ug/L	0.20	0.60	3.0	332.0

Anly Batch: 680-55324 Date Analyzed 09/18/2006 1858

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SOIL/WATER SAMPLING REPORT

Building 1018
Naval Support Facility
Indian Head, Maryland

Prepared for:

Eastern Research Group, Inc.
14555 Avion Parkway, Suite 200
Chantilly, Virginia 20151

January 20, 2011

Prepared by:

Timothy J. Baker, P.G.
Division Manager
Environmental Services

Signature

Applied Environmental, Inc.
Project Number 1937-10-0289

SOIL/WATER SAMPLING REPORT

Building 1018
Naval Support Facility
Indian Head, Maryland

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2.0	INTRODUCTION	2
3.0	SAMPLING ACTIVITIES	3
4.0	RESULTS	5
5.0	CONCLUSIONS	9
6.0	RECOMMENDATIONS	10

FIGURE

Figure 1 Sample Location Plan

TABLES

Table 1 Summary of Soil Analytical Results
Table 2 Summary of Water Analytical Results

APPENDICES

Appendix A Daily Field Notes
Appendix B Photographs
Appendix C Laboratory Analytical Reports and Chain of Custody Forms

SOIL/WATER SAMPLING REPORT

Building 1018
Naval Support Facility
Indian Head, Maryland

1.0 EXECUTIVE SUMMARY

Applied Environmental, Inc. was contracted by Eastern Research Group, Inc. (ERG) to provide environmental services at Naval Support Facility (NSF) Indian Head, Indian Head, Maryland. Analyses of potentially contaminated media near Building 1018 were required in order to characterize the type and degree of contamination that could be encountered during demolition activities and site restoration. The primary objective of the sampling and analyses activities was to generate data that will be used to prepare health and safety protocols for onsite workers during building demolition activities. In addition, the information may be used in the future to document baseline contaminant levels for preliminary assessment and site investigation studies.

This investigation consisted of the collection and analyses of surface and subsurface soil samples at five locations surrounding Building 1018, and one water sample from within a catch basin associated with a hydraulic lift near the southern corner of the building. The field sampling activities were conducted on October 27, 2010. Primary contaminants of concern include perchlorate and heavy metals.

Based on the laboratory analytical report, perchlorates were detected in the soil samples at concentrations ranging from below the limit of quantitation (LOQ) to 14,000 micrograms per kilogram (µg/kg), with the highest concentrations encountered from four to five feet below ground surface (BGS) in the borings. These perchlorate levels do not exceed the Maryland Department of the Environment (MDE) Non-Residential Cleanup Standard of 72,000 µg/kg. Therefore, it does not appear that perchlorate concentrations in soil warrant remedial actions at the site based on the results of this sampling effort.

Perchlorate was detected in the water sample collected from the hydraulic lift pit at 620 micrograms per liter (µg/L). The concentration of perchlorate in the water sample exceeds both the state groundwater cleanup standard and the federal Preliminary Remediation Goal (PRG). Due to the levels of perchlorate detected, the water present in the hydraulic lift pit should be containerized for proper disposal or treatment at the time of building demolition. The water should not be discharged on-site, due to the potential of adversely impacting surface water and groundwater quality.

Arsenic was detected in all soil samples at concentrations ranging from 1.9 to 15.5 milligrams per kilogram (mg/kg), exceeding both state cleanup standards and federal screening levels for industrial soil. These arsenic concentrations may be representative of background concentrations in the area of the site but exceed the regional reference level of 3.6 mg/kg in six of the ten samples analyzed. Alternatively, these arsenic levels may be indicative of the presence of contamination from past operations at the site. No other metals were reported above the relevant criteria in the soil samples. Barium was the only Resource Conservation and Recovery Act (RCRA) metal detected above the method reporting limit in the water sample at a concentration of 9.5 µg/L, well below relevant standards.

Onsite workers should be protected from contact with the soil and dust during demolition activities due to the potential for exposure to levels of arsenic above current criteria. Additionally, due to the presence of perchlorate in soils, it may be appropriate to review worker protection procedures to prevent unnecessary exposures during demolition activities.

2.0 INTRODUCTION

The Navy intends to demolish Building 1018, the Oxidizer Process Building, at NSF Indian Head under demolition project DE09-2723. Building 1018 has the potential for environmental contamination due to historical operations. Specifically, this building had been used for the grinding of ammonium perchlorate and potassium perchlorate into powder form, and rinse water from the interior was historically released into the soil surrounding the building. Additional contamination may have occurred during handling of

perchlorate compounds around the loading dock. Operations at Building 1018 have been permanently discontinued.

This sampling program was conducted by Applied Environmental, Inc. under the supervision of the Public Works Department of Naval Facilities Engineering Command Washington (NAVFAC Washington) and the Naval Surface Warfare Center, Indian Head Division (NSWC IHD). Project requirements, including sampling locations, were identified in the final Scope of Work (SOW) for the project dated September 27, 2010 and prepared by ERG. Five soil sampling locations and one water sampling location were identified in the SOW. The sampling locations to determine the level of contamination present in areas surrounding Building 1018 were chosen by Navy personnel based on historical operations and site activities.

The work has been performed in accordance with the approved project plans, including the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP), dated October 26, 2010, prepared by Applied Environmental. Analytical procedures were conducted to comply with the Department of Defense (DOD) *Quality Systems Manual for Environmental Laboratories, Version 4.1* (QSM). This report has been prepared to present the results of the soil and water sampling activities conducted by Applied Environmental and to provide appropriate conclusions and recommendations based on these data.

3.0 SAMPLING ACTIVITIES

A site visit was conducted on October 7, 2010 to inspect each sampling location as identified in the SOW. Sampling locations were identified, agreed upon, and marked by Applied Environmental, ERG, and NAVFAC personnel at that time. Underground utilities in the vicinity of the soil sampling locations were marked and cleared by Utilities Search, Inc. of Manassas, Virginia, on October 22, 2010 in advance of the sampling activities. It was necessary to make minor adjustments to the soil boring locations identified in the SOW in order to safely avoid grounding wires, water lines, and other buried utility lines.

The sampling activities were performed on October 27, 2010, from approximately 10:00 to 16:00. Temperatures were roughly 70° to 75° F on the day of sampling, with intermittent rain showers. Geoprobe sampling was conducted by Green Services, Inc. of Bel Air, Maryland. A truck mounted Geoprobe direct push unit was used to install the five soil borings to a depth of approximately five feet BGS at locations surrounding Building 1018. The soil boring locations, identified as S-1 through S-5, are shown on Figure 1.

Continuous soil sampling was performed at each location by driving a sampler through the target interval. Soil cores entered the samplers, which contained four-foot dedicated Polyvinyl Chloride (PVC) liners. The PVC liners containing the core samples were removed from the samplers for examination and sample collection. At some sampling locations, it was possible to sample to five feet BGS using one four foot sampler due to compaction of the materials within the sampler, particularly the surficial organic soils. If necessary, a second run using another sampler was conducted in order to reach the required total depth. The tips of the sampling devices were decontaminated prior to coring each sampling interval. A copy of the field notes is included in Appendix A. Photographs of the sampling activities are included in Appendix B.

Surface soil samples were collected from 0.5' to 1.0' BGS at each boring location. A second sample was also collected from each boring at the depth of the water table, as indicated by saturated conditions, or at the total depth of the borehole. Samples were collected using dedicated disposable nitrile gloves and placed directly into the sample containers. Each soil sample was identified with a unique sample number consisting of the boring number followed by "A" or "B" to designate surface or subsurface samples, respectively. Following sample collection activities, each of the soil boreholes was backfilled with the remaining soil cores and sealed to ground surface with bentonite chips.

The water sample, identified as W-1, was collected from the pit beneath the hydraulic lift at the site as shown on Figure 1 using a dedicated container. The water sample was collected by pouring directly into the appropriate sample containers.

All samples were collected for analyses of perchlorate by EPA Method 6850 and total RCRA metals. The metal samples were analyzed by EPA Method 6020, with the exception of mercury analyses, which was conducted using EPA methods 7471A (Soil) and 7470A (Water). All samples were placed into appropriate laboratory-supplied containers, properly labeled, and preserved as necessary, in accordance with the techniques specified in the approved SAP. Water samples for perchlorate analyses by Method 6850 were filtered in the field at the time of collection using dedicated laboratory-supplied sterile filtering kits and containers, as required.

One field duplicate sample for both soil and water was collected during the sampling event. For soil, sample S-2B was selected as the field duplicate. A separate aliquot, identified as S-2C, was prepared for analysis for each parameter. Water sample W-2 was collected as the field duplicate from the hydraulic lift pit. A field blank sample, W-3, was also prepared using laboratory-supplied deionized water. One matrix spike/matrix spike duplicate sample for both soil and water was also collected during the sampling activities for laboratory QA/QC analyses for each parameter.

The samples were submitted to Phase Separation Science, Inc. (PSS) of Baltimore, Maryland, by private courier under strict chain of custody procedures. PSS provided local consultation and laboratory coordination services for this project. Test America performed the laboratory analyses for this project in accordance with the current version of the DOD QSM.

4.0 RESULTS

In general, the soil cores consisted of layers of fine grained sand and clayey sand, silt, and mottled silty clay characteristic of natural undisturbed deposits. A thin veneer of dark organic topsoil was present at the surface to about 0.5' BGS in most of the borings. No unusual odors, evidence of staining, or indication of buried debris were reported during the soil boring activities. The water in the hydraulic lift pit appeared to be clear with no sheens or odors. Tadpoles and crayfish were observed in the pit at the time of sample collection.

The laboratory analytical results for the soil and water samples are summarized in Tables 1 and 2, respectively. Regulatory cleanup standards and screening levels are also included on each table for comparison. The laboratory analytical reports and chain-of-custody forms are included in Appendix C for reference.

For soils, these data are compared to the MDE Non-Residential Cleanup Standards and the EPA Region 3 Regional Screening Level (RSL) for Industrial Properties. The MDE standards are generic numeric values considered protective of public health. These Non-Residential Standards for soil apply to cleanup or remedial actions performed at industrial or commercial properties in Maryland under the Voluntary Cleanup Program or State Superfund Program [State of Maryland, Department of the Environment, *Cleanup Standards for Soil and Groundwater*, Interim Final Guidance (Update No. 2.1), June 2008]. The EPA Region 3 RSLs for Industrial Soil represent default generic values considered protective of human health for application at hazardous waste sites. The RSLs are intended for use during the initial site scoping process to determine if further assessment or cleanup may be required at a site. The RSLs are not to be used as cleanup standards; cleanup standards at hazardous waste sites are developed based on the results of a site-specific baseline risk assessment [Mid-Atlantic Risk Assessment, *User's Guide (November 2010)*, EPA Region 3].

The water analytical data are compared to the current MDE Groundwater Standards and the EPA Maximum Contaminant Levels (MCL). The MDE standards are generic numeric cleanup levels applicable to groundwater in aquifers and in groundwater use areas that serve, or may potentially serve in the future, as a potable water supply (MDE, 2008). EPA MCLs are legally enforceable standards under the National Primary Drinking Water Regulations established to protect public health by limiting the levels of contaminants in drinking water. The MCL represents the maximum permissible level of a contaminant in water delivered by a public water system (40 CFR, Part 141, National Primary Drinking Water Regulations).

In the case of perchlorate in water, a PRG has been established by the EPA in lieu of an MCL. The EPA PRG for perchlorate in water of 15 µg/L is based on an Interim Health Advisory. The PRG, which is recommended for site-specific cleanup goals, is based on levels to which human populations may be exposed without adverse effects. This recommended level has been established for the protection of groundwater resources where there may be a drinking water exposure pathway (Memorandum, EPA, Office of Solid Waste and Emergency Response, Subject: Revised Assessment Guidance for Perchlorate, January 8, 2009).

Analytical results for each group of compounds are presented below:

Perchlorate

Based on the laboratory analytical report, perchlorates were detected in the soil samples at concentrations ranging from below the LOQ to 14,000 micrograms per kilogram (µg/kg) as shown in Table 1. The highest concentrations were encountered from 4.0' to 4.5' feet BGS in sample S-1B (9,600 µg/kg), and from 4.5' to 5.0' in sample S-4B (14,000 µg/kg). Duplicate samples collected from 1.5' to 2.5' in boring S-2 yielded slightly varying concentrations of perchlorate (estimated concentration of 0.61 µg/kg versus 11 µg/kg for samples S-2B and S-2C, respectively), likely due to the heterogeneity of the soil samples. The perchlorate concentrations reported in the soil samples are well below both the MDE Non-Residential Cleanup Standards, and the EPA Region 3 Industrial RSL as shown in Table 1.

Perchlorate was detected in the water sample W-1 collected from the hydraulic lift pit at a concentration of 620 micrograms per liter (µg/L) as shown in Table 2. A concentration of 630 µg/L was reported for the duplicate sample, W-2, indicating reliable sampling techniques and data. These concentrations reported in the water samples exceed the MDE Groundwater Standard of 2.6 µg/L and the EPA PRG of 15 µg/L.

Based on the laboratory analytical report, perchlorate was not detected at the LOQ in the field blank sample W-3, indicating that cross contamination of samples did not appear to have occurred during the sampling event.

RCRA Metals

As indicated in Table 1, all of the RCRA metals, with the exception of silver, were detected at relatively low levels above the laboratory LOQ in soil samples collected from the borings. Of these, only arsenic, detected in all of the soil samples at concentrations ranging from 1.9 to 15.5 mg/kg, exceeds both MDE Non-Residential Cleanup Standard of 1.9 mg/kg, and the EPA Region 3 Industrial RSL of 1.6 mg/kg. The Anticipated Typical Concentration (ATC), which represents a background reference level, for arsenic in soils of eastern Maryland is 3.6 mg/kg (MDE, 2008). Arsenic concentrations in six of the ten samples analyzed from the site exceeded the ATC for this region of Maryland.

Barium was detected in all soil samples at concentrations ranging from 12.9 to 55.0 mg/kg, cadmium from 0.22 to 0.40 mg/kg, chromium from 6.6 to 22.2 mg/kg, and lead from 7.7 to 39.2 mg/kg as shown in Table 1. Mercury was reported slightly above the LOQ in two samples, with a maximum concentration of 0.17 mg/kg; selenium was detected in eight samples above the LOQ, ranging from 0.34 to 1.1 mg/kg. Silver was not reported above the LOQ in any of the soil samples. None of these levels were found to exceed the relevant standards or screening levels as shown in Table 1. Although an MDE soil standard does not exist for elemental mercury, the concentrations detected do not exceed the ATC of 0.51 mg/kg for mercury in eastern Maryland.

With the exception of arsenic, the metal concentrations reported in the duplicate soil samples collected from boring S-2 were very similar. As with the perchlorate results, the duplicate samples yielded slightly varying concentrations of arsenic (6.4 mg/kg versus 15.5 mg/kg for samples S-2B and S-2C, respectively), likely due to the heterogeneity of the soil samples.

Barium was the only RCRA metal detected above the LOQ in water sample W-1 collected from the hydraulic lift pit. Barium was reported at a concentration of 9.5 µg/L in the water sample, as indicated in Table 2. As with the perchlorate data, similar results for RCRA metals were reported for the duplicate sample, W-2, indicating reliable sampling techniques and data. The concentrations of RCRA metals reported in the water samples are all below the MDE Groundwater Standards and the EPA MCLs for metals, as listed in Table 2.

Barium was present in the laboratory blank sample at an estimated concentration of 0.79 µg/L; this low level detection is not considered significant and does not adversely affect the reliability of the data. Based on the laboratory analytical report, none of the RCRA metals were detected at the LOQ in field blank sample W-3, indicating that these sampling data are reliable.

5.0 CONCLUSIONS

Applied Environmental has conducted sampling of soil from five Geoprobe borings and water from within the hydraulic lift pit at Building 1018, NSF Indian Head, Maryland. All samples were submitted to Test America for analyses of perchlorate and total RCRA metal concentrations in accordance with DOD QSM protocols. Based on the laboratory results for the duplicate samples and the field blank these data appear to be reliable. Although barium was reported in the laboratory blank sample for water, it was at a very low concentration below the reporting limit and is not considered significant. Based on the field sampling activities, there were no unusual odors, visual observations such as staining or sheens that would indicate the presence of contamination by fuels or other volatile constituents, or any buried debris identified in the soil borings.

These analytical data have been compared to state and federal standards and screening levels for industrial properties. For soils, perchlorate was detected at up to 14,000 µg/kg, well below the MDE Non-Residential Cleanup Standard of 72,000 µg/kg. Therefore, it does not appear that perchlorate concentrations in soil warrant remedial actions at the site based on the results of this sampling effort.

Arsenic, detected in all soil samples at concentrations ranging from 1.9 to 15.5 mg/kg, is the only RCRA metal reported by the laboratory to exceed the current MDE standards and EPA RSLs for soils. No other metals were reported above the relevant criteria in the soil samples.

The average concentration for arsenic in the conterminous United States is 7.2 mg/kg, as determined by the U.S. Geological Survey and provided in the 2008 MDE guidance document. The average arsenic concentration for the site is 5.9 mg/kg, based on the sampling results. Concentrations in six of the ten samples analyzed from the site exceeded the ATC of 3.6 mg/kg for arsenic in eastern Maryland. The ATC is considered to be a reference level for background concentrations in the area. Although the levels of arsenic detected at the site may be representative of background concentrations in the area, they appear to be slightly elevated over regional reference level data. Therefore, these arsenic levels may be indicative of the presence of contamination from past operations at the site.

Based on the results of the water sampling, perchlorate concentrations exceed the MDE Groundwater Standard and the EPA PRG. Since these standards have been established for the protection of groundwater resources where there may be a drinking water exposure pathway, they may not be entirely relevant to the water contained in the hydraulic lift pit at the site. However, if the water were released from the pit, it would have the potential to impact surface water and groundwater quality in the area due to the levels of perchlorate present.

Based on the sample results, the levels of the eight RCRA metals in the water do not present a concern. All concentrations in the water samples were significantly below the standards.

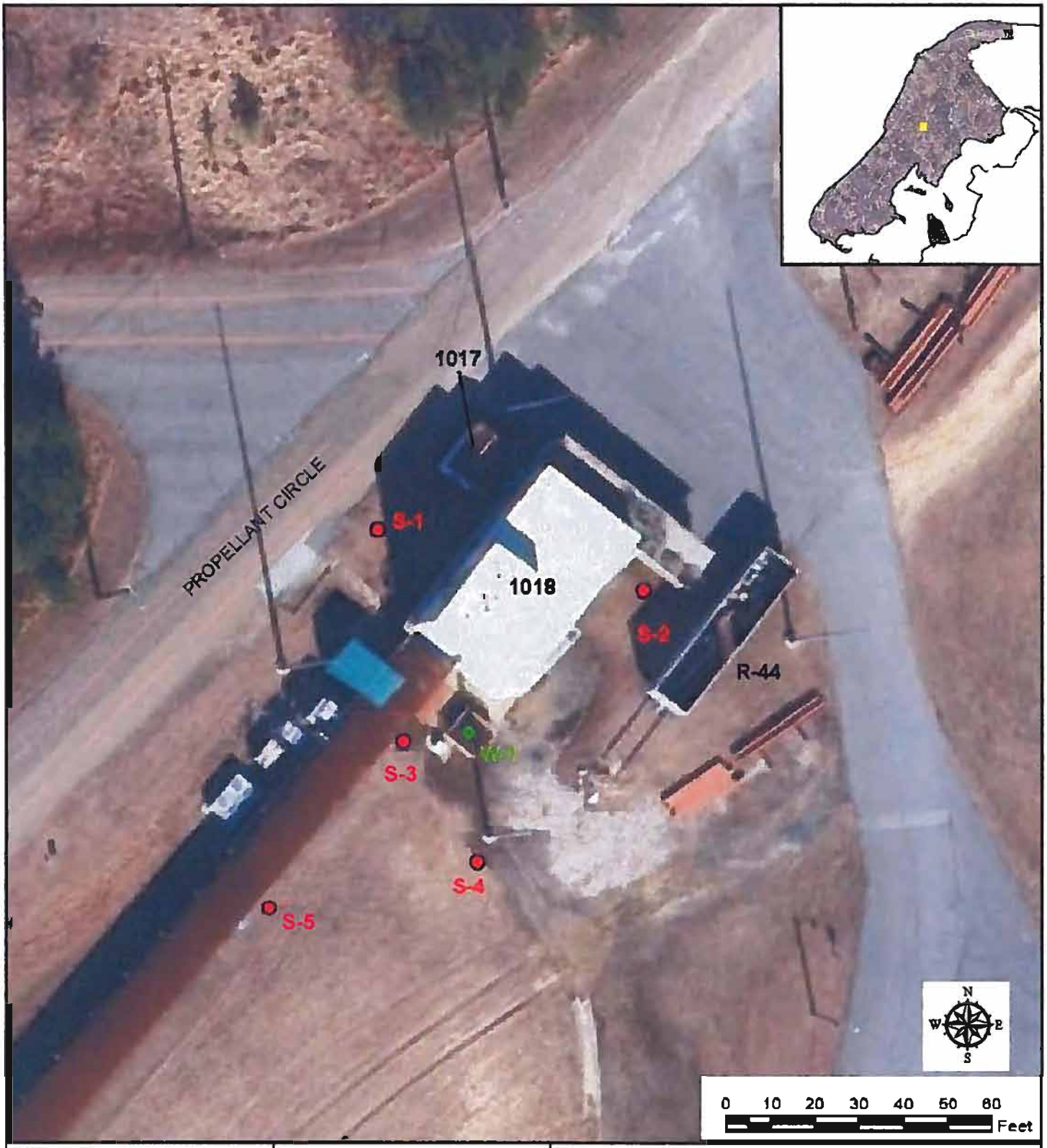
6.0 RECOMMENDATIONS

Arsenic in soil, at concentrations slightly above the regional reference level, appears to be ubiquitous at the site. The protection of on-site workers, and any nearby populations, from contact with the soil and dust during demolition activities is recommended during the project due to the potential for exposure to levels of

arsenic above current standards. In addition, although perchlorate concentrations in soils were not found to exceed current criteria for industrial cleanup, it may be appropriate to review worker protection procedures to prevent unnecessary exposures during site excavation and demolition activities.

Due to the levels of perchlorate detected in the water sample, the water present in the hydraulic lift pit should be containerized for proper disposal or treatment at the time of building demolition. The water should not be discharged on-site, due to the potential to adversely impact surface water and groundwater quality. Following demolition of the unit, an additional subsurface investigation may be warranted to determine if perchlorate impacts have occurred due to overflowing or leakage through cracks in the concrete containment pit.

FIGURE



Legend

- Soil Boring Locations
- Water Sample Location

applied environmental inc.

200 Fairbrook Dr., Suite 201, Herndon, VA 20170

FIGURE 1

SAMPLE LOCATION PLAN

BUILDING 1018
NAVAL SUPPORT FACILITY
INDIAN HEAD, MARYLAND

DRAWN BY	DATE
OAB	JANUARY 20, 2011

PROJECT NO.: 1937-10-0289

TABLES

Table 1
Summary of Soil Analytical Results

SOIL/WATER SAMPLING REPORT

Building 1018
Naval Support Facility
Indian Head, Maryland

	Results											Standards	
Sample ID/Depth / Parameter	S-1A 0.5'-1.0' bgs	S-1B 4.0'-4.5' bgs	S-2A 0.5'-1.0' bgs	S-2B 1.5'-2.5' bgs	S-2C 1.5'-2.5' bgs (Dup. of "B")	S-3A 0.5'-1.0' bgs	S-3B 2.5'-3.0' bgs	S-4A 0.5'-1.0' bgs	S-4B 4.5'-5.0' bgs	S-5A 0.5'-1.0' bgs	S-5B 4.5'-5.0' bgs	MDE Non-Residential Cleanup Standard	EPA Region 3 Industrial Soil RSL
Perchlorate (µg/kg)	0.48[U]	**9,600**	**220**	0.61[J]	**11**	4.0[J]	**31**	**30**	**14,000**	1.8[J]	**230**	72,000	720,000
RCRA Metals (mg/kg)													
Arsenic	3.7	**5.1**	**5.4**	**6.4**	**15.5**	**7.5**	**3.1**	**2.3**	**2.3**	**11.2**	**1.9**	1.9 (3.6*)	1.6
Barium	**52.8**	**38.9**	**36.0**	**52.0**	**44.3**	**12.9**	**26.9**	**42.2**	**55.0**	**47.7**	**44.3**	20,000	190,000
Cadmium	**0.36**	**0.34**	**0.33**	**0.27**	**0.31**	**0.29**	**0.22**	**0.34**	**0.38**	**0.40**	**0.32**	51	800
Chromium	**18.1**	**20.6**	**20.9**	**17.3**	**18.8**	**6.6**	**13.5**	**16.8**	**22.2**	**20.2**	**19.5**	310	N/A
Lead	**10.6**	**11.4**	**14.9**	**7.8**	**8.4**	**39.2**	**7.7**	**9.4**	**12.9**	**20.0**	**11.0**	1,000	800
Mercury	0.036[J]	0.035[J]	**0.082**	0.022[J]	0.025[J]	0.013[U]	0.026[J]	0.018[J]	0.015[U]	**0.17**	0.014[U]	N/A (0.51*)	34
Selenium	**0.48**	**0.49**	**0.38**	**0.40**	**0.50**	0.22[U]	0.12[J]	**0.34**	**0.79**	**0.46**	**1.1**	510	5,100
Silver	0.065[J]	0.084[J]	0.076[J]	0.057[J]	0.068[J]	0.056[U]	0.052[J]	0.090[J]	0.083[J]	0.065[J]	0.065[J]	510	5,100

Notes:

Samples collected on October 27, 2010.

mg/kg = Milligrams per Kilogram

µg/kg = Micrograms per Kilogram

bgs = Below Ground Surface

N/A = Not Available

RSL = Regional Screening Level

U = Undetected

J = Estimated result less than reporting limit.

Concentrations in bold exceed method reporting limit.

Shaded concentrations exceed standards.

* = Eastern Maryland Anticipated Typical Concentration (ATC).

January 20, 2011
Project Number 1937-10-0289

Table 2
Summary of Water Analytical Results

SOIL/WATER SAMPLING REPORT

Building 1018
Naval Support Facility
Indian Head, Maryland

	Results			Standards	
Sample ID/Depth / Parameter	W-1	W-2 (Duplicate of W-1)	W-3 Field Blank	MDE Groundwater Standard	MCL/PRG
Perchlorate (µg/L)	**620**	**630**	0.25^{U}	2.6	15*
RCRA Metals (µg/L)					
Arsenic	2.0^{U}	1.1^{J}	2.0^{U}	10	10
Barium	**9.5^{B}**	**9.2^{B}**	1.0^{U}	2,000	2,000
Cadmium	0.50^{U}	0.50^{U}	0.50^{U}	5	5
Chromium	4.0^{U}	4.0^{U}	4.0^{U}	100	100
Lead	1.4^{J}	1.3^{J}	1.0^{U}	15	15
Mercury	0.10^{U}	0.10^{U}	0.10^{U}	2	2
Selenium	2.5^{U}	2.5^{U}	2.5^{U}	50	50
Silver	0.50^{U}	0.50^{U}	0.50^{U}	100	N/A

Notes:

Samples collected on October 27, 2010.

µg/L = Micrograms per Liter

N/A = Not Available

MCL = EPA Maximum Contaminant Level

Concentrations in bold exceed method reporting limit.

U = Undetected

J = Estimated result less than reporting limit.

B = Method blank contamination. Analyte detected at a reportable level in blank.

Shaded concentrations exceed standards.

* - EPA Preliminary Remediation Goal (PRG) for perchlorate established January 8, 2009.

January 20, 2011
Project Number 1937-10-0289

APPENDIX A

DAILY FIELD NOTES

INDIAN HEAD BUILDING 1018 10/27/10
GEOPROBE SOIL SAMPLING

13:40 S-2 A 0.5 - 1.0

1345 S-2B 1.5 - 2.5
1350 S-2C DUPLICATE OF "B"

2.5'
CLAYEY SAND TO 3'
FINE LT GRAY SAND TO 5'

14:05 S-4 A 0.5 - 1.0

14:10 (3 rolls) S-4 B 4.5 - 5.0
MS, MSD

DK GRAY SILT TO 1'
LT BROWN SANDY SILT TO 2'
LT GRAY TAN BROWN CLAYEY SILT TO 4'
TAN & BROWN MOTTLED TO 5

S-5
BROWN GRAY FINE SAND TO 2'
LT GRAY SILTY CLAY TO 5'

S-5 A 0.5 - 1.0' 14:30

S-5 B 4.5 - 5.0 14:35

S-3 + GRAVEL
BROWN FINE SAND TO 3.0'
LT GRAY BROWN SILTY CLAY TO 5'

S-3A 0.5 - 1.0' 14:45

S-3B 2.5 - 3.0' 14:50
IN BROWN SAND

S-1
GRAY SILT + TOPSOIL TO 2'
BROWN FINE SAND TO 4'
BROWN MOTTLED GRAY TAN
CLAY TO 5'

S-1A 0.5 - 1.0' 15:00
S-1B 4.0-4.5 - 15:05

ALL SAMPLE CORES PLACED BACK
INTO BORINGS AND TOPPED WITH
BENTONITE CHIPS.

WEATHER TODAY: 70 - 75°
INTERMITTENT HEAVY RAIN

ALL SOIL SAMPLES COLLECTED FOR
PERCHLORATE (6850) AND RCRA METALS
ANALYSES. PLACED ON ICE IN
COOLER.

WATER SAMPLES COLLECTED FROM
PIT UNDER HYDRAULIC LIFT AT
BLD. 1018. WATER APPEARS CLEAR
W/ TADPOLES + CRAWFISH PRESENT.

SAMPLES COLLECTED W/ NEW DEDICATED
1-LITER HDPE BOTTLE.

10:50 W-1
W-1 MS
W-1 MSD

10:55 W-2 (DUPLICATE)

11:30 W-3 FIELD BLANK
COLLECTED USING NEW HDPE CONTAINER

ALL WATER SAMPLES TO BE ANALYZED
FOR PERCHLORATES (6850) AND
RCRA METALS. SAMPLES FOR
PERCHLORATES FIELD FILTERED (0.2 MM)
FILTER KITS, STERILE BOTTLES.

15:45 BLD 1018 SAMPLING COMPLETE. WILL
SEND SAMPLES TO LAB TOMORROW.
LEAVE SITE.

APPENDIX B

PHOTOGRAPHS

Photograph 1. View toward the northwest showing the hydraulic lift and associated pit containing surface water.

Photograph 2. View of the water within the hydraulic lift pit. Water samples W-1 and W-2 (field duplicate) were collected near the center of the containment area, from just below the surface.

Photograph 3. Photograph looking north showing Geoprobe soil sampling activities at Boring S-1 on the northwest side of Building 1018.

Photograph 4. Photograph of the soil core in the PVC sample sleeve taken at Boring S-1. The top of the core is to the left in the photo. Sample S-1B collected from 4.0' to 4.5' in clay yielded a perchlorate concentration of 9,600 µg/kg.

Photograph 5. View of the Geoprobe direct-push unit sampling at boring S-4 south of Building 1018. Note buried utility lines marked in the foreground.

Photograph 6. Photograph of the Geoprobe rig sampling at Boring S-5 adjacent to the covered walkway.

APPENDIX C

LABORATORY ANALYTICAL REPORTS AND CHAIN OF CUSTODY FORMS

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

November 23, 2010

TestAmerica Project Number: G0K020530
PO/Contract:

John Slowikowski
Phase Separation Sciences
6630 Baltimore National Pike
Route 40 West
Baltimore, MD 21228

Dear Mr. Slowikowski,

This report contains the analytical results for the samples received under chain of custody by TestAmerica on October 29, 2010. These samples are associated with your 1937-10-0289 project.

The test results in this report meet all NELAC requirements for parameters that accreditation is required or available. Any exceptions to NELAC requirements are noted in the case narrative. The case narrative is an integral part of this report.

If you have any questions, please feel free to call me at (916) 374-4384.

Sincerely,

Karen Dahl
Project Manager

Table of Contents

TestAmerica West Sacramento Project Number G0K020530

Case Narrative

Quality Assurance Program

Sample Description Information

Chain of Custody Documentation

WATER, 6850/DOD Handbook, Perchlorate
Samples: 1, 2, 3
- Sample Data Sheets
- Method Blank Report
- Laboratory QC Reports

SOLID, 6850/DOD Handbook, Perchlorate
Samples: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
- Sample Data Sheets
- Method Blank Report
- Laboratory QC Reports

Metals - Various Methods
Samples: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
- Sample Data Sheets
- Method Blank Report
- Laboratory QC Reports

SOLID, D 2216-90, Percent Moisture
Samples: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
- Sample Data Sheets
- Laboratory QC Reports

Full Raw Data Package

Case Narrative

TestAmerica West Sacramento Project Number G0K020530

General Comments
As requested, the samples listed on chain of custody (1/2) were analyzed for perchlorate by 6850 and for RCRA metals.

WATER, 6850/DOD Handbook, Perchlorate
Samples: 1, 2, 3
In accordance with the requirements of Method 6850, both a Laboratory Control Sample (LCS) and a Synthetic Matrix Check Sample (SMCS) were analyzed with the associated samples. Both are reported on the LCS data evaluation and recovery reports, and are differentiated from one another by their workorder number:

LCS: L9RPG1AC
SMCS: L9RPG1AD

Samples: 1, 2, 3
The matrix spikes, which were performed on sample 1, were diluted out.

Samples: 1, 2
The isotopic ion ratio in the closing Limit of Detection Verification standard analyzed on November 17, 2010 failed low for Perchlorate. Since the associated sample results were either “ND” or were positive above the reporting limit, no corrective action was performed.

SOLID, 6850/DOD Handbook, Perchlorate
Samples: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
In accordance with the requirements of Method 6850, both a LCS and a SMCS were analyzed with the associated samples. Both are reported on the LCS data evaluation and recovery reports, and are differentiated from one another by their workorder number:

LCS: L9J9K1AC
SMCS: L9J9K1AD

Samples: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
The matrix spikes, which were performed on sample 12, were diluted out.

Case Narrative

TestAmerica West Sacramento Project Number G0K020530

SOLID, 6020, Metals
Samples: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
The matrix spikes, which were performed on sample 12, have several recoveries that are outside control limits due to possible matrix interferences. Since the laboratory control sample met acceptance criteria, no corrective action was performed.

There are no other anomalies associated with this project.

TestAmerica Laboratories West Sacramento Certifications/Accreditations

Certifying State	Certificate #	Certifying State	Certificate #
Alaska	UST-055	New York*	11666
Arizona	AZ0708	Oregon*	CA 200005
Arkansas	88-0691	Pennsylvania	68-1272
California*	01119CA	South Carolina	87014
Colorado	NA	Texas	T104704399-08-TX
Connecticut	PH-0691	Utah*	QUAN1
Florida*	E87570	Virginia	00178
Georgia	960	Washington	C1281
Hawaii	NA	West Virginia	9930C, 334
Illinois	200060	Wisconsin	998204680
Kansas*	E-10375	NFESC	NA
Louisiana*	30612	USACE	NA
Michigan	9947	USDA Foreign Plant	37-82605
Nevada	CA44	USDA Foreign Soil	P330-09-00055
New Jersey*	CA005	US Fish & Wildlife	LE148388-0
New Mexico	NA	Guam	09-014r

*NELAP accredited. A more detailed parameter list is available upon request. Updated 3/25/2009

QC Parameter Definitions

QC Batch: The QC batch consists of a set of up to 20 field samples that behave similarly (i.e., same matrix) and are processed using the same procedures, reagents, and standards at the same time.

Method Blank: An analytical control consisting of all reagents, which may include internal standards and surrogates, and is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background contamination.

Laboratory Control Sample and Laboratory Control Sample Duplicate (LCS/LCSD): An aliquot of blank matrix spiked with known amounts of representative target analytes. The LCS (and LCSD as required) is carried through the entire analytical process and is used to monitor the accuracy of the analytical process independent of potential matrix effects. If an LCSD is performed, it may also be used to evaluate the precision of the process.

Duplicate Sample (DU): Different aliquots of the same sample are analyzed to evaluate the precision of an analysis.

Surrogates: Organic compounds not expected to be detected in field samples, which behave similarly to target analytes. These are added to every sample within a batch at a known concentration to determine the efficiency of the sample preparation and analytical process.

Matrix Spike and Matrix Spike Duplicate (MS/MSD): An MS is an aliquot of a matrix fortified with known quantities of specific compounds and subjected to an entire analytical procedure in order to indicate the appropriateness of the method for a particular matrix. The percent recovery for the respective compound(s) is then calculated. The MSD is a second aliquot of the same matrix as the matrix spike, also spiked, in order to determine the precision of the method.

Isotope Dilution: For isotope dilution methods, isotopically labeled analogs (internal standards) of the native target analytes are spiked into the sample at time of extraction. These internal standards are used for quantitation, and monitor and correct for matrix effects. Since matrix effects on method performance can be judged by the recovery of these analogs, there is little added benefit of performing MS/MSD for these methods. MS/MSD are only performed for client or QAPP requirements.

Control Limits: The reported control limits are either based on laboratory historical data, method requirements, or project data quality objectives. The control limits represent the estimated uncertainty of the test results.

Sample Summary

TestAmerica West Sacramento Project Number G0K020530

WO#	Sample #	Client Sample ID	Sampling Date	Received Date
L9FW8	1	W-1	10/27/2010 10:50 AM	10/29/2010 09:05 AM
L9FXA	2	W-2	10/27/2010 10:55 AM	10/29/2010 09:05 AM
L9FXC	3	W-3	10/27/2010 11:30 AM	10/29/2010 09:05 AM
L9FXD	4	S-1A	10/27/2010 03:00 PM	10/29/2010 09:05 AM
L9FXE	5	S-1B	10/27/2010 03:05 PM	10/29/2010 09:05 AM
L9FXF	6	S-2A	10/27/2010 01:40 PM	10/29/2010 09:05 AM
L9FXG	7	S-2B	10/27/2010 01:45 PM	10/29/2010 09:05 AM
L9FXH	8	S-2C	10/27/2010 01:50 PM	10/29/2010 09:05 AM
L9FXJ	9	S-3A	10/27/2010 02:45 PM	10/29/2010 09:05 AM
L9FXL	10	S-3B	10/27/2010 02:50 PM	10/29/2010 09:05 AM
L9FXM	11	S-4A	10/27/2010 02:05 PM	10/29/2010 09:05 AM
L9FXN	12	S-4B	10/27/2010 02:10 PM	10/29/2010 09:05 AM
L9FXQ	13	S-5A	10/27/2010 02:30 PM	10/29/2010 09:05 AM
L9FXW	14	S-5B	10/27/2010 02:35 PM	10/29/2010 09:05 AM

Notes(s):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity, pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

G0K020530

[redacted]

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☒

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
PHASE SEPARATION SCIENCE, INC.	JOHN SLOWIKOWSKI	10/27/10	114462
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 2**
6630 BALTIMORE NATIONAL PIKE	410-747-8770/410-788-8723		

City	State	Zip Code	Site Contact	Lab Contact
BALTIMORE	MD	21228	TIM BAKER	

Project Name and Location (State)	Carrier/Waybill Number
INDIAN HEAD, MD BLD. 1018	

Contract/Purchase Order/Quote No.: PROJECT NO. 1937-10-0289

Analysis (Attach list if more space is needed)

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil		Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		Special Instructions/ Conditions of Receipt
S-4A	10/27/10	14:05				X		1							
S-4B		14:10				X		1							
S-4B MS		14:10				X		1							
S-4B MSD		14:10				X		1							
S-5A		14:30				X		1							
S-5B		14:35				X		1							

Possible Hazard Identification: ☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☒ 21 Days ☐ Other _____

QC Requirements (Specify): DOD - QSM PROCEDURES

1. Relinquished By: R. J. Baker of Applied Environmental	Date: 10/28/10	Time: 11:10	1. Received By: [signature]	Date: 10/28/10	Time: 11:10
2. Relinquished By: RON TORNOLLAN	Date: 10/28/10	Time: 12:30	2. Received By: Paul Gayland	Date: 10/28/10	Time: 12:30
3. Relinquished By: Paul Gayland	Date: 10/28/10	Time: 1230	3. Received By: [signature]	Date: 29 OCT 10	Time: 1045

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

G0K020530

[redacted]

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☒

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client: PHASE SEPARATION SCIENCE, INC.	Project Manager: JOHN SLOWIKOWSKI	Date: 10/27/10	Chain of Custody Number: 114463
Address: 6630 BALTIMORE NATIONAL PIKE	Telephone Number (Area Code)/Fax Number: 410-747-8770 / 410-788-8723	Lab Number	Page 2 of 2
City: BALTIMORE State: MD Zip Code: 21228	Site Contact: TIM BAKER	Lab Contact	
Project Name and Location (State): INDIAN HEAD, MD, BUILDING 1018	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.: PROJECT NO. 1937-10-0289			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil		Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		Analysis (Attach list if more space is needed): PERCHLORATE (6850)	RCRA METALS	Special Instructions/ Conditions of Receipt
W-1	10/27/10	10:50		X				1		1					X	X	
W-1MS		10:50		X				1		1					X	X	
W-1MSD		10:50		X				1		1					X	X	
W-2		10:55		X				1		1					X	X	
W-3		11:30		X				1		1					X	X	
S-1A		15:00				X		1							X	X	
S-1B		15:05				X		1							X	X	
S-2A		13:40				X		1							X	X	
S-2B		13:45				X		1							X	X	
S-2C		13:50				X		1							X	X	
S-3A		14:45				X		1							X	X	
S-3B		14:50				X		1							X	X	

Possible Hazard Identification: ☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☒ 21 Days ☐ Other _____

QC Requirements (Specify): DOD - QSM PROCEDURES

1. Relinquished By: D. Baker of Applied Environmental	Date: 10/28/10	Time: 11:10	1. Received By: Ron Torrollion	Date: 10/28/10	Time: 11:10
2. Relinquished By: RON TORROLLION	Date: 10/28/10	Time: 12:30	2. Received By: Paul Gayland	Date: 10/28/10	Time: 1230
3. Relinquished By: Paul Gayland	Date: 10/28/10	Time: 1230	3. Received By: [illegible]	Date: 29OCT10	Time: 1045

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

LOT RECEIPT CHECKLIST
TestAmerica West Sacramento

CLIENT Phase Separation PM KD LOG # 67891

LOT# (QUANTIMS ID) G0K020530 QUOTE# 87455 LOCATION ~~67891~~ W9A

Checked (✓)

DATE RECEIVED 29 OCT 10 TIME RECEIVED 0905 ☑

DELIVERED BY ☑ FEDEX ☐ ON TRAC ☐ CLIENT

☐ GOLDENSTATE ☐ UPS ☐ GO-GETTERS ☐ OTHER

☐ TAL COURIER ☐ TAL SF ☐ VALLEY LOGISTICS ☑

CUSTODY SEAL STATUS ☑ INTACT ☐ BROKEN ☐ N/A ☑

CUSTODY SEAL #(S) 597575

SHIPPPING CONTAINER(S) ☑ TAL ☐ CLIENT ☐ N/A ☑

COC #(S) 114462, 114463 ☑

TEMPERATURE BLANK Observed: 1 Corrected: 2

SAMPLE TEMPERATURE - (TEMPERATURES ARE IN °C)

Observed: 2, 1, 2 Average 2 Corrected Average 2

LABORATORY THERMOMETER ID:

IR UNIT: #4 ☑ #5 ☐ ☐ OTHER ☑

Initials: [illegible] Date: 29 OCT 10

==========

pH MEASURED ☐ YES ☐ ANOMALY ☑ N/A ☑

LABELED BY..... ☑

LABELS CHECKED BY..... ☑

PEER REVIEW ☑ NA

SHORT HOLD TEST NOTIFICATION

SAMPLE RECEIVING ☑

WETCHEM ☑ N/A ☑

VOA-ENCORES ☑ N/A ☑

☐ METALS NOTIFIED OF FILTER/PRESERVE VIA VERBAL & EMAIL ☑ N/A ☑

☑ COMPLETE SHIPMENT RECEIVED IN GOOD CONDITION WITH APPROPRIATE TEMPERATURES, CONTAINERS, PRESERVATIVES ☐ N/A ☑

☐ CLOUSEAU ☐ TEMPERATURE EXCEEDED (2 °C – 6 °C)*1 ☑ N/A

☐ WET ICE ☐ BLUE ICE ☐ GEL PACK ☐ NO COOLING AGENTS USED ☐ PM NOTIFIED

Initials: [illegible] Date: 11-2-10 ~~29 OCT 10~~

Notes

*1 Acceptable temperature range for State of Wisconsin samples is ≤4°C.

THE LEADER IN ENVIRONMENTAL TESTING

Lot ID: G0K020530

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
VOA*																				
VOAh*																				
AGB																				
AGBs																				
250AGB																				
250AGBs																				
250AGBn																				
500AGB																				
____AGJ																				
500AGJ																				
250AGJ																				
125AGJ				1	1	1	1	1	1	1	1	3	1	1						
____CGJ																				
500CGJ																				
250CGJ																				
125CGJ																				
PJ																				
PJn																				
500PJ																				
500PJn	3	1	1																	
500PJna																				
500PJzn/na																				
250PJ	3	1	1																	
250PJn																				
250PJna																				
250PJzn/na																				
Acetate Tube																				
_____"CT																				
Encore																				
Folder/filter																				
PUF																				
Petri/Filter																				
XAD Trap																				
Ziploc																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

h = hydrochloric acid **s** = sulfuric acid **na** = sodium hydroxide **n** = nitric acid **zn** = zinc acetate

Number of VOAs with air bubbles present / total number of VOA's

QA-185 5/05 EM

Page 3

WATER, 6850/DOD Handbook, Perchlorate

Phase Separation Sciences

Client Sample ID: W-1

Dissolved HPLC

Lot-Sample #...:	G0K020530-001	Work Order #...:	L9FW81AA	Matrix.....:	WATER
Date Sampled...:	10/27/10	Date Received..:	10/29/10		
Prep Date.....:	11/10/10	Analysis Date..:	11/17/10		
Prep Batch #...:	0314148				
Dilution Factor:	50	Method.....:	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	620	25	ug/L	4.1

Phase Separation Sciences

Client Sample ID: W-2

Dissolved HPLC

Lot-Sample #...:	G0K020530-002	**Work Order #...:**	L9FXA1AA	**Matrix.....:**	WATER
Date Sampled...:	10/27/10	**Date Received..:**	10/29/10		
Prep Date.....:	11/10/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0314148				
Dilution Factor:	50	**Method.....:**	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	**630**	**25**	**ug/L**	**4.1**

Phase Separation Sciences

Client Sample ID: W-3

Dissolved HPLC

Lot-Sample #...:	G0K020530-003	**Work Order #...:**	L9FXC1AA	**Matrix.....:**	WATER
Date Sampled...:	10/27/10	**Date Received..:**	10/29/10		
Prep Date.....:	11/10/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0314148				
Dilution Factor:	1	**Method.....:**	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	**0.25 U**	**0.50**	**ug/L**	**0.082**

QC DATA ASSOCIATION SUMMARY

G0K020530

Sample Preparation and Analysis Control Numbers

SAMPLE#	MATRIX	ANALYTICAL METHOD	LEACH BATCH #	PREP BATCH #	MS RUN#
001	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
002	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
003	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
004	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
005	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
006	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
007	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
008	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
009	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180

(Continued on next page)

QC DATA ASSOCIATION SUMMARY

G0K020530

Sample Preparation and Analysis Control Numbers

SAMPLE#	MATRIX	ANALYTICAL METHOD	LEACH BATCH #	PREP BATCH #	MS RUN#
010	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
011	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
012	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
013	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
014	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180

METHOD BLANK REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9RPG1AA **Matrix.....:** WATER
MB Lot-Sample #: G0K100000-148
Prep Date.....: 11/10/10
Analysis Date..: 11/16/10 **Prep Batch #...:** 0314148
Dilution Factor: 1

PARAMETER	RESULT	LOQ	UNITS	METHOD
Perchlorate	0.25 U	0.50	ug/L	SW846 6850_DOD Ha

NOTE(S):

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

LABORATORY CONTROL SAMPLE DATA REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9RPG1AC **Matrix.....:** WATER
LCS Lot-Sample#: G0K100000-148
Prep Date.....: 11/10/10 **Analysis Date..:** 11/16/10
Prep Batch #...: 0314148
Dilution Factor: 1

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECOVERY	METHOD
Perchlorate	**0.500**	**0.432**	**ug/L**	**86**	**SW846 6850_DO**

NOTE(S):

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

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE EVALUATION REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9RPG1AC **Matrix.....:** WATER
LCS Lot-Sample#: G0K100000-148
Prep Date.....: 11/10/10 **Analysis Date..:** 11/16/10
Prep Batch #...: 0314148
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD
Perchlorate	**86**	**(80 - 120)**	**SW846 6850_DOD Handb**

NOTE(S):

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

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE DATA REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9RPG1AD **Matrix.....:** WATER
LCS Lot-Sample#: G0K100000-148
Prep Date.....: 11/10/10 **Analysis Date..:** 11/16/10
Prep Batch #...: 0314148
Dilution Factor: 1

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECOVERY	METHOD
Perchlorate	**0.500**	**0.486**	**ug/L**	**97**	**SW846 6850_DO**

NOTE(S):

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

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE EVALUATION REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9RPG1AD **Matrix.....:** WATER
LCS Lot-Sample#: G0K100000-148
Prep Date.....: 11/10/10 **Analysis Date..:** 11/16/10
Prep Batch #...: 0314148
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD
Perchlorate	**97**	**(80 - 120)**	**SW846 6850_DOD Handb**

NOTE(S):

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

Bold print denotes control parameters

MATRIX SPIKE SAMPLE DATA REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9FW81AL-MS **Matrix.....:** WATER
MS Lot-Sample #: G0K020530-001 L9FW81AM-MSD
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10
Prep Date.....: 11/10/10 **Analysis Date..:** 11/17/10
Prep Batch #...: 0314148
Dilution Factor: 50

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD
Perchlorate	**620**	**0.500**	**0.0**	**ug/L**	**0.0**		**SW846 6850_DOD Handb**
	Qualifiers:		MSA,a				
	620	**0.500**	**0.0**	**ug/L**	**0.0**	**0.0**	**SW846 6850_DOD Handb**
	Qualifiers:		MSA,a				

NOTE(S):

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

Bold print denotes control parameters

MSA The recovery and RPD were not calculated because the sample was diluted beyond the ability to quantitate a recovery.

a Spiked analyte recovery is outside stated control limits.

MATRIX SPIKE SAMPLE EVALUATION REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9FW81AL-MS **Matrix.....:** WATER
MS Lot-Sample #: G0K020530-001 L9FW81AM-MSD
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10
Prep Date.....: 11/10/10 **Analysis Date..:** 11/17/10
Prep Batch #...: 0314148
Dilution Factor: 50

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
Perchlorate	**0.0 MSA,a**	**(80 - 120)**			**SW846 6850_DOD Handb**
	0.0 MSA,a	**(80 - 120)**	**0.0**	**(0-15)**	**SW846 6850_DOD Handb**

NOTE(S):

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

Bold print denotes control parameters

MSA The recovery and RPD were not calculated because the sample was diluted beyond the ability to quantitate a recovery.

a Spiked analyte recovery is outside stated control limits.

SOLID, 6850/DOD Handbook, Perchlorate

Phase Separation Sciences

Client Sample ID: S-1A

HPLC

Lot-Sample #...:	G0K020530-004	**Work Order #...:**	L9FXD1AC	**Matrix.....:**	SOLID
Date Sampled...:	10/27/10	**Date Received..:**	10/29/10		
Prep Date.....:	11/04/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	0.97				
% Moisture.....:	19	**Method.....:**	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	**0.48 U**	**6.0**	**ug/kg**	**0.31**

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

Phase Separation Sciences

Client Sample ID: S-1B

HPLC

Lot-Sample #...:	G0K020530-005	Work Order #...:	L9FXE1AC	Matrix.....:	SOLID
Date Sampled...:	10/27/10	Date Received..:	10/29/10		
Prep Date.....:	11/04/10	Analysis Date..:	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	952				
% Moisture.....:	18	Method.....:	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	9600	5800	ug/kg	300

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

Phase Separation Sciences

Client Sample ID: S-2A

HPLC

Lot-Sample #...:	G0K020530-006	Work Order #...:	L9FXF1AC	Matrix.....:	SOLID
Date Sampled...:	10/27/10	Date Received..:	10/29/10		
Prep Date.....:	11/04/10	Analysis Date..:	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	4.62				
% Moisture.....:	17	Method.....:	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	220	28	ug/kg	1.4

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

Phase Separation Sciences

Client Sample ID: S-2B

HPLC

Lot-Sample #...:	G0K020530-007	**Work Order #...:**	L9FXG1AC	**Matrix.....:**	SOLID
Date Sampled...:	10/27/10	**Date Received..:**	10/29/10		
Prep Date.....:	11/04/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	0.99				
% Moisture.....:	13	**Method.....:**	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	**0.61 J**	**5.7**	**ug/kg**	**0.29**

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-2C

HPLC

Lot-Sample #...:	G0K020530-008	Work Order #...:	L9FXH1AC	Matrix.....:	SOLID
Date Sampled...:	10/27/10	Date Received..:	10/29/10		
Prep Date.....:	11/04/10	Analysis Date..:	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	0.94				
% Moisture.....:	15	Method.....:	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	11	5.5	ug/kg	0.29

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

Phase Separation Sciences

Client Sample ID: S-3A

HPLC

Lot-Sample #...:	G0K020530-009	**Work Order #...:**	L9FXJ1AC	**Matrix.....:**	SOLID
Date Sampled...:	10/27/10	**Date Received..:**	10/29/10		
Prep Date.....:	11/04/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	1				
% Moisture.....:	11	**Method.....:**	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	**4.0 J**	**5.6**	**ug/kg**	**0.29**

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-3B

HPLC

Lot-Sample #...:	G0K020530-010	**Work Order #...:**	L9FXL1AC	**Matrix.....:**	SOLID
Date Sampled...:	10/27/10	**Date Received..:**	10/29/10		
Prep Date.....:	11/04/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	0.98				
% Moisture.....:	13	**Method.....:**	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	**31**	**5.6**	**ug/kg**	**0.29**

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

Phase Separation Sciences

Client Sample ID: S-4A

HPLC

Lot-Sample #...:	G0K020530-011	Work Order #...:	L9FXM1AC	Matrix.....:	SOLID
Date Sampled...:	10/27/10	Date Received..:	10/29/10		
Prep Date.....:	11/04/10	Analysis Date..:	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	0.95				
% Moisture.....:	10	Method.....:	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	30	5.3	ug/kg	0.28

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

Phase Separation Sciences

Client Sample ID: S-4B

HPLC

Lot-Sample #...:	G0K020530-012	**Work Order #...:**	L9FXN1AC	**Matrix.....:**	SOLID
Date Sampled...:	10/27/10	**Date Received..:**	10/29/10		
Prep Date.....:	11/04/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	1000				
% Moisture.....:	18	**Method.....:**	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	**14000**	**6100**	**ug/kg**	**320**

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

Phase Separation Sciences

Client Sample ID: S-5A

HPLC

Lot-Sample #...:	G0K020530-013	Work Order #...:	L9FXQ1AC	Matrix.....:	SOLID
Date Sampled...:	10/27/10	Date Received..:	10/29/10		
Prep Date.....:	11/04/10	Analysis Date..:	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	0.97				
% Moisture.....:	15	Method.....:	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	1.8 J	5.7	ug/kg	0.30

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-5B

HPLC

Lot-Sample #...:	G0K020530-014	**Work Order #...:**	L9FXW1AC	**Matrix.....:**	SOLID
Date Sampled...:	10/27/10	**Date Received..:**	10/29/10		
Prep Date.....:	11/04/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0308373				
Dilution Factor:	9.84				
% Moisture.....:	15	**Method.....:**	SW846 6850_DOD Ha		

PARAMETER	RESULT	LOQ	UNITS	DL
Perchlorate	**230**	**58**	**ug/kg**	**3.0**

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

QC DATA ASSOCIATION SUMMARY

G0K020530

Sample Preparation and Analysis Control Numbers

SAMPLE#	MATRIX	ANALYTICAL METHOD	LEACH BATCH #	PREP BATCH #	MS RUN#
001	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
002	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
003	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
004	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
005	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
006	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
007	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
008	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
009	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180

(Continued on next page)

QC DATA ASSOCIATION SUMMARY

G0K020530

Sample Preparation and Analysis Control Numbers

SAMPLE#	MATRIX	ANALYTICAL METHOD	LEACH BATCH #	PREP BATCH #	MS RUN#
010	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
011	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
012	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
013	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
014	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180

METHOD BLANK REPORT

HPLC

Client Lot #...: G0K020530 Work Order #...: L9J9K1AA Matrix.....: SOLID
MB Lot-Sample #: G0K040000-373
Prep Date.....: 11/04/10
Analysis Date..: 11/17/10 Prep Batch #...: 0308373
Dilution Factor: 1

PARAMETER	RESULT	LOQ	UNITS	METHOD
Perchlorate	0.40 U	5.0	ug/kg	SW846 6850_DOD Ha

NOTE(S):

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

LABORATORY CONTROL SAMPLE DATA REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9J9K1AC **Matrix.....:** SOLID
LCS Lot-Sample#: G0K040000-373
Prep Date.....: 11/04/10 **Analysis Date..:** 11/17/10
Prep Batch #...: 0308373
Dilution Factor: 1

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECOVERY	METHOD
Perchlorate	**5.00**	**4.53**	**ug/kg**	**91**	**SW846 6850_DO**

NOTE(S):

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

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE EVALUATION REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9J9K1AC **Matrix.....:** SOLID
LCS Lot-Sample#: G0K040000-373
Prep Date.....: 11/04/10 **Analysis Date..:** 11/17/10
Prep Batch #...: 0308373
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD
Perchlorate	**91**	**(80 - 120)**	**SW846 6850_DOD Handb**

NOTE(S):

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

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE DATA REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9J9K1AD **Matrix.....:** SOLID
LCS Lot-Sample#: G0K040000-373
Prep Date.....: 11/04/10 **Analysis Date..:** 11/17/10
Prep Batch #...: 0308373
Dilution Factor: 1

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCENT RECOVERY	METHOD
Perchlorate	**5.00**	**4.55**	**ug/kg**	**91**	**SW846 6850_DO**

NOTE(S):

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

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE EVALUATION REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9J9K1AD **Matrix.....:** SOLID
LCS Lot-Sample#: G0K040000-373
Prep Date.....: 11/04/10 **Analysis Date..:** 11/17/10
Prep Batch #...: 0308373
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD
Perchlorate	**91**	**(80 - 120)**	**SW846 6850_DOD Handb**

NOTE(S):

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

Bold print denotes control parameters

MATRIX SPIKE SAMPLE DATA REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9FXN1AM-MS **Matrix.....:** SOLID
MS Lot-Sample #: G0K020530-012 L9FXN1AN-MSD
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10
Prep Date.....: 11/04/10 **Analysis Date..:** 11/17/10
Prep Batch #...: 0308373
Dilution Factor: 965 **% Moisture.....:** 18

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD
Perchlorate	**14000**	**6.12**	**0.0**	**ug/kg**	**0.0**		**SW846 6850_DOD Handb**
	Qualifiers:		MSA,a				
	14000	**6.12**	**0.0**	**ug/kg**	**0.0**	**0.0**	**SW846 6850_DOD Handb**
	Qualifiers:		MSA,a				

NOTE(S):

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

Bold print denotes control parameters

MSA The recovery and RPD were not calculated because the sample was diluted beyond the ability to quantitate a recovery.

a Spiked analyte recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

MATRIX SPIKE SAMPLE EVALUATION REPORT

HPLC

Client Lot #...: G0K020530 **Work Order #...:** L9FXN1AM-MS **Matrix.....:** SOLID
MS Lot-Sample #: G0K020530-012 L9FXN1AN-MSD
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10
Prep Date.....: 11/04/10 **Analysis Date..:** 11/17/10
Prep Batch #...: 0308373
Dilution Factor: 965 **% Moisture.....:** 18

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
Perchlorate	**0.0 MSA,a**	**(80 - 120)**			**SW846 6850_DOD Handb**
	0.0 MSA,a	**(80 - 120)**	**0.0**	**(0-15)**	**SW846 6850_DOD Handb**

NOTE(S):

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

Bold print denotes control parameters

MSA The recovery and RPD were not calculated because the sample was diluted beyond the ability to quantitate a recovery.

a Spiked analyte recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

Metals - Various Methods

Phase Separation Sciences

Client Sample ID: W-1

TOTAL Metals

Lot-Sample #...: G0K020530-001 Matrix.....: WATER
Date Sampled...: 10/27/10 Date Received..: 10/29/10

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0312242						
Silver	0.50 U	1.0	ug/L	SW846 6020	11/08-11/13/10	L9FW81AC
		Dilution Factor: 1		DL.....: 0.30		
Arsenic	2.0 U	3.0	ug/L	SW846 6020	11/08-11/13/10	L9FW81AD
		Dilution Factor: 1		DL.....: 1.0		
Barium	9.5 B	1.5	ug/L	SW846 6020	11/08-11/13/10	L9FW81AE
		Dilution Factor: 1		DL.....: 0.50		
Cadmium	0.50 U	1.5	ug/L	SW846 6020	11/08-11/13/10	L9FW81AF
		Dilution Factor: 1		DL.....: 0.50		
Chromium	4.0 U	5.0	ug/L	SW846 6020	11/08-11/13/10	L9FW81AG
		Dilution Factor: 1		DL.....: 1.5		
Lead	1.4 J	2.5	ug/L	SW846 6020	11/08-11/13/10	L9FW81AH
		Dilution Factor: 1		DL.....: 0.60		
Selenium	2.5 U	3.0	ug/L	SW846 6020	11/08-11/13/10	L9FW81AJ
		Dilution Factor: 1		DL.....: 1.0		
Prep Batch #...: 0313137						
Mercury	0.00010 U	0.00020	mg/L	SW846 7470A	11/08-11/09/10	L9FW81AK
		Dilution Factor: 1		DL.....: 0.00010		

NOTE(S):

B Method blank contamination. Analyte detected at a reportable level in blank.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: W-2

TOTAL Metals

Lot-Sample #...: G0K020530-002 Matrix.....: WATER
Date Sampled...: 10/27/10 Date Received..: 10/29/10

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0312242						
Silver	0.50 U	1.0	ug/L	SW846 6020	11/08-11/13/10	L9FXA1AC
		Dilution Factor: 1		DL.....: 0.30		
Arsenic	1.1 J	3.0	ug/L	SW846 6020	11/08-11/13/10	L9FXA1AD
		Dilution Factor: 1		DL.....: 1.0		
Barium	9.2 B	1.5	ug/L	SW846 6020	11/08-11/13/10	L9FXA1AE
		Dilution Factor: 1		DL.....: 0.50		
Cadmium	0.50 U	1.5	ug/L	SW846 6020	11/08-11/13/10	L9FXA1AF
		Dilution Factor: 1		DL.....: 0.50		
Chromium	4.0 U	5.0	ug/L	SW846 6020	11/08-11/13/10	L9FXA1AG
		Dilution Factor: 1		DL.....: 1.5		
Lead	1.3 J	2.5	ug/L	SW846 6020	11/08-11/13/10	L9FXA1AH
		Dilution Factor: 1		DL.....: 0.60		
Selenium	2.5 U	3.0	ug/L	SW846 6020	11/08-11/13/10	L9FXA1AJ
		Dilution Factor: 1		DL.....: 1.0		
Prep Batch #...: 0313137						
Mercury	0.00010 U	0.00020	mg/L	SW846 7470A	11/08-11/09/10	L9FXA1AK
		Dilution Factor: 1		DL.....: 0.00010		

NOTE(S):

J Estimated result. Result is less than RL.

B Method blank contamination. Analyte detected at a reportable level in blank.

Phase Separation Sciences

Client Sample ID: W-3

TOTAL Metals

Lot-Sample #...: G0K020530-003 Matrix.....: WATER
Date Sampled...: 10/27/10 Date Received..: 10/29/10

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0312242						
Silver	0.50 U	1.0	ug/L	SW846 6020	11/08-11/13/10	L9FXC1AC
		Dilution Factor: 1		DL.....: 0.30		
Arsenic	2.0 U	3.0	ug/L	SW846 6020	11/08-11/13/10	L9FXC1AD
		Dilution Factor: 1		DL.....: 1.0		
Barium	1.0 U	1.5	ug/L	SW846 6020	11/08-11/13/10	L9FXC1AE
		Dilution Factor: 1		DL.....: 0.50		
Cadmium	0.50 U	1.5	ug/L	SW846 6020	11/08-11/13/10	L9FXC1AF
		Dilution Factor: 1		DL.....: 0.50		
Chromium	4.0 U	5.0	ug/L	SW846 6020	11/08-11/13/10	L9FXC1AG
		Dilution Factor: 1		DL.....: 1.5		
Lead	1.0 U	2.5	ug/L	SW846 6020	11/08-11/13/10	L9FXC1AH
		Dilution Factor: 1		DL.....: 0.60		
Selenium	2.5 U	3.0	ug/L	SW846 6020	11/08-11/13/10	L9FXC1AJ
		Dilution Factor: 1		DL.....: 1.0		
Prep Batch #...: 0313137						
Mercury	0.00010 U	0.00020	mg/L	SW846 7470A	11/08-11/09/10	L9FXC1AK
		Dilution Factor: 1		DL.....: 0.00010		

Phase Separation Sciences

Client Sample ID: S-1A

TOTAL Metals

Lot-Sample #...: G0K020530-004 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 19

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	0.036 J	0.049	mg/kg	SW846 7471A	11/10/10	L9FXD1AL
		Dilution Factor: 1		DL.....: 0.011		
Prep Batch #...: 0313206						
Silver	0.065 J	0.12	mg/kg	SW846 6020	11/09-11/10/10	L9FXD1AD
		Dilution Factor: 1		DL.....: 0.037		
Arsenic	3.7	0.62	mg/kg	SW846 6020	11/09-11/10/10	L9FXD1AE
		Dilution Factor: 1		DL.....: 0.18		
Barium	52.8	0.37	mg/kg	SW846 6020	11/09-11/10/10	L9FXD1AF
		Dilution Factor: 1		DL.....: 0.12		
Cadmium	0.36	0.18	mg/kg	SW846 6020	11/09-11/10/10	L9FXD1AG
		Dilution Factor: 1		DL.....: 0.062		
Chromium	18.1	0.74	mg/kg	SW846 6020	11/09-11/10/10	L9FXD1AH
		Dilution Factor: 1		DL.....: 0.25		
Lead	10.6	0.25	mg/kg	SW846 6020	11/09-11/10/10	L9FXD1AJ
		Dilution Factor: 1		DL.....: 0.074		
Selenium	0.48	0.37	mg/kg	SW846 6020	11/09-11/10/10	L9FXD1AK
		Dilution Factor: 1		DL.....: 0.12		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-1B

TOTAL Metals

Lot-Sample #...: G0K020530-005 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 18

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	**0.035 J**	**0.049**	**mg/kg**	**SW846 7471A**	**11/10/10**	**L9FXE1AL**
		Dilution Factor: 1		DL.....: 0.011		
Prep Batch #...: 0313206						
Silver	**0.084 J**	**0.12**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXE1AD**
		Dilution Factor: 1		DL.....: 0.037		
Arsenic	**5.1**	**0.61**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXE1AE**
		Dilution Factor: 1		DL.....: 0.18		
Barium	**38.9**	**0.37**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXE1AF**
		Dilution Factor: 1		DL.....: 0.12		
Cadmium	**0.34**	**0.18**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXE1AG**
		Dilution Factor: 1		DL.....: 0.061		
Chromium	**20.6**	**0.73**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXE1AH**
		Dilution Factor: 1		DL.....: 0.24		
Lead	**11.4**	**0.24**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXE1AJ**
		Dilution Factor: 1		DL.....: 0.073		
Selenium	**0.49**	**0.37**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXE1AK**
		Dilution Factor: 1		DL.....: 0.12		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-2A

TOTAL Metals

Lot-Sample #...: G0K020530-006 **Matrix.....:** SOLID
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10
% Moisture.....: 17

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	**0.082**	**0.048**	**mg/kg**	**SW846 7471A**	**11/10/10**	**L9FXF1AL**
		Dilution Factor: 1		DL.....: 0.010		
Prep Batch #...: 0313206						
Silver	**0.076 J**	**0.12**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXF1AD**
		Dilution Factor: 1		DL.....: 0.036		
Arsenic	**5.4**	**0.60**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXF1AE**
		Dilution Factor: 1		DL.....: 0.18		
Barium	**36.0**	**0.36**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXF1AF**
		Dilution Factor: 1		DL.....: 0.12		
Cadmium	**0.33**	**0.18**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXF1AG**
		Dilution Factor: 1		DL.....: 0.060		
Chromium	**20.9**	**0.72**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXF1AH**
		Dilution Factor: 1		DL.....: 0.24		
Lead	**14.9**	**0.24**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXF1AJ**
		Dilution Factor: 1		DL.....: 0.072		
Selenium	**0.38**	**0.36**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXF1AK**
		Dilution Factor: 1		DL.....: 0.12		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-2B

TOTAL Metals

Lot-Sample #...: G0K020530-007 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 13

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	0.022 J	0.046	mg/kg	SW846 7471A	11/10/10	L9FXG1AL
		Dilution Factor: 1		DL.....: 0.0098		
Prep Batch #...: 0313206						
Silver	0.057 J	0.11	mg/kg	SW846 6020	11/09-11/10/10	L9FXG1AD
		Dilution Factor: 1		DL.....: 0.034		
Arsenic	6.4	0.57	mg/kg	SW846 6020	11/09-11/10/10	L9FXG1AE
		Dilution Factor: 1		DL.....: 0.17		
Barium	52.0	0.34	mg/kg	SW846 6020	11/09-11/10/10	L9FXG1AF
		Dilution Factor: 1		DL.....: 0.11		
Cadmium	0.27	0.17	mg/kg	SW846 6020	11/09-11/10/10	L9FXG1AG
		Dilution Factor: 1		DL.....: 0.057		
Chromium	17.3	0.69	mg/kg	SW846 6020	11/09-11/10/10	L9FXG1AH
		Dilution Factor: 1		DL.....: 0.23		
Lead	7.8	0.23	mg/kg	SW846 6020	11/09-11/10/10	L9FXG1AJ
		Dilution Factor: 1		DL.....: 0.069		
Selenium	0.40	0.34	mg/kg	SW846 6020	11/09-11/10/10	L9FXG1AK
		Dilution Factor: 1		DL.....: 0.11		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-2C

TOTAL Metals

Lot-Sample #...: G0K020530-008 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 15

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	**0.025 J**	**0.047**	**mg/kg**	**SW846 7471A**	**11/10/10**	**L9FXH1AL**
		Dilution Factor: 1		DL.....: 0.010		
Prep Batch #...: 0313206						
Silver	**0.068 J**	**0.12**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXH1AD**
		Dilution Factor: 1		DL.....: 0.035		
Arsenic	**15.5**	**0.59**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXH1AE**
		Dilution Factor: 1		DL.....: 0.18		
Barium	**44.3**	**0.35**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXH1AF**
		Dilution Factor: 1		DL.....: 0.12		
Cadmium	**0.31**	**0.18**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXH1AG**
		Dilution Factor: 1		DL.....: 0.059		
Chromium	**18.8**	**0.70**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXH1AH**
		Dilution Factor: 1		DL.....: 0.23		
Lead	**8.4**	**0.23**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXH1AJ**
		Dilution Factor: 1		DL.....: 0.070		
Selenium	**0.50**	**0.35**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXH1AK**
		Dilution Factor: 1		DL.....: 0.12		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-3A

TOTAL Metals

Lot-Sample #...: G0K020530-009 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 11

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	0.013 U	0.045	mg/kg	SW846 7471A	11/10/10	L9FXJ1AL
		Dilution Factor: 1		DL.....: 0.0096		
Prep Batch #...: 0313206						
Silver	0.056 U	0.11	mg/kg	SW846 6020	11/09-11/10/10	L9FXJ1AD
		Dilution Factor: 1		DL.....: 0.034		
Arsenic	7.5	0.56	mg/kg	SW846 6020	11/09-11/10/10	L9FXJ1AE
		Dilution Factor: 1		DL.....: 0.17		
Barium	12.9	0.34	mg/kg	SW846 6020	11/09-11/10/10	L9FXJ1AF
		Dilution Factor: 1		DL.....: 0.11		
Cadmium	0.29	0.17	mg/kg	SW846 6020	11/09-11/10/10	L9FXJ1AG
		Dilution Factor: 1		DL.....: 0.056		
Chromium	6.6	0.67	mg/kg	SW846 6020	11/09-11/10/10	L9FXJ1AH
		Dilution Factor: 1		DL.....: 0.22		
Lead	39.2	0.22	mg/kg	SW846 6020	11/09-11/10/10	L9FXJ1AJ
		Dilution Factor: 1		DL.....: 0.067		
Selenium	0.22 U	0.34	mg/kg	SW846 6020	11/09-11/10/10	L9FXJ1AK
		Dilution Factor: 1		DL.....: 0.11		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

Phase Separation Sciences

Client Sample ID: S-3B

TOTAL Metals

Lot-Sample #...: G0K020530-010 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 13

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	0.026 J	0.046	mg/kg	SW846 7471A	11/10/10	L9FXL1AL
		Dilution Factor: 1		DL.....: 0.0098		
Prep Batch #...: 0313206						
Silver	0.052 J	0.11	mg/kg	SW846 6020	11/09-11/10/10	L9FXL1AD
		Dilution Factor: 1		DL.....: 0.034		
Arsenic	3.1	0.57	mg/kg	SW846 6020	11/09-11/10/10	L9FXL1AE
		Dilution Factor: 1		DL.....: 0.17		
Barium	26.9	0.34	mg/kg	SW846 6020	11/09-11/10/10	L9FXL1AF
		Dilution Factor: 1		DL.....: 0.11		
Cadmium	0.22	0.17	mg/kg	SW846 6020	11/09-11/10/10	L9FXL1AG
		Dilution Factor: 1		DL.....: 0.057		
Chromium	13.5	0.69	mg/kg	SW846 6020	11/09-11/10/10	L9FXL1AH
		Dilution Factor: 1		DL.....: 0.23		
Lead	7.7	0.23	mg/kg	SW846 6020	11/09-11/10/10	L9FXL1AJ
		Dilution Factor: 1		DL.....: 0.069		
Selenium	0.12 J	0.34	mg/kg	SW846 6020	11/09-11/10/10	L9FXL1AK
		Dilution Factor: 1		DL.....: 0.11		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-4A

TOTAL Metals

Lot-Sample #...: G0K020530-011 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 10

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	0.018 J	0.045	mg/kg	SW846 7471A	11/10/10	L9FXM1AL
		Dilution Factor: 1		DL.....: 0.0096		
Prep Batch #...: 0313206						
Silver	0.090 J	0.11	mg/kg	SW846 6020	11/09-11/10/10	L9FXM1AD
		Dilution Factor: 1		DL.....: 0.034		
Arsenic	2.3	0.56	mg/kg	SW846 6020	11/09-11/10/10	L9FXM1AE
		Dilution Factor: 1		DL.....: 0.17		
Barium	42.2	0.34	mg/kg	SW846 6020	11/09-11/10/10	L9FXM1AF
		Dilution Factor: 1		DL.....: 0.11		
Cadmium	0.34	0.17	mg/kg	SW846 6020	11/09-11/10/10	L9FXM1AG
		Dilution Factor: 1		DL.....: 0.056		
Chromium	16.8	0.67	mg/kg	SW846 6020	11/09-11/10/10	L9FXM1AH
		Dilution Factor: 1		DL.....: 0.22		
Lead	9.4	0.22	mg/kg	SW846 6020	11/09-11/10/10	L9FXM1AJ
		Dilution Factor: 1		DL.....: 0.067		
Selenium	0.34	0.34	mg/kg	SW846 6020	11/09-11/10/10	L9FXM1AK
		Dilution Factor: 1		DL.....: 0.11		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-4B

TOTAL Metals

Lot-Sample #...: G0K020530-012 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 18

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	0.015 U	0.049	mg/kg	SW846 7471A	11/10/10	L9FXN1AL
		Dilution Factor: 1		DL.....: 0.010		
Prep Batch #...: 0313206						
Silver	0.083 J	0.12	mg/kg	SW846 6020	11/09-11/10/10	L9FXN1AD
		Dilution Factor: 1		DL.....: 0.037		
Arsenic	2.3	0.61	mg/kg	SW846 6020	11/09-11/10/10	L9FXN1AE
		Dilution Factor: 1		DL.....: 0.18		
Barium	55.0	0.37	mg/kg	SW846 6020	11/09-11/10/10	L9FXN1AF
		Dilution Factor: 1		DL.....: 0.12		
Cadmium	0.38	0.18	mg/kg	SW846 6020	11/09-11/10/10	L9FXN1AG
		Dilution Factor: 1		DL.....: 0.061		
Chromium	22.2	0.73	mg/kg	SW846 6020	11/09-11/10/10	L9FXN1AH
		Dilution Factor: 1		DL.....: 0.24		
Lead	12.9	0.24	mg/kg	SW846 6020	11/09-11/10/10	L9FXN1AJ
		Dilution Factor: 1		DL.....: 0.073		
Selenium	0.79	0.37	mg/kg	SW846 6020	11/09-11/10/10	L9FXN1AK
		Dilution Factor: 1		DL.....: 0.12		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-5A

TOTAL Metals

Lot-Sample #...: G0K020530-013 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 15

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	**0.17**	**0.047**	**mg/kg**	**SW846 7471A**	**11/10/10**	**L9FXQ1AL**
		Dilution Factor: 1		DL.....: 0.010		
Prep Batch #...: 0313206						
Silver	**0.065 J**	**0.12**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXQ1AD**
		Dilution Factor: 1		DL.....: 0.035		
Arsenic	**11.2**	**0.58**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXQ1AE**
		Dilution Factor: 1		DL.....: 0.18		
Barium	**47.7**	**0.35**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXQ1AF**
		Dilution Factor: 1		DL.....: 0.12		
Cadmium	**0.40**	**0.18**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXQ1AG**
		Dilution Factor: 1		DL.....: 0.058		
Chromium	**20.2**	**0.70**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXQ1AH**
		Dilution Factor: 1		DL.....: 0.23		
Lead	**20.0**	**0.23**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXQ1AJ**
		Dilution Factor: 1		DL.....: 0.070		
Selenium	**0.46**	**0.35**	**mg/kg**	**SW846 6020**	**11/09-11/10/10**	**L9FXQ1AK**
		Dilution Factor: 1		DL.....: 0.12		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

Phase Separation Sciences

Client Sample ID: S-5B

TOTAL Metals

Lot-Sample #...: G0K020530-014 Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 15

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0313106						
Mercury	0.014 U	0.047	mg/kg	SW846 7471A	11/10/10	L9FXW1AL
		Dilution Factor: 1		DL.....: 0.010		
Prep Batch #...: 0313206						
Silver	0.065 J	0.12	mg/kg	SW846 6020	11/09-11/10/10	L9FXW1AD
		Dilution Factor: 1		DL.....: 0.035		
Arsenic	1.9	0.59	mg/kg	SW846 6020	11/09-11/10/10	L9FXW1AE
		Dilution Factor: 1		DL.....: 0.18		
Barium	44.3	0.35	mg/kg	SW846 6020	11/09-11/10/10	L9FXW1AF
		Dilution Factor: 1		DL.....: 0.12		
Cadmium	0.32	0.18	mg/kg	SW846 6020	11/09-11/10/10	L9FXW1AG
		Dilution Factor: 1		DL.....: 0.059		
Chromium	19.5	0.71	mg/kg	SW846 6020	11/09-11/10/10	L9FXW1AH
		Dilution Factor: 1		DL.....: 0.24		
Lead	11.0	0.24	mg/kg	SW846 6020	11/09-11/10/10	L9FXW1AJ
		Dilution Factor: 1		DL.....: 0.071		
Selenium	1.1	0.35	mg/kg	SW846 6020	11/09-11/10/10	L9FXW1AK
		Dilution Factor: 1		DL.....: 0.12		

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

QC DATA ASSOCIATION SUMMARY

G0K020530

Sample Preparation and Analysis Control Numbers

SAMPLE#	MATRIX	ANALYTICAL METHOD	LEACH BATCH #	PREP BATCH #	MS RUN#
001	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
002	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
003	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
004	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
005	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
006	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
007	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
008	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
009	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
010	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
011	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
012	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
013	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058
014	SOLID	SW846 6020		0313206	0313108
	SOLID	SW846 7471A		0313106	0313058

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** WATER

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: G0K080000-242 **Prep Batch #...:** 0312242						
Arsenic	2.0 U	3.0	ug/L	SW846 6020	11/08-11/13/10	L9PEM1AC
		Dilution Factor: 1				
Barium	0.79 J	1.5	ug/L	SW846 6020	11/08-11/13/10	L9PEM1AD
		Dilution Factor: 1				
Cadmium	0.50 U	1.5	ug/L	SW846 6020	11/08-11/13/10	L9PEM1AE
		Dilution Factor: 1				
Chromium	4.0 U	5.0	ug/L	SW846 6020	11/08-11/13/10	L9PEM1AF
		Dilution Factor: 1				
Lead	1.0 U	2.5	ug/L	SW846 6020	11/08-11/13/10	L9PEM1AG
		Dilution Factor: 1				
Selenium	2.5 U	3.0	ug/L	SW846 6020	11/08-11/13/10	L9PEM1AH
		Dilution Factor: 1				
Silver	0.50 U	1.0	ug/L	SW846 6020	11/08-11/13/10	L9PEM1AA
		Dilution Factor: 1				
MB Lot-Sample #: G0K090000-137 **Prep Batch #...:** 0313137						
Mercury	0.00010 U	0.00020	mg/L	SW846 7470A	11/08-11/09/10	L9P891AA
		Dilution Factor: 1				

NOTE(S):

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

J Estimated result. Result is less than RL.

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: G0K020530 Matrix.....: SOLID

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: G0K090000-106 **Prep Batch #...:** 0313106						
Mercury	0.012 U	0.040	mg/kg	SW846 7471A	11/10/10	L9P701AA
		Dilution Factor: 1				
MB Lot-Sample #: G0K090000-206 **Prep Batch #...:** 0313206						
Arsenic	0.30 U	0.50	mg/kg	SW846 6020	11/09-11/10/10	L9QF01AC
		Dilution Factor: 1				
Barium	0.10 U	0.30	mg/kg	SW846 6020	11/09-11/10/10	L9QF01AD
		Dilution Factor: 1				
Cadmium	0.050 U	0.15	mg/kg	SW846 6020	11/09-11/10/10	L9QF01AE
		Dilution Factor: 1				
Chromium	0.50 U	0.60	mg/kg	SW846 6020	11/09-11/10/10	L9QF01AF
		Dilution Factor: 1				
Lead	0.10 U	0.20	mg/kg	SW846 6020	11/09-11/10/10	L9QF01AG
		Dilution Factor: 1				
Selenium	0.20 U	0.30	mg/kg	SW846 6020	11/09-11/10/10	L9QF01AH
		Dilution Factor: 1				
Silver	0.050 U	0.10	mg/kg	SW846 6020	11/09-11/10/10	L9QF01AA
		Dilution Factor: 1				

NOTE(S):

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

LABORATORY CONTROL SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** WATER

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: G0K080000-242 **Prep Batch #...:** 0312242							
Silver	50.0	51.0	ug/L	102	SW846 6020	11/08-11/13/10	L9PEM1AJ
			Dilution Factor: 1				
Arsenic	200	198	ug/L	99	SW846 6020	11/08-11/13/10	L9PEM1AK
			Dilution Factor: 1				
Barium	200	204	ug/L	102	SW846 6020	11/08-11/13/10	L9PEM1AL
			Dilution Factor: 1				
Cadmium	200	201	ug/L	100	SW846 6020	11/08-11/13/10	L9PEM1AM
			Dilution Factor: 1				
Chromium	200	198	ug/L	99	SW846 6020	11/08-11/13/10	L9PEM1AN
			Dilution Factor: 1				
Lead	200	205	ug/L	102	SW846 6020	11/08-11/13/10	L9PEM1AP
			Dilution Factor: 1				
Selenium	200	194	ug/L	97	SW846 6020	11/08-11/13/10	L9PEM1AQ
			Dilution Factor: 1				
LCS Lot-Sample#: G0K090000-137 **Prep Batch #...:** 0313137							
Mercury	0.00100	0.000972	mg/L	97	SW846 7470A	11/08-11/09/10	L9P891AC
			Dilution Factor: 1				

NOTE(S):

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

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** WATER

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: G0K080000-242 **Prep Batch #...:** 0312242					
Silver	102	(90 - 112)	SW846 6020	11/08-11/13/10	L9PEM1AJ
		Dilution Factor: 1			
Arsenic	99	(90 - 110)	SW846 6020	11/08-11/13/10	L9PEM1AK
		Dilution Factor: 1			
Barium	102	(90 - 112)	SW846 6020	11/08-11/13/10	L9PEM1AL
		Dilution Factor: 1			
Cadmium	100	(90 - 110)	SW846 6020	11/08-11/13/10	L9PEM1AM
		Dilution Factor: 1			
Chromium	99	(90 - 112)	SW846 6020	11/08-11/13/10	L9PEM1AN
		Dilution Factor: 1			
Lead	102	(90 - 113)	SW846 6020	11/08-11/13/10	L9PEM1AP
		Dilution Factor: 1			
Selenium	97	(88 - 110)	SW846 6020	11/08-11/13/10	L9PEM1AQ
		Dilution Factor: 1			
LCS Lot-Sample#: G0K090000-137 **Prep Batch #...:** 0313137					
Mercury	97	(80 - 120)	SW846 7470A	11/08-11/09/10	L9P891AC
		Dilution Factor: 1			

NOTE(S):

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

LABORATORY CONTROL SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** SOLID

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: G0K090000-106 **Prep Batch #...:** 0313106							
Mercury	0.0833	0.0833	mg/kg	100	SW846 7471A	11/10/10	L9P701AC
			Dilution Factor: 1				
LCS Lot-Sample#: G0K090000-206 **Prep Batch #...:** 0313206							
Silver	5.00	5.07	mg/kg	101	SW846 6020	11/09-11/10/10	L9QF01AJ
			Dilution Factor: 1				
Arsenic	20.0	18.3	mg/kg	91	SW846 6020	11/09-11/10/10	L9QF01AK
			Dilution Factor: 1				
Barium	20.0	19.9	mg/kg	99	SW846 6020	11/09-11/10/10	L9QF01AL
			Dilution Factor: 1				
Cadmium	20.0	19.4	mg/kg	97	SW846 6020	11/09-11/10/10	L9QF01AM
			Dilution Factor: 1				
Chromium	20.0	21.3	mg/kg	106	SW846 6020	11/09-11/10/10	L9QF01AN
			Dilution Factor: 1				
Lead	20.0	20.8	mg/kg	104	SW846 6020	11/09-11/10/10	L9QF01AP
			Dilution Factor: 1				
Selenium	20.0	17.7	mg/kg	88	SW846 6020	11/09-11/10/10	L9QF01AQ
			Dilution Factor: 1				

NOTE(S):

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

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: G0K090000-106 **Prep Batch #...:** 0313106					
Mercury	100	(80 - 120)	SW846 7471A	11/10/10	L9P701AC
		Dilution Factor: 1			
LCS Lot-Sample#: G0K090000-206 **Prep Batch #...:** 0313206					
Silver	101	(44 - 128)	SW846 6020	11/09-11/10/10	L9QF01AJ
		Dilution Factor: 1			
Arsenic	91	(81 - 110)	SW846 6020	11/09-11/10/10	L9QF01AK
		Dilution Factor: 1			
Barium	99	(89 - 110)	SW846 6020	11/09-11/10/10	L9QF01AL
		Dilution Factor: 1			
Cadmium	97	(83 - 110)	SW846 6020	11/09-11/10/10	L9QF01AM
		Dilution Factor: 1			
Chromium	106	(88 - 113)	SW846 6020	11/09-11/10/10	L9QF01AN
		Dilution Factor: 1			
Lead	104	(87 - 113)	SW846 6020	11/09-11/10/10	L9QF01AP
		Dilution Factor: 1			
Selenium	88	(75 - 110)	SW846 6020	11/09-11/10/10	L9QF01AQ
		Dilution Factor: 1			

NOTE(S):

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

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** WATER
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: G0K020530-001 **Prep Batch #...:** 0312242									
Arsenic									
	2.0 U	200	197	ug/L	98		SW846 6020	11/08-11/13/10	L9FW81AQ
	2.0 U	200	199	ug/L	99	1.2	SW846 6020	11/08-11/13/10	L9FW81AR
			Dilution Factor: 1						
Barium									
	9.5	200	208	ug/L	99		SW846 6020	11/08-11/13/10	L9FW81AT
	9.5	200	211	ug/L	101	1.2	SW846 6020	11/08-11/13/10	L9FW81AU
			Dilution Factor: 1						
Cadmium									
	0.50 U	200	194	ug/L	97		SW846 6020	11/08-11/13/10	L9FW81AV
	0.50 U	200	197	ug/L	98	1.5	SW846 6020	11/08-11/13/10	L9FW81AW
			Dilution Factor: 1						
Chromium									
	4.0 U	200	193	ug/L	96		SW846 6020	11/08-11/13/10	L9FW81AX
	4.0 U	200	195	ug/L	97	1.1	SW846 6020	11/08-11/13/10	L9FW81A0
			Dilution Factor: 1						
Lead									
	1.4	200	202	ug/L	100		SW846 6020	11/08-11/13/10	L9FW81A1
	1.4	200	206	ug/L	103	2.1	SW846 6020	11/08-11/13/10	L9FW81A2
			Dilution Factor: 1						
Selenium									
	2.5 U	200	191	ug/L	95		SW846 6020	11/08-11/13/10	L9FW81A3
	2.5 U	200	190	ug/L	95	0.11	SW846 6020	11/08-11/13/10	L9FW81A4
			Dilution Factor: 1						
Silver									
	0.50 U	50.0	49.0	ug/L	98		SW846 6020	11/08-11/13/10	L9FW81AN
	0.50 U	50.0	49.8	ug/L	100	1.6	SW846 6020	11/08-11/13/10	L9FW81AP
			Dilution Factor: 1						
MS Lot-Sample #: G0K020530-001 **Prep Batch #...:** 0313137									
Mercury									
	0.00010	0.00100	0.00105	mg/L	105		SW846 7470A	11/08-11/09/10	L9FW81A5
	0.00010	0.00100	0.00105	mg/L	105	0.0	SW846 7470A	11/08-11/09/10	L9FW81A6
			Dilution Factor: 1						

NOTE(S):

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

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** WATER
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: G0K020530-001 **Prep Batch #...:** 0312242							
Arsenic	98	(90 - 110)			SW846 6020	11/08-11/13/10	L9FW81AQ
	99	(90 - 110)	1.2	(0-15)	SW846 6020	11/08-11/13/10	L9FW81AR
		Dilution Factor: 1					
Barium	99	(90 - 112)			SW846 6020	11/08-11/13/10	L9FW81AT
	101	(90 - 112)	1.2	(0-15)	SW846 6020	11/08-11/13/10	L9FW81AU
		Dilution Factor: 1					
Cadmium	97	(90 - 110)			SW846 6020	11/08-11/13/10	L9FW81AV
	98	(90 - 110)	1.5	(0-15)	SW846 6020	11/08-11/13/10	L9FW81AW
		Dilution Factor: 1					
Chromium	96	(90 - 112)			SW846 6020	11/08-11/13/10	L9FW81AX
	97	(90 - 112)	1.1	(0-15)	SW846 6020	11/08-11/13/10	L9FW81A0
		Dilution Factor: 1					
Lead	100	(90 - 113)			SW846 6020	11/08-11/13/10	L9FW81A1
	103	(90 - 113)	2.1	(0-15)	SW846 6020	11/08-11/13/10	L9FW81A2
		Dilution Factor: 1					
Selenium	95	(88 - 110)			SW846 6020	11/08-11/13/10	L9FW81A3
	95	(88 - 110)	0.11	(0-15)	SW846 6020	11/08-11/13/10	L9FW81A4
		Dilution Factor: 1					
Silver	98	(90 - 112)			SW846 6020	11/08-11/13/10	L9FW81AN
	100	(90 - 112)	1.6	(0-15)	SW846 6020	11/08-11/13/10	L9FW81AP
		Dilution Factor: 1					
MS Lot-Sample #: G0K020530-001 **Prep Batch #...:** 0313137							
Mercury	105	(80 - 120)			SW846 7470A	11/08-11/09/10	L9FW81A5
	105	(80 - 120)	0.0	(0-20)	SW846 7470A	11/08-11/09/10	L9FW81A6
		Dilution Factor: 1					

NOTE(S):

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

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** SOLID
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: G0K020530-012 **Prep Batch #...:** 0313106									
								% Moisture.....: 18	
Mercury									
	0.015 U	0.296	0.292	mg/kg	95		SW846 7471A	11/10/10	L9FXN1A6
	0.015 U	0.291	0.275	mg/kg	91	6.1	SW846 7471A	11/10/10	L9FXN1A7
			Dilution Factor: 1						
MS Lot-Sample #: G0K020530-012 **Prep Batch #...:** 0313206									
								% Moisture.....: 18	
Arsenic									
	2.3	23.5	20.1 N	mg/kg	76		SW846 6020	11/09-11/10/10	L9FXN1AR
	2.3	24.7	23.9	mg/kg	87	17	SW846 6020	11/09-11/10/10	L9FXN1AT
			Dilution Factor: 1						
Barium									
	55.0	23.5	78.4	mg/kg	100		SW846 6020	11/09-11/10/10	L9FXN1AU
	55.0	24.7	69.1 N	mg/kg	57	13	SW846 6020	11/09-11/10/10	L9FXN1AV
			Dilution Factor: 1						
Cadmium									
	0.38	23.5	22.1	mg/kg	92		SW846 6020	11/09-11/10/10	L9FXN1AW
	0.38	24.7	23.1	mg/kg	92	4.4	SW846 6020	11/09-11/10/10	L9FXN1AX
			Dilution Factor: 1						
Chromium									
	22.2	23.5	44.5	mg/kg	95		SW846 6020	11/09-11/10/10	L9FXN1A0
	22.2	24.7	43.5 N	mg/kg	86	2.4	SW846 6020	11/09-11/10/10	L9FXN1A1
			Dilution Factor: 1						
Lead									
	12.9	23.5	36.1	mg/kg	98		SW846 6020	11/09-11/10/10	L9FXN1A2
	12.9	24.7	34.4	mg/kg	87	4.8	SW846 6020	11/09-11/10/10	L9FXN1A3
			Dilution Factor: 1						
Selenium									
	0.79	23.5	19.1	mg/kg	78		SW846 6020	11/09-11/10/10	L9FXN1A4
	0.79	24.7	19.8	mg/kg	77	3.7	SW846 6020	11/09-11/10/10	L9FXN1A5
			Dilution Factor: 1						
Silver									
	0.083	5.88	5.60	mg/kg	94		SW846 6020	11/09-11/10/10	L9FXN1AP
	0.083	6.18	5.85	mg/kg	93	4.3	SW846 6020	11/09-11/10/10	L9FXN1AQ
			Dilution Factor: 1						

(Continued on next page)

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** SOLID
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10

NOTE(S):

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

Results and reporting limits have been adjusted for dry weight.

N Spiked analyte recovery is outside stated control limits.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: G0K020530 **Matrix.....:** SOLID
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: G0K020530-012 **Prep Batch #...:** 0313106							
						% Moisture.....: 18	
Mercury	95	(80 - 120)			SW846 7471A	11/10/10	L9FXN1A6
	91	(80 - 120)	6.1	(0-20)	SW846 7471A	11/10/10	L9FXN1A7
		Dilution Factor: 1					
MS Lot-Sample #: G0K020530-012 **Prep Batch #...:** 0313206							
						% Moisture.....: 18	
Arsenic	76 N	(81 - 110)			SW846 6020	11/09-11/10/10	L9FXN1AR
	87	(81 - 110)	17	(0-20)	SW846 6020	11/09-11/10/10	L9FXN1AT
		Dilution Factor: 1					
Barium	100	(89 - 110)			SW846 6020	11/09-11/10/10	L9FXN1AU
	57 N	(89 - 110)	13	(0-20)	SW846 6020	11/09-11/10/10	L9FXN1AV
		Dilution Factor: 1					
Cadmium	92	(83 - 110)			SW846 6020	11/09-11/10/10	L9FXN1AW
	92	(83 - 110)	4.4	(0-20)	SW846 6020	11/09-11/10/10	L9FXN1AX
		Dilution Factor: 1					
Chromium	95	(88 - 113)			SW846 6020	11/09-11/10/10	L9FXN1A0
	86 N	(88 - 113)	2.4	(0-20)	SW846 6020	11/09-11/10/10	L9FXN1A1
		Dilution Factor: 1					
Lead	98	(87 - 113)			SW846 6020	11/09-11/10/10	L9FXN1A2
	87	(87 - 113)	4.8	(0-20)	SW846 6020	11/09-11/10/10	L9FXN1A3
		Dilution Factor: 1					
Selenium	78	(75 - 110)			SW846 6020	11/09-11/10/10	L9FXN1A4
	77	(75 - 110)	3.7	(0-20)	SW846 6020	11/09-11/10/10	L9FXN1A5
		Dilution Factor: 1					
Silver	94	(44 - 128)			SW846 6020	11/09-11/10/10	L9FXN1AP
	93	(44 - 128)	4.3	(0-47)	SW846 6020	11/09-11/10/10	L9FXN1AQ
		Dilution Factor: 1					

NOTE(S):

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

Results and reporting limits have been adjusted for dry weight.

N Spiked analyte recovery is outside stated control limits.

SOLID, D 2216-90, Percent Moisture

Phase Separation Sciences

Client Sample ID: S-1A

General Chemistry

Lot-Sample #...: G0K020530-004 Work Order #...: L9FXD Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 19

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	18.9	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-1B

General Chemistry

Lot-Sample #...: G0K020530-005 Work Order #...: L9FXE Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 18

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	18.4	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-2A

General Chemistry

Lot-Sample #...: G0K020530-006 Work Order #...: L9FXF Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 17

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	16.9	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-2B

General Chemistry

Lot-Sample #...: G0K020530-007 Work Order #...: L9FXG Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 13

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	12.5	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-2C

General Chemistry

Lot-Sample #...: G0K020530-008 Work Order #...: L9FXH Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 15

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	14.5	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-3A

General Chemistry

Lot-Sample #...: G0K020530-009 Work Order #...: L9FXJ Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 11

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	11.0	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-3B

General Chemistry

Lot-Sample #...: G0K020530-010 Work Order #...: L9FXL Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 13

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	12.7	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-4A

General Chemistry

Lot-Sample #...: G0K020530-011 Work Order #...: L9FXM Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 10

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	10.5	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-4B

General Chemistry

Lot-Sample #...: G0K020530-012 Work Order #...: L9FXN Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 18

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	18.2	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-5A

General Chemistry

Lot-Sample #...: G0K020530-013 Work Order #...: L9FXQ Matrix.....: SOLID
Date Sampled...: 10/27/10 Date Received..: 10/29/10
% Moisture.....: 15

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	14.5	0.10	%	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1 DL.....: 0.10

Phase Separation Sciences

Client Sample ID: S-5B

General Chemistry

Lot-Sample #...: G0K020530-014 **Work Order #...:** L9FXW **Matrix.....:** SOLID
Date Sampled...: 10/27/10 **Date Received..:** 10/29/10
% Moisture.....: 15

PARAMETER	RESULT	LOQ	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture	15.3	**0.10**	**%**	**ASTM D 2216-90**	**11/09-11/10/10**	**0313210**

Dilution Factor: 1 DL.....: 0.10

QC DATA ASSOCIATION SUMMARY

G0K020530

Sample Preparation and Analysis Control Numbers

SAMPLE#	MATRIX	ANALYTICAL METHOD	LEACH BATCH #	PREP BATCH #	MS RUN#
001	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
002	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
003	WATER	SW846 6020		0312242	0312159
	WATER	SW846 7470A		0313137	0313071
	WATER	SW846 6850_DOD Ha		0314148	0314083
004	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
005	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
006	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
007	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
008	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
009	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180

(Continued on next page)

QC DATA ASSOCIATION SUMMARY

G0K020530

Sample Preparation and Analysis Control Numbers

SAMPLE#	MATRIX	ANALYTICAL METHOD	LEACH BATCH #	PREP BATCH #	MS RUN#
010	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
011	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
012	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
013	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180
014	SOLID	SW846 6020		0313206	0313108
	SOLID	ASTM D 2216-90		0313210	0313112
	SOLID	SW846 7471A		0313106	0313058
	SOLID	SW846 6850_DOD Ha		0308373	0308180

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: G0K020530 **Work Order #...:** L88C4-SMP L88C4-DUP **Matrix.....:** SOLID

Date Sampled...: 10/27/10 **Date Received..:** 10/28/10

% Moisture.....: 7.3

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Moisture						SD Lot-Sample #:	G0J280451-010	
	7.3	7.1	%	3.2	(0-20)	ASTM D 2216-90	11/09-11/10/10	0313210

Dilution Factor: 1

WATER, 6850/DOD Handbook, Perchlorate

Raw Data Package

Run/Batch Data

Includes (as applicable):

runlogs

continuing calibration standards

interference/performance check standards

continuing calibration blanks

method blanks

lcs

ms/sd

sample raw data

ms tune data

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Sequence Table

Data File	Sample Name	Position	Level	Sample Type	Acq. Date & Time
16NOV10-perc-009.d	Blank, no IS	P2-A9		Sample	11/16/2010 16:56
16NOV10-perc-010.d	Blank + IS	P2-C1		Sample	11/16/2010 17:13
16NOV10-perc-011.d	ICAL-1 E100702D Perchlorate Std 0.15ng/mL	P2-B2	1	Calibration	11/16/2010 17:31
16NOV10-perc-012.d	ICAL-2 E100720E Perchlorate Std 0.30ng/mL	P2-B3	2	Calibration	11/16/2010 17:48
16NOV10-perc-013.d	ICAL-3 E100720F Perchlorate Std 0.50ng/mL	P2-B4	3	Calibration	11/16/2010 18:05
16NOV10-perc-014.d	ICAL-4 E100720G Perchlorate Std 1.0ng/mL	P2-B5	4	Calibration	11/16/2010 18:23
16NOV10-perc-015.d	ICAL-5 E100720H Perchlorate Std 2.0ng/mL	P2-B6	5	Calibration	11/16/2010 18:40
16NOV10-perc-016.d	ICAL-6 E100720I Perchlorate Std 5.0ng/mL	P2-B7	6	Calibration	11/16/2010 18:58
16NOV10-perc-017.d	ICAL-7 E100720J Perchlorate Std 10ng/mL	P2-B8	7	Calibration	11/16/2010 19:15
16NOV10-perc-018.d	ICAL-8 E100720K Perchlorate Std 20ng/mL	P2-B9	8	Calibration	11/16/2010 19:33
16NOV10-perc-019.d	STD_6 Perchlorate Std 5.0ng/mL	P2-A2		Sample	11/16/2010 19:50
16NOV10-perc-020.d	STD_6 Perchlorate Std 5.0ng/mL	P2-A2		Sample	11/16/2010 20:08
16NOV10-perc-021.d	Blank + IS	P2-C1		Sample	11/16/2010 20:25
16NOV10-perc-022.d	ICV E100720C Perchlorate Std 5.0ng/mL	P2-C2	ICV	QC	11/16/2010 20:43
16NOV10-perc-023.d	LODV E100720D Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/16/2010 21:00
16NOV10-perc-024.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/16/2010 21:18
16NOV10-perc-025.d	G0K100000-MB, 0314148, 20mL/20mL, 6850-DOD-L	P1-A1		Sample	11/16/2010 21:35
16NOV10-perc-026.d	G0K100000-LCS, 0314148, 20mL/20mL	P1-A2	LCS_0.5	QC	11/16/2010 21:52
16NOV10-perc-027.d	G0K100000-SMCS, 0314148, 20mL/20mL	P1-A3	LCS_0.5	QC	11/16/2010 22:10
16NOV10-perc-028.d	G0K020530-1, 0314148, 20mL/20mL RI @50x	P1-A4		Sample	11/16/2010 22:27
16NOV10-perc-029.d	G0K020530-1MS, 0314148, 20mL/20mL	P1-A5	MS_0.5	QC	11/16/2010 22:45
16NOV10-perc-030.d	G0K020530-1MSD, 0314148, 20mL/20mL	P1-A6	MS_0.5	QC	11/16/2010 23:02
16NOV10-perc-031.d	G0K020530-2, 0314148, 20mL/20mL	P1-A7		Sample	11/16/2010 23:20
16NOV10-perc-032.d	G0K020530-3, 0314148, 20mL/20mL	P1-A8		Sample	11/16/2010 23:37
16NOV10-perc-033.d	Q4 LOQ 6850-L, 0314148, 20mL/20mL	P1-A9		Sample	11/16/2010 23:55
16NOV10-perc-034.d	Q4 LOD 6850-L, 0314148, 20mL/20mL	P2-F3		Sample	11/17/2010 00:12

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16NOV10-perc-035.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 00:30
16NOV10-perc-036.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 00:47
16NOV10-perc-037.d	Blank + IS	P2-C1		Sample	11/17/2010 01:05
16NOV10-perc-038.d	G0K040000-MB, 0308373, 3.00g/10mL, 6850-DOD-S	P1-B1		Sample	11/17/2010 01:22
16NOV10-perc-039.d	G0K040000-LCS, 0308373, 3.00g/10mL,	P1-B2	LCS_5	QC	11/17/2010 01:39
16NOV10-perc-040.d	G0K040000-SMCS, 0308373, 3.00g/10mL,	P1-B3	LCS_5	QC	11/17/2010 01:57
16NOV10-perc-041.d	G0K020530-4, 0308373, 3.09g/10mL,	P1-B4		Sample	11/17/2010 02:14
16NOV10-perc-042.d	G0K020530-5, 0308373, 3.15g/10mL, 1000X + IS	P1-B5		Sample	11/17/2010 02:32
16NOV10-perc-043.d	G0K020530-6, 0308373, 3.25g/10mL, 5X	P1-B6		Sample	11/17/2010 02:49
16NOV10-perc-044.d	G0K020530-7, 0308373, 3.03g/10mL,	P1-B7		Sample	11/17/2010 03:07
16NOV10-perc-045.d	G0K020530-8, 0308373, 3.19g/10mL,	P1-B8		Sample	11/17/2010 03:24
16NOV10-perc-046.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 03:42
16NOV10-perc-047.d	G0K020530-9, 0308373, 3.00g/10mL,	P1-B9		Sample	11/17/2010 03:59
16NOV10-perc-048.d	G0K020530-10, 0308373, 3.07g/10mL,	P1-C1		Sample	11/17/2010 04:16
16NOV10-perc-049.d	G0K020530-11, 0308373, 3.15g/10mL,	P1-C2		Sample	11/17/2010 04:34
16NOV10-perc-050.d	G0K020530-12, 0308373, 3.00g/10mL, 1000X + IS	P1-C3		Sample	11/17/2010 04:51
16NOV10-perc-051.d	G0K020530-12MS, 0308373, 3.11g/10mL, 1000X + IS	P1-C4	MS_5	QC	11/17/2010 05:09
16NOV10-perc-052.d	G0K020530-12MSD, 0308373, 3.18g/10mL, 1000X + IS	P1-C5	MS_5	QC	11/17/2010 05:26
16NOV10-perc-053.d	G0K020530-13, 0308373, 3.10g/10mL,	P1-C6		Sample	11/17/2010 05:44
16NOV10-perc-054.d	G0K020530-14, 0308373, 3.05g/10mL, 10X	P1-C7		Sample	11/17/2010 06:01
16NOV10-perc-055.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 06:19
16NOV10-perc-056.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 06:36
16NOV10-perc-057.d	Blank + IS	P2-C1		Sample	11/17/2010 06:54
16NOV10-perc-058.d	G0J260000-MB, 0299273, 3.00g/10mL, 6850-DOD-S	P1-C8		Sample	11/17/2010 07:11
16NOV10-perc-059.d	G0J260000-LCS, 0299273, 3.00g/10mL,	P1-C9	LCS_5	QC	11/17/2010 07:29
16NOV10-perc-060.d	G0J260000-SMCS, 0299273, 3.00g/10mL,	P1-D1	LCS_5	QC	11/17/2010 07:46
16NOV10-perc-061.d	A0J210551-1, 0299273, 2.98g/10mL,	P1-D2		Sample	11/17/2010 08:04
16NOV10-perc-062.d	A0J210551-2, 0299273, 3.08g/10mL,	P1-D3		Sample	11/17/2010 08:21
16NOV10-perc-063.d	A0J210551-3, 0299273, 3.01g/10mL,	P1-D4		Sample	11/17/2010 08:38

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16NOV10-perc-064.d	A0J210551-3MS, 0299273, 2.98g/10mL,	P1-D5	MS_5	QC	11/17/2010 08:56
16NOV10-perc-065.d	A0J210551-3MSD, 0299273, 3.02g/10mL,	P1-D6	MS_5	QC	11/17/2010 09:13
16NOV10-perc-066.d	A0J210551-4, 0299273, 3.06g/10mL,	P1-D7		Sample	11/17/2010 09:31
16NOV10-perc-067.d	A0J210551-5, 0299273, 3.07g/10mL,	P1-D8		Sample	11/17/2010 09:48
16NOV10-perc-068.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 10:06
16NOV10-perc-069.d	Blank + IS	P2-C1		Sample	11/17/2010 10:23
16NOV10-perc-070.d	A0J210551-6, 0299273, 3.02g/10mL,	P1-D9		Sample	11/17/2010 10:41
16NOV10-perc-071.d	A0J210551-7, 0299273, 2.96g/10mL,	P1-E1		Sample	11/17/2010 10:58
16NOV10-perc-072.d	G0K150000-MB, 0319363, 20mL/20mL, 6850-DOD-L	P1-B1		Sample	11/17/2010 11:16
16NOV10-perc-073.d	G0K150000-LCS, 0319363, 20mL/20mL	P1-B2	LCS_0.5	QC	11/17/2010 11:33
16NOV10-perc-074.d	G0K150000-SMCS, 0319363, 20mL/20mL	P1-B3	LCS_0.5	QC	11/17/2010 11:50
16NOV10-perc-075.d	G0K120447-1, 0319363, 20mL/20mL	P1-B4		Sample	11/17/2010 12:08
16NOV10-perc-076.d	G0K120447-1MS, 0319363, 20mL/20mL	P1-B5	MS_0.5	QC	11/17/2010 12:25
16NOV10-perc-077.d	G0K120447-1MSD, 0319363, 20mL/20mL	P1-B6	MS_0.5	QC	11/17/2010 12:43
16NOV10-perc-078.d	G0K130463-1, 0319363, 20mL/20mL	P1-B7		Sample	11/17/2010 13:00
16NOV10-perc-079.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 13:18
16NOV10-perc-080.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 13:35
16NOV10-perc-081.d	Blank + IS	P2-C1		Sample	11/17/2010 13:53

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Quantitation Results

Compound *Perchlorate*

Data File	Compound	Sample Type	Exp Conc	Response	Accuracy	Final Conc.
16NOV10-perc-009.d	Perchlorate	Sample				
16NOV10-perc-010.d	Perchlorate	Sample		219		
16NOV10-perc-011.d	Perchlorate	Calibration	0.1500	3104	130.5	
16NOV10-perc-012.d	Perchlorate	Calibration	0.3000	4877	95.5	
16NOV10-perc-013.d	Perchlorate	Calibration	0.5000	8532	102.1	
16NOV10-perc-014.d	Perchlorate	Calibration	1.0000	15105	82.8	
16NOV10-perc-015.d	Perchlorate	Calibration	2.0000	29560	88.9	
16NOV10-perc-016.d	Perchlorate	Calibration	5.0000	78435	96.3	
16NOV10-perc-017.d	Perchlorate	Calibration	10.0000	157503	102.5	
16NOV10-perc-018.d	Perchlorate	Calibration	20.0000	300401	101.4	
16NOV10-perc-019.d	Perchlorate	Sample				
16NOV10-perc-020.d	Perchlorate	Sample				
16NOV10-perc-021.d	Perchlorate	Sample		330		
16NOV10-perc-022.d	Perchlorate	QC	5.0000	76334	87.4	
16NOV10-perc-023.d	Perchlorate	QC	0.1500	2620	107.7	
16NOV10-perc-024.d	Perchlorate	QC	5.0000	76957	94.4	
16NOV10-perc-025.d	Perchlorate	Sample				
16NOV10-perc-026.d	Perchlorate	QC	0.5000	6947	86.5	
16NOV10-perc-027.d	Perchlorate	QC	0.5000	8166	97.1	
16NOV10-perc-028.d	Perchlorate	Sample		3880167		
16NOV10-perc-029.d	Perchlorate	QC	0.5000	3873506	155668.3	OSR
16NOV10-perc-030.d	Perchlorate	QC	0.5000	3861931	156941.7	
16NOV10-perc-031.d	Perchlorate	Sample		3875610		
16NOV10-perc-032.d	Perchlorate	Sample		1092		
16NOV10-perc-033.d	Perchlorate	Sample		7879		
16NOV10-perc-034.d	Perchlorate	Sample		1944		

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16NOV10-perc-035.d	Perchlorate	QC	2.0000	29789	87.8
16NOV10-perc-036.d	Perchlorate	QC	0.1500	2800	115.3
16NOV10-perc-037.d	Perchlorate	Sample			
16NOV10-perc-038.d	Perchlorate	Sample			
16NOV10-perc-039.d	Perchlorate	QC	5.0000	21940	27.2
16NOV10-perc-040.d	Perchlorate	QC	5.0000	21856	27.3
16NOV10-perc-041.d	Perchlorate	Sample		349	
16NOV10-perc-042.d	Perchlorate	Sample		45942	
16NOV10-perc-043.d	Perchlorate	Sample		176119	
16NOV10-perc-044.d	Perchlorate	Sample		2535	
16NOV10-perc-045.d	Perchlorate	Sample		46480	
16NOV10-perc-046.d	Perchlorate	QC	5.0000	74546	91.5
16NOV10-perc-047.d	Perchlorate	Sample		17573	
16NOV10-perc-048.d	Perchlorate	Sample		126988	
16NOV10-perc-049.d	Perchlorate	Sample		128041	
16NOV10-perc-050.d	Perchlorate	Sample		63694	
16NOV10-perc-051.d	Perchlorate	QC	5.0000	68655	64888.8
16NOV10-perc-052.d	Perchlorate	QC	5.0000	61961	63311.2
16NOV10-perc-053.d	Perchlorate	Sample		7917	
16NOV10-perc-054.d	Perchlorate	Sample		96830	
16NOV10-perc-055.d	Perchlorate	QC	2.0000	30076	86.9
16NOV10-perc-056.d	Perchlorate	QC	0.1500	2654	106.1
16NOV10-perc-057.d	Perchlorate	Sample		279	
16NOV10-perc-058.d	Perchlorate	Sample			
16NOV10-perc-059.d	Perchlorate	QC	5.0000	22047	27.4
16NOV10-perc-060.d	Perchlorate	QC	5.0000	22942	28.1
16NOV10-perc-061.d	Perchlorate	Sample		4032236	
16NOV10-perc-062.d	Perchlorate	Sample		964939	
16NOV10-perc-063.d	Perchlorate	Sample		3020	

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16NOV10-perc-064.d	Perchlorate	QC	5.0000	25833	31.4
16NOV10-perc-065.d	Perchlorate	QC	5.0000	25985	32.7
16NOV10-perc-066.d	Perchlorate	Sample		16366	
16NOV10-perc-067.d	Perchlorate	Sample		1703	
16NOV10-perc-068.d	Perchlorate	QC	2.0000	31405	88.3
16NOV10-perc-069.d	Perchlorate	Sample			
16NOV10-perc-070.d	Perchlorate	Sample		12043	
16NOV10-perc-071.d	Perchlorate	Sample		6274	
16NOV10-perc-072.d	Perchlorate	Sample			
16NOV10-perc-073.d	Perchlorate	QC	0.5000	8178	94.0
16NOV10-perc-074.d	Perchlorate	QC	0.5000	8058	87.6
16NOV10-perc-075.d	Perchlorate	Sample		45208	
16NOV10-perc-076.d	Perchlorate	QC	0.5000	53198	591.8
16NOV10-perc-077.d	Perchlorate	QC	0.5000	53492	593.2
16NOV10-perc-078.d	Perchlorate	Sample		93364	
16NOV10-perc-079.d	Perchlorate	QC	5.0000	81120	92.2
16NOV10-perc-080.d	Perchlorate	QC	0.1500	2763	103.3
16NOV10-perc-081.d	Perchlorate	Sample			

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Quantitation Results

Compound *Perchlorate-(35Cl18O4)*

Data File	Compound	Sample Type	Exp Conc	Response	Accuracy	Final Conc.
16NOV10-perc-009.d	Perchlorate-(35Cl18O4)	Sample				
16NOV10-perc-010.d	Perchlorate-(35Cl18O4)	Sample		190515		
16NOV10-perc-011.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	185574		
16NOV10-perc-012.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	198021		
16NOV10-perc-013.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	193127		
16NOV10-perc-014.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	209981		
16NOV10-perc-015.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	190942		
16NOV10-perc-016.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	186717		
16NOV10-perc-017.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	176091		
16NOV10-perc-018.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	169654	188763.3	Averge ICAL IS area response
16NOV10-perc-019.d	Perchlorate-(35Cl18O4)	Sample			-100.0	Run not needed
16NOV10-perc-020.d	Perchlorate-(35Cl18O4)	Sample			-100.0	Run not needed
16NOV10-perc-021.d	Perchlorate-(35Cl18O4)	Sample		193688	2.6	% Dev from average
16NOV10-perc-022.d	Perchlorate-(35Cl18O4)	QC	10.0000	200224	6.1	
16NOV10-perc-023.d	Perchlorate-(35Cl18O4)	QC	10.0000	190832	1.1	
16NOV10-perc-024.d	Perchlorate-(35Cl18O4)	QC	10.0000	186919	-1.0	
16NOV10-perc-025.d	Perchlorate-(35Cl18O4)	Sample		187015	-0.9	
16NOV10-perc-026.d	Perchlorate-(35Cl18O4)	QC	10.0000	185831	-1.6	
16NOV10-perc-027.d	Perchlorate-(35Cl18O4)	QC	10.0000	194296	2.9	
16NOV10-perc-028.d	Perchlorate-(35Cl18O4)	Sample		57084	-69.8	See 50X dilution
16NOV10-perc-029.d	Perchlorate-(35Cl18O4)	QC	10.0000	57005	-69.8	See 50X dilution
16NOV10-perc-030.d	Perchlorate-(35Cl18O4)	QC	10.0000	56373	-70.1	See 50X dilution
16NOV10-perc-031.d	Perchlorate-(35Cl18O4)	Sample		59265	-68.6	See 50X dilution
16NOV10-perc-032.d	Perchlorate-(35Cl18O4)	Sample		195568	3.6	
16NOV10-perc-033.d	Perchlorate-(35Cl18O4)	Sample		191420	1.4	
16NOV10-perc-034.d	Perchlorate-(35Cl18O4)	Sample		188321	-0.2	

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16NOV10-perc-035.d	Perchlorate-(35Cl18O4)	QC	10.0000	194852	3.2	
16NOV10-perc-036.d	Perchlorate-(35Cl18O4)	QC	10.0000	190185	0.8	
16NOV10-perc-037.d	Perchlorate-(35Cl18O4)	Sample		193918	2.7	
16NOV10-perc-038.d	Perchlorate-(35Cl18O4)	Sample		189384	0.3	
16NOV10-perc-039.d	Perchlorate-(35Cl18O4)	QC	10.0000	185333	-1.8	
16NOV10-perc-040.d	Perchlorate-(35Cl18O4)	QC	10.0000	184079	-2.5	
16NOV10-perc-041.d	Perchlorate-(35Cl18O4)	Sample		182079	-3.5	
16NOV10-perc-042.d	Perchlorate-(35Cl18O4)	Sample		213495	13.1	
16NOV10-perc-043.d	Perchlorate-(35Cl18O4)	Sample		33733	-10.6	
16NOV10-perc-044.d	Perchlorate-(35Cl18O4)	Sample		182991	-3.1	5x Dilution
16NOV10-perc-045.d	Perchlorate-(35Cl18O4)	Sample		177772	-5.8	
16NOV10-perc-046.d	Perchlorate-(35Cl18O4)	QC	10.0000	186789	-1.0	
16NOV10-perc-047.d	Perchlorate-(35Cl18O4)	Sample		187055	-0.9	
16NOV10-perc-048.d	Perchlorate-(35Cl18O4)	Sample		177923	-5.7	
16NOV10-perc-049.d	Perchlorate-(35Cl18O4)	Sample		172295	-8.7	
16NOV10-perc-050.d	Perchlorate-(35Cl18O4)	Sample		215870	14.4	
16NOV10-perc-051.d	Perchlorate-(35Cl18O4)	QC	10000.0000	242703	28.6	
16NOV10-perc-052.d	Perchlorate-(35Cl18O4)	QC	10000.0000	224505	18.9	
16NOV10-perc-053.d	Perchlorate-(35Cl18O4)	Sample		188452	-0.2	
16NOV10-perc-054.d	Perchlorate-(35Cl18O4)	Sample		18752	-0.7	10x Dilution
16NOV10-perc-055.d	Perchlorate-(35Cl18O4)	QC	10.0000	198745	5.3	
16NOV10-perc-056.d	Perchlorate-(35Cl18O4)	QC	10.0000	196302	4.0	
16NOV10-perc-057.d	Perchlorate-(35Cl18O4)	Sample		200694	6.3	
16NOV10-perc-058.d	Perchlorate-(35Cl18O4)	Sample		189443	0.4	
16NOV10-perc-059.d	Perchlorate-(35Cl18O4)	QC	10.0000	184685	-2.2	
16NOV10-perc-060.d	Perchlorate-(35Cl18O4)	QC	10.0000	187799	-0.5	
16NOV10-perc-061.d	Perchlorate-(35Cl18O4)	Sample		53074	-71.9	See 50X dilution
16NOV10-perc-062.d	Perchlorate-(35Cl18O4)	Sample		119064	-36.9	
16NOV10-perc-063.d	Perchlorate-(35Cl18O4)	Sample		186101	-1.4	

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16NOV10-perc-064.d	Perchlorate-(35Cl18O4)	QC	10000.0000	188960	0.1
16NOV10-perc-065.d	Perchlorate-(35Cl18O4)	QC	10000.0000	182363	-3.4
16NOV10-perc-066.d	Perchlorate-(35Cl18O4)	Sample		184053	-2.5
16NOV10-perc-067.d	Perchlorate-(35Cl18O4)	Sample		184681	-2.2
16NOV10-perc-068.d	Perchlorate-(35Cl18O4)	QC	10.0000	204132	8.1
16NOV10-perc-069.d	Perchlorate-(35Cl18O4)	Sample		202103	7.1
16NOV10-perc-070.d	Perchlorate-(35Cl18O4)	Sample		185444	-1.8
16NOV10-perc-071.d	Perchlorate-(35Cl18O4)	Sample		196456	4.1
16NOV10-perc-072.d	Perchlorate-(35Cl18O4)	Sample		205854	9.1
16NOV10-perc-073.d	Perchlorate-(35Cl18O4)	QC	10.0000	201092	6.5
16NOV10-perc-074.d	Perchlorate-(35Cl18O4)	QC	10.0000	212801	12.7
16NOV10-perc-075.d	Perchlorate-(35Cl18O4)	Sample		203683	7.9
16NOV10-perc-076.d	Perchlorate-(35Cl18O4)	QC	10.0000	206224	9.3
16NOV10-perc-077.d	Perchlorate-(35Cl18O4)	QC	10.0000	206864	9.6
16NOV10-perc-078.d	Perchlorate-(35Cl18O4)	Sample		201928	7.0
16NOV10-perc-079.d	Perchlorate-(35Cl18O4)	QC	10.0000	201806	6.9
16NOV10-perc-080.d	Perchlorate-(35Cl18O4)	QC	10.0000	210100	11.3
16NOV10-perc-081.d	Perchlorate-(35Cl18O4)	Sample		214743	13.8

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 21:18
Analyst	lores
Data File	16NOV10-perc-024 d
Acquisition Method	PercMRM_2.m
Sample Name	CCV_6 E100720I Perchlorate Std 5.0ng/mL
Sample Identification	CCV_6
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C7
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

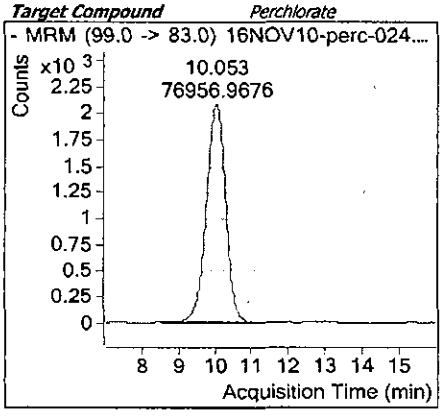
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.053	76957	99	83	4.72019	4.72019	1
Perchlorate-(35Cl18O4)	ISTD	10.044	186919	107	89			1
							-5.6 % Deviation	

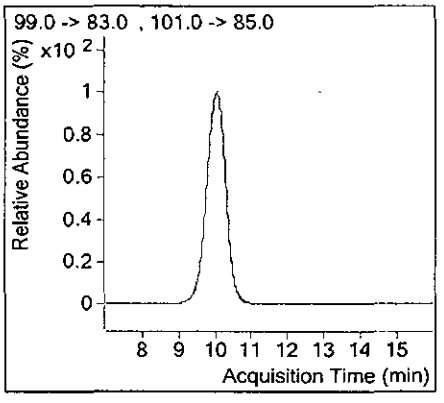
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	25592	101	85	3.01	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	57460	109	91	3.25	2.30	3.80	In Control

Compound Graphics

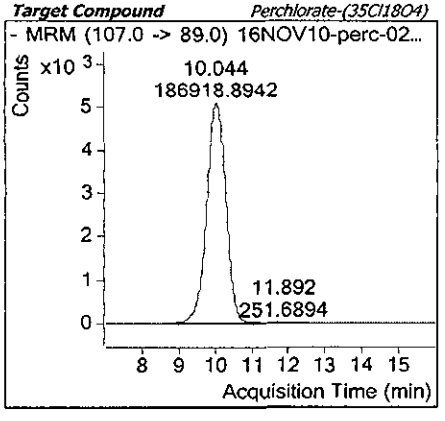
mr 11/17/10

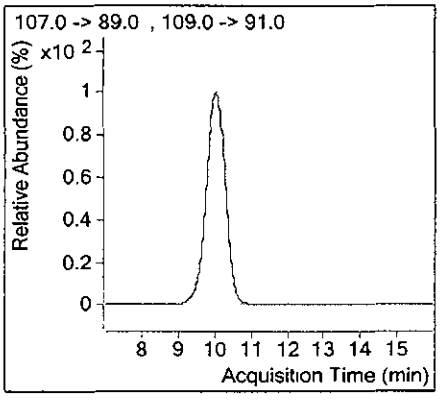
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 21:35
Analyst	lores
Data File	16NOV10-perc-025.d
Acquisition Method	PercMRM_2 m
Sample Name	G0K100000-MB, 0314148, 20mL/20mL, 6850-DOD-L
Sample Identification	L9RPG1AAB
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-A1
Exp. Concentration	
Injection Volume	50

Quantitation Results

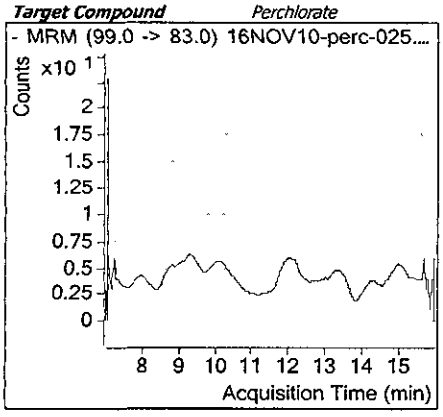
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate-(35Cl18O4)	ISTD	10.038	187015	107	89			1
							Perchlorate = ND ✓	

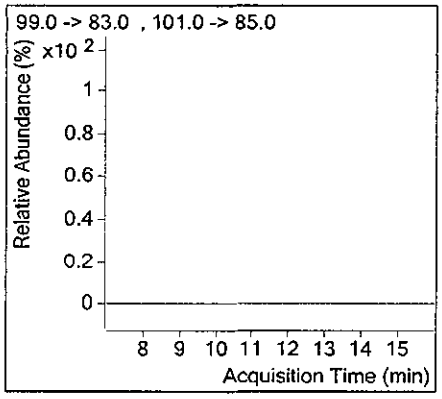
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	57502	109	91	3 25	2.30	3.80	In Control

Compound Graphics

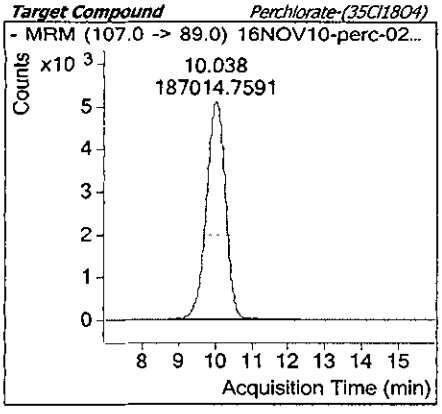
mr 11/17/10

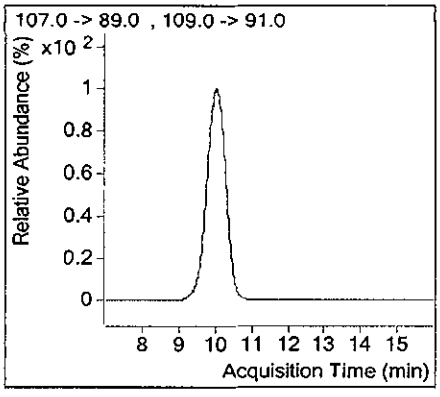
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 21:52
Analyst	lores
Data File	16NOV10-perc-026.d
Acquisition Method	PercMRM_2 m
Sample Name	G0K100000-LCS, 0314148, 20mL/20mL
Sample Identification	L9RPG1ACC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P1-A2
Exp. Concentration	0.50
Injection Volume	50

Quantitation Results

Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.053	6947	99	83	0.43248	0.43248	1
Perchlorate-(35Cl18O4)	ISTD	10 039	185831	107	89			1
							86.5 % Recovery	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	2576	101	85	2 70	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	56900	109	91	3.27	2 30	3.80	In Control

Compound Graphics

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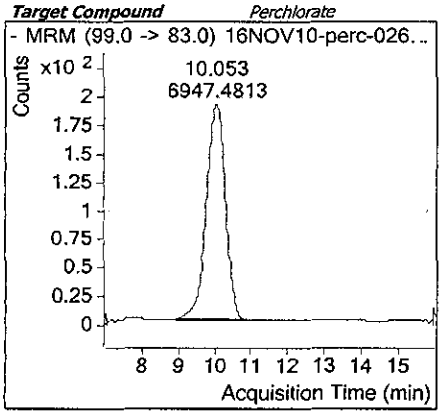
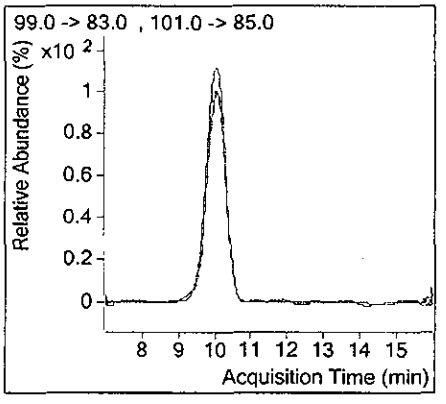
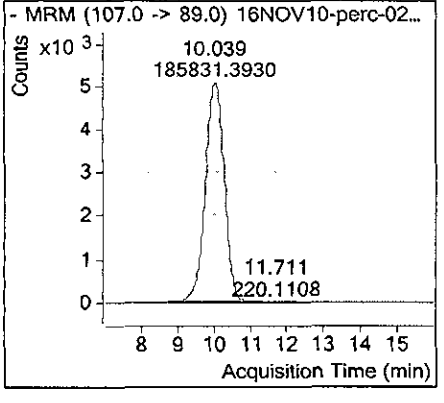
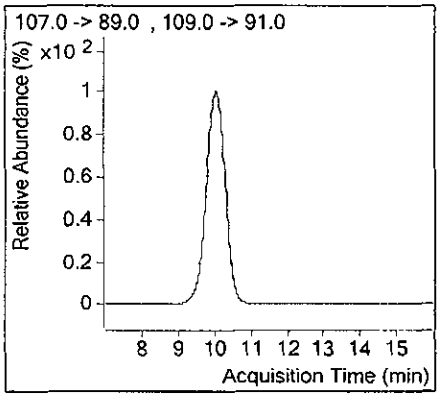
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 22:10
Analyst	lores
Data File	16NOV10-perc-027.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K100000-SMCS, 0314148, 20mL/20mL
Sample Identification	L9RPG1ADC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P1-A3
Exp. Concentration	0.50
Injection Volume	50

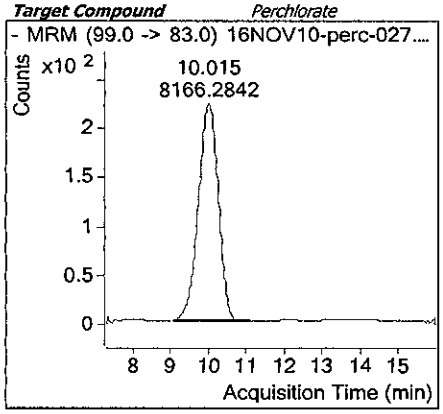
Quantitation Results

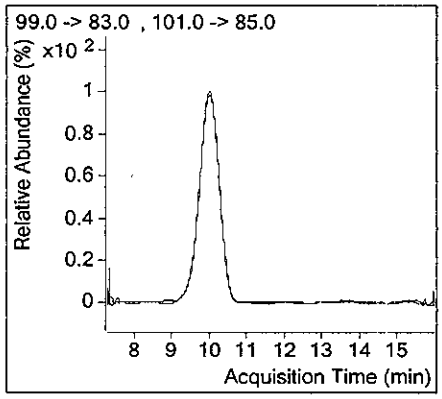
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.015	8166	99	83	0.48568	0.48568	1
Perchlorate-(35Cl18O4)	ISTD	10.006	194296	107	89			1
							97.1 % Recovery	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	2757	101	85	2 96	2 30	3.80	In Control
Perchlorate-(35Cl18O4)	60250	109	91	3.22	2 30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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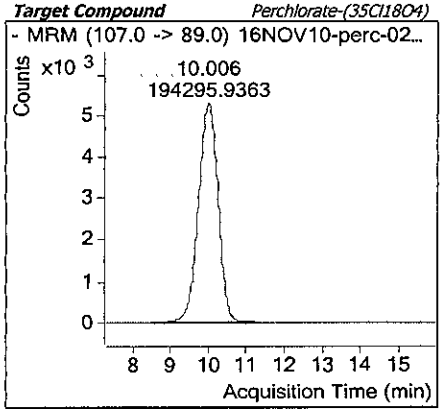
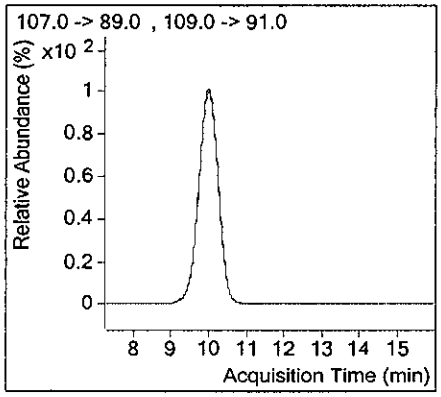
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 23:37
Analyst	lores
Data File	16NOV10-perc-032.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-3, 0314148, 20mL/20mL
Sample Identification	L9FXC1AA
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-A8
Exp. Concentration	
Injection Volume	50

Quantitation Results

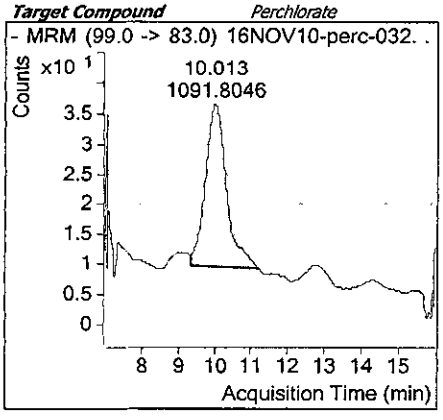
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.013	1092	99	83	0.06819	0.06819	1
Perchlorate-(35Cl18O4)	ISTD	10 030	195568	107	89			1

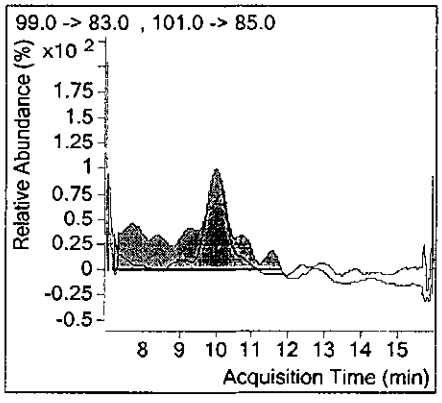
Result is < MDL => ND

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	891	101	85	1.23	2.30	3.80	Low
Perchlorate-(35Cl18O4)	59955	109	91	3.26	2.30	3.80	In Control

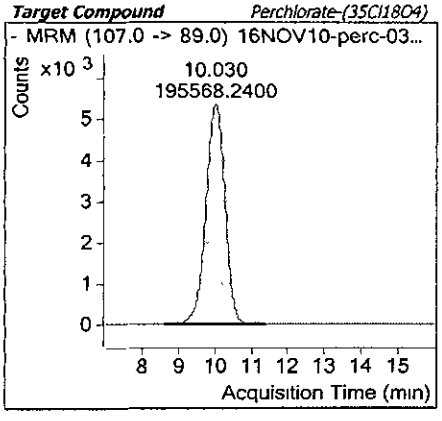
Compound Graphics

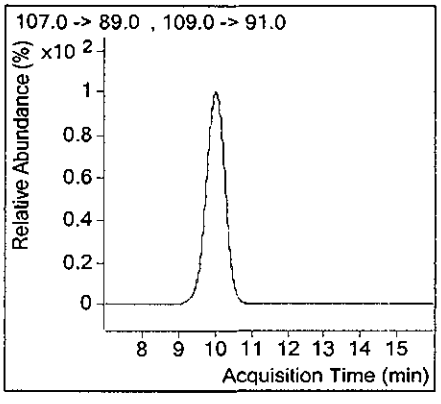
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





mr 11/17/10

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 00:30
Analyst	lores
Data File	16NOV10-perc-035.d
Acquisition Method	PercMRM_2 m
Sample Name	CCV_5 E100720H Perchlorate Std 2 0ng/mL
Sample Identification	CCV_5
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45'55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C6
Exp. Concentration	2 00
Injection Volume	50

Quantitation Results

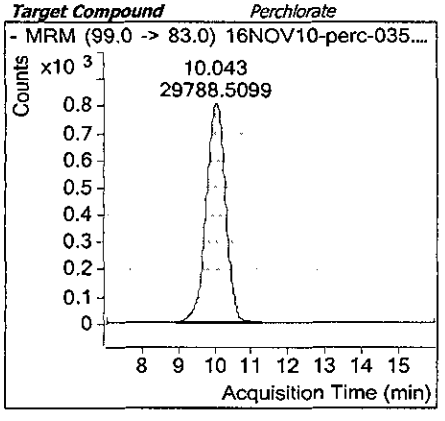
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.043	29789	99	83	1.75538	1.75538	1
Perchlorate-(35Cl18O4)	ISTD	10.033	194852	107	89			1
							-12.2 % Deviation	

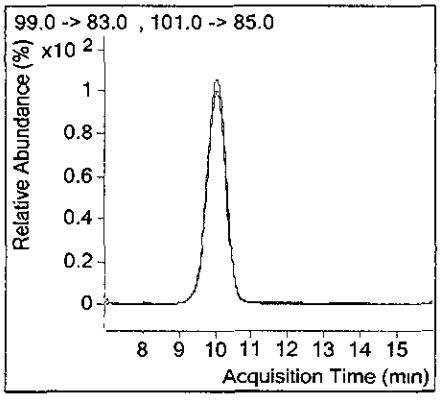
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	10553	101	85	2 82	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	58875	109	91	3 31	2.30	3.80	In Control

Compound Graphics

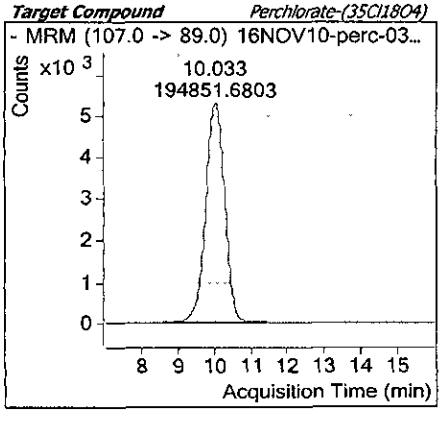
✓ m 11/17/10

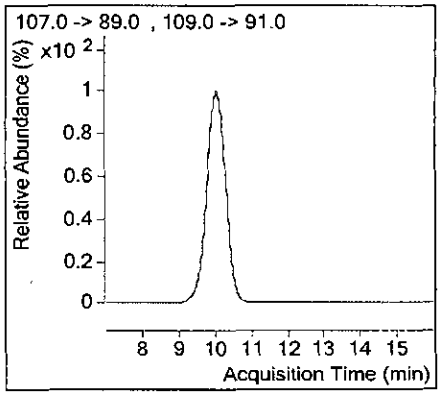
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 00:47
Analyst	lores
Data File	16NOV10-perc-036.d
Acquisition Method	PercMRM_2.m
Sample Name	LODV E100924A Perchlorate Std 0.15ng/mL
Sample Identification	LODV
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C3
Exp. Concentration	0 15
Injection Volume	50

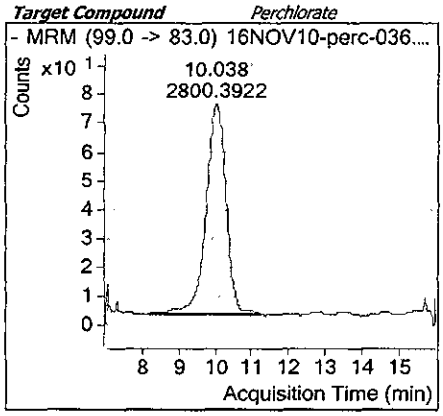
Quantitation Results

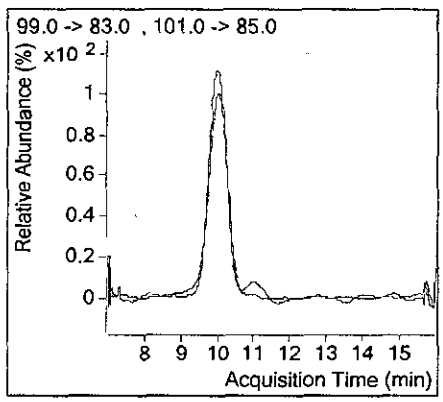
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10 038	2800	99	83	**0.17291**	**0.17291**	1
Perchlorate-(35Cl18O4)	ISTD	10.032	190185	107	89			1
							15.3 % Deviation	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	980	101	85	2.86	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	59992	109	91	3 17	2.30	3.80	In Control

Compound Graphics

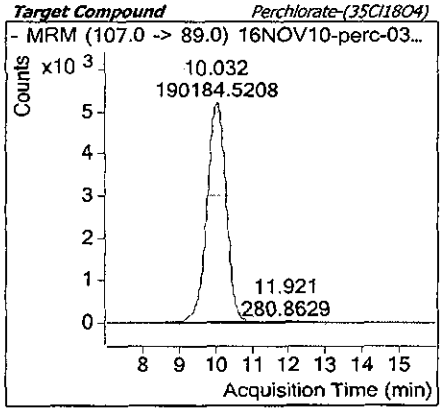
Target Compound *Perchlorate*

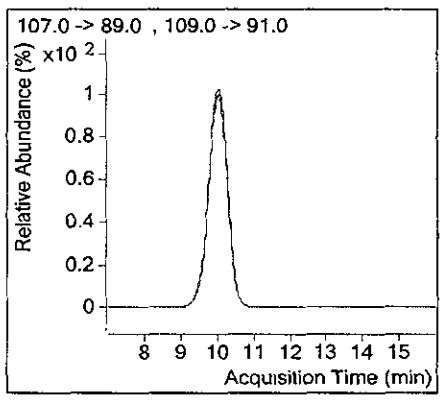




✓ m 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 01:05
Analyst	lores
Data File	16NOV10-perc-037.d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

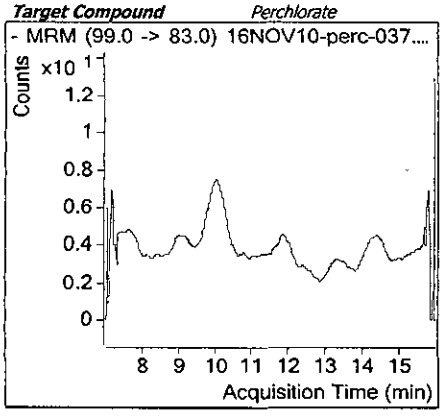
Quantitation Results

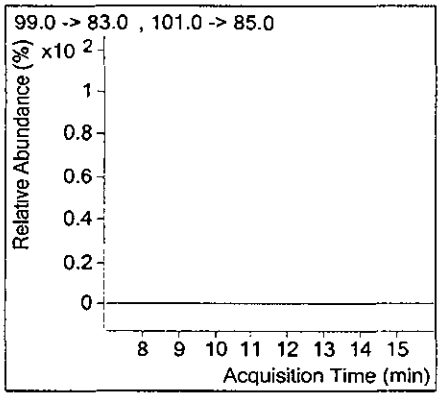
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate-(35Cl18O4)	ISTD	10 033	193918	107	89	Perchlorate = ND		1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	60642	109	91	3.20	2.30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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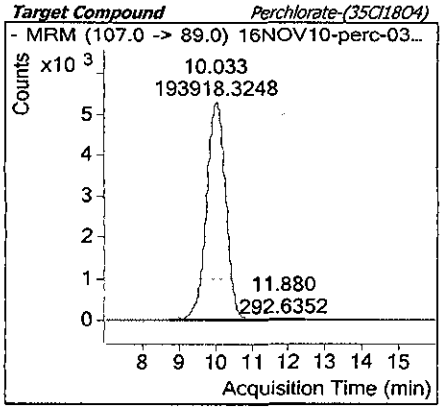
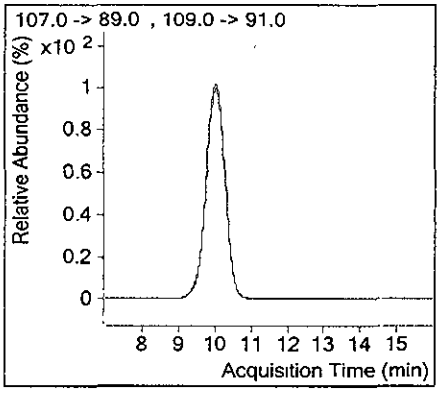
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Sequence Table

Data File	Sample Name	Position	Level	Sample Type	Acq. Date & Time
17NOV10-perc-005.d	Blank, no IS	P2-A9		Sample	11/17/2010 16:36
17NOV10-perc-006.d	Blank + IS	P2-C1		Sample	11/17/2010 16:54
17NOV10-perc-007.d	ICAL-1 E100702D Perchlorate Std 0.15ng/mL	P2-B2	1	Calibration	11/17/2010 17:11
17NOV10-perc-008.d	ICAL-2 E100720E Perchlorate Std 0.30ng/mL	P2-B3	2	Calibration	11/17/2010 17:29
17NOV10-perc-009.d	ICAL-3 E100720F Perchlorate Std 0.50ng/mL	P2-B4	3	Calibration	11/17/2010 17:46
17NOV10-perc-010.d	ICAL-4 E100720G Perchlorate Std 1.0ng/mL	P2-B5	4	Calibration	11/17/2010 18:04
17NOV10-perc-011.d	ICAL-5 E100720H Perchlorate Std 2.0ng/mL	P2-B6	5	Calibration	11/17/2010 18:21
17NOV10-perc-012.d	ICAL-6 E100720I Perchlorate Std 5.0ng/mL	P2-B7	6	Calibration	11/17/2010 18:38
17NOV10-perc-013.d	ICAL-7 E100720J Perchlorate Std 10ng/mL	P2-B8	7	Calibration	11/17/2010 18:56
17NOV10-perc-014.d	ICAL-8 E100720K Perchlorate Std 20ng/mL	P2-B9	8	Calibration	11/17/2010 19:13
17NOV10-perc-015.d	Blank + IS	P2-C1		Sample	11/17/2010 19:31
17NOV10-perc-016.d	ICV E100720C Perchlorate Std 5.0ng/mL	P2-C2	ICV	QC	11/17/2010 19:48
17NOV10-perc-017.d	LODV E100720D Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 20:06
17NOV10-perc-018.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 20:23
17NOV10-perc-019.d	G0K100000-MB, 0314148, 20mL/20mL, 6850-DOD-L Not needed	P1-A1		Sample	11/17/2010 20:41
17NOV10-perc-020.d	G0K020530-1, 0314148, 20mL/20mL, 50x	P1-A4		Sample	11/17/2010 20:58
17NOV10-perc-021.d	G0K020530-1MS, 0314148, 20mL/20mL, 50x MB 11/19/10	P1-A5	MS_0.5	QC	11/17/2010 21:16
17NOV10-perc-022.d	G0K020530-1MSD, 0314148, 20mL/20mL, 50x	P1-A6	MS_0.5	QC	11/17/2010 21:33
17NOV10-perc-023.d	G0K020530-2, 0314148, 20mL/20mL, 50x	P1-A7		Sample	11/17/2010 21:51
17NOV10-perc-024.d	Q4 LOQ 6850-L, 0314148, 20mL/20mL	P1-A9		Sample	11/17/2010 22:08
17NOV10-perc-025.d	Q4 LOD 6850-L, 0314148, 20mL/20mL	P2-F3		Sample	11/17/2010 22:26
17NOV10-perc-026.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 22:43
17NOV10-perc-027.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 23:01
17NOV10-perc-028.d	Blank + IS	P2-C1		Sample	11/17/2010 23:18
17NOV10-perc-029.d	A0J210551-1, 0299273, 2.98g/10mL, 50x	P1-D2		Sample	11/17/2010 23:36
17NOV10-perc-030.d	A0J210551-2, 0299273, 3.08g/10mL, 10x	P1-D3		Sample	11/17/2010 23:53

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

17NOV10-perc-031.d	A0J210551-3, 0299273, 3.01g/10mL,	P1-D4		Sample	11/18/2010 00:11
17NOV10-perc-032.d	A0J210551-3MS, 0299273, 2.98g/10mL,	P1-D5	M5_5	QC	11/18/2010 00:28
17NOV10-perc-033.d	A0J210551-3MSD, 0299273, 3.02g/10mL,	P1-D6	MS_5	QC	11/18/2010 00:45
17NOV10-perc-034.d	A0J210551-4, 0299273, 3.06g/10mL,	P1-D7		Sample	11/18/2010 01:03
17NOV10-perc-035.d	A0J210551-5, 0299273, 3.07g/10mL,	P1-D8		Sample	11/18/2010 01:20
17NOV10-perc-036.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/18/2010 01:38
17NOV10-perc-037.d	A0J210551-8, 0299273, 2.97g/10mL,	P1-E2		Sample	11/18/2010 01:55
17NOV10-perc-038.d	A0J210551-9, 0299273, 3.00g/10mL,	P1-E3		Sample	11/18/2010 02:13

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Quantitation Results

Compound *Perchlorate*

Data File	Compound	Sample Type	Exp Conc	Response	Accuracy	Final Conc.
17NOV10-perc-005.d	Perchlorate	Sample				
17NOV10-perc-006.d	Perchlorate	Sample				
17NOV10-perc-007.d	Perchlorate	Calibration	0.1500	2870	127.6	
17NOV10-perc-008.d	Perchlorate	Calibration	0.3000	4846	98.4	
17NOV10-perc-009.d	Perchlorate	Calibration	0.5000	8636	104.7	
17NOV10-perc-010.d	Perchlorate	Calibration	1.0000	15241	83.1	
17NOV10-perc-011.d	Perchlorate	Calibration	2.0000	29981	88.7	
17NOV10-perc-012.d	Perchlorate	Calibration	5.0000	78623	94.6	
17NOV10-perc-013.d	Perchlorate	Calibration	10.0000	157978	100.0	
17NOV10-perc-014.d	Perchlorate	Calibration	20.0000	311448	103.0	
17NOV10-perc-015.d	Perchlorate	Sample				
17NOV10-perc-016.d	Perchlorate	QC	5.0000	81686	89.6	
17NOV10-perc-017.d	Perchlorate	QC	0.1500	2688	118.6	
17NOV10-perc-018.d	Perchlorate	QC	5.0000	79842	96.8	
17NOV10-perc-019.d	Perchlorate	Sample				
17NOV10-perc-020.d	Perchlorate	Sample		219942		
17NOV10-perc-021.d	Perchlorate	QC	0.5000	222376	133301.8	
17NOV10-perc-022.d	Perchlorate	QC	0.5000	218111	127527.2	
17NOV10-perc-023.d	Perchlorate	Sample		217275		
17NOV10-perc-024.d	Perchlorate	Sample		7977		
17NOV10-perc-025.d	Perchlorate	Sample		1408		
17NOV10-perc-026.d	Perchlorate	QC	2.0000	30224	88.4	
17NOV10-perc-027.d	Perchlorate	QC	0.1500	2508	112.8	
17NOV10-perc-028.d	Perchlorate	Sample				
17NOV10-perc-029.d	Perchlorate	Sample		132202		
17NOV10-perc-030.d	Perchlorate	Sample		222782		

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

17NOV10-perc-031.d	Perchlorate	Sample		2757	
17NOV10-perc-032.d	Perchlorate	QC	5.0000	26521	33.0
17NOV10-perc-033.d	Perchlorate	QC	5.0000	26087	34.0
17NOV10-perc-034.d	Perchlorate	Sample		14817	
17NOV10-perc-035.d	Perchlorate	Sample		1386	
17NOV10-perc-036.d	Perchlorate	QC	2.0000	30344	88.9
17NOV10-perc-037.d	Perchlorate	Sample			
17NOV10-perc-038.d	Perchlorate	Sample		580	

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Quantitation Results

Compound *Perchlorate-(35Cl18O4)*

Data File	Compound	Sample Type	Exp Conc	Response	Accuracy	Final Conc.
17NOV10-perc-005.d	Perchlorate-(35Cl18O4)	Sample				
17NOV10-perc-006.d	Perchlorate-(35Cl18O4)	Sample		199978		
17NOV10-perc-007.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	197834		
17NOV10-perc-008.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	206357		
17NOV10-perc-009.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	199654		
17NOV10-perc-010.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	218171		
17NOV10-perc-011.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	197820		
17NOV10-perc-012.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	192874		
17NOV10-perc-013.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	182942		
17NOV10-perc-014.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	174741	196299.0	Averge ICAL IS area response
17NOV10-perc-015.d	Perchlorate-(35Cl18O4)	Sample		202273	3.0	% Dev from average
17NOV10-perc-016.d	Perchlorate-(35Cl18O4)	QC	10.0000	211728	7.9	
17NOV10-perc-017.d	Perchlorate-(35Cl18O4)	QC	10.0000	201498	2.6	
17NOV10-perc-018.d	Perchlorate-(35Cl18O4)	QC	10.0000	191353	-2.5	
17NOV10-perc-019.d	Perchlorate-(35Cl18O4)	Sample		194426	-1.0	
17NOV10-perc-020.d	Perchlorate-(35Cl18O4)	Sample		4074	3.8	50x dilution
17NOV10-perc-021.d	Perchlorate-(35Cl18O4)	QC	10.0000	3853	-1.9	50x dilution
17NOV10-perc-022.d	Perchlorate-(35Cl18O4)	QC	10.0000	3950	0.6	50x dilution
17NOV10-perc-023.d	Perchlorate-(35Cl18O4)	Sample		4009	2.1	50x dilution
17NOV10-perc-024.d	Perchlorate-(35Cl18O4)	Sample		196787	0.2	
17NOV10-perc-025.d	Perchlorate-(35Cl18O4)	Sample		193630	-1.4	
17NOV10-perc-026.d	Perchlorate-(35Cl18O4)	QC	10.0000	200124	1.9	
17NOV10-perc-027.d	Perchlorate-(35Cl18O4)	QC	10.0000	199324	1.5	
17NOV10-perc-028.d	Perchlorate-(35Cl18O4)	Sample		201465	2.6	
17NOV10-perc-029.d	Perchlorate-(35Cl18O4)	Sample		17799	-9.3	
17NOV10-perc-030.d	Perchlorate-(35Cl18O4)	Sample		3636	-7.4	

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

17NOV10-perc-031.d	Perchlorate-(35Cl18O4)	Sample		187484	-4.5
17NOV10-perc-032.d	Perchlorate-(35Cl18O4)	QC	10.0000	188263	-4.1
17NOV10-perc-033.d	Perchlorate-(35Cl18O4)	QC	10.0000	179789	-8.4
17NOV10-perc-034.d	Perchlorate-(35Cl18O4)	Sample		183458	-6.5
17NOV10-perc-035.d	Perchlorate-(35Cl18O4)	Sample		182838	-6.9
17NOV10-perc-036.d	Perchlorate-(35Cl18O4)	QC	10.0000	199770	1.8
17NOV10-perc-037.d	Perchlorate-(35Cl18O4)	Sample		169312	-13.7
17NOV10-perc-038.d	Perchlorate-(35Cl18O4)	Sample		176857	-9.9

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 20:23
Analyst	lores
Data File	17NOV10-perc-018.d
Acquisition Method	PercMRM_2 m
Sample Name	CCV_6 E100720I Perchlorate Std 5 0ng/mL
Sample Identification	CCV_6
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C7
Exp. Concentration	5.00
Injection Volume	50

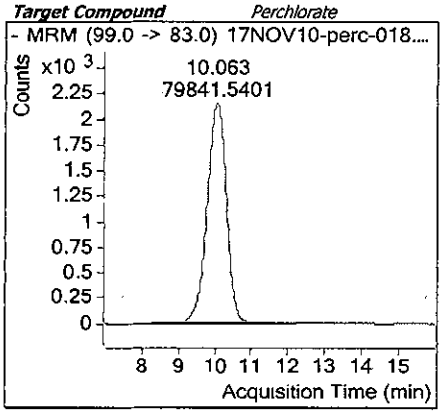
Quantitation Results

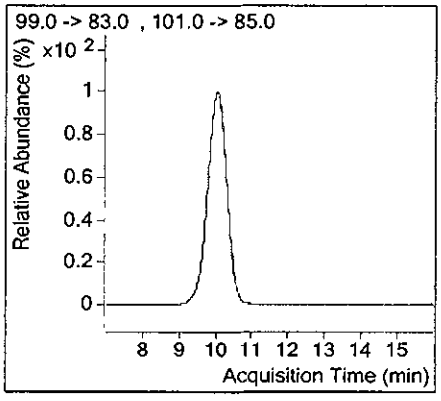
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.063	79842	99	83	**4.84245**	**4.84245**	1
Perchlorate-(35Cl18O4)	ISTD	10 055	191353	107	89			1
							-3.2 % Deviation	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	26211	101	85	3.05	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	59476	109	91	3.22	2.30	3 80	In Control

Compound Graphics

Target Compound *Perchlorate*





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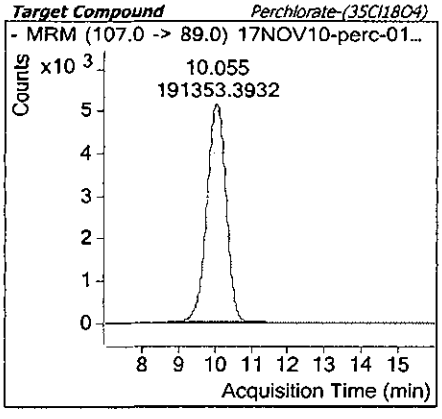
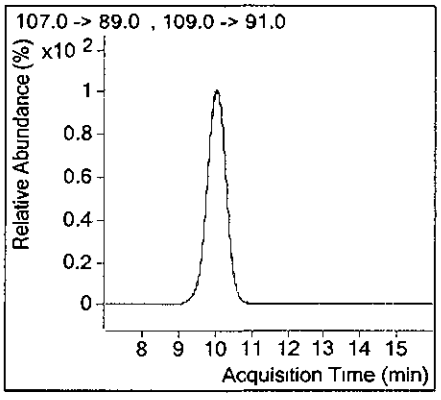
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 20:58
Analyst	lores
Data File	17NOV10-perc-020.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-1, 0314148, 20mL/20mL, 50x
Sample Identification	L9FW81AA
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-A4
Exp. Concentration	
Injection Volume	50

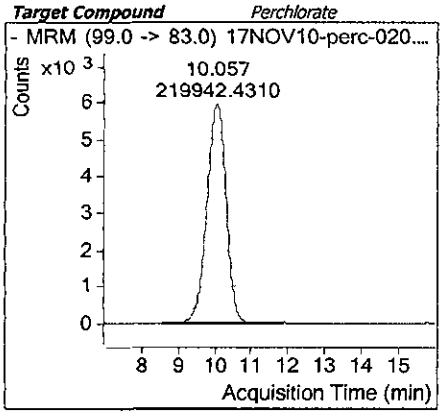
Quantitation Results

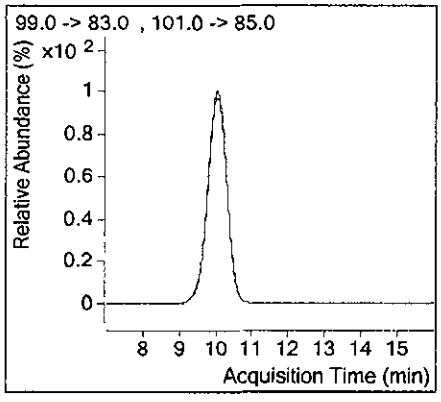
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.057	219942	99	83	623.56062	623.56062	1
Perchlorate-(35Cl18O4)	ISTD	10.059	4074	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	71057	101	85	3.10	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	1258	109	91	3.24	2.30	3.80	In Control

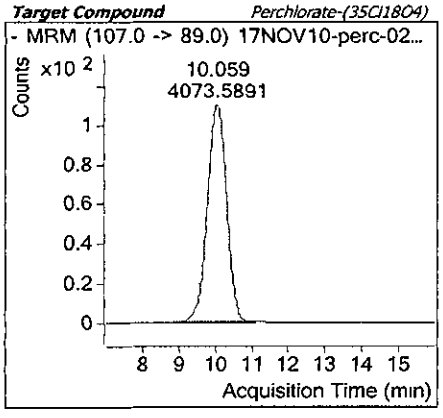
Compound Graphics

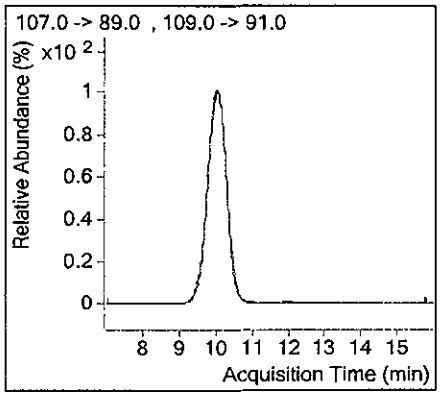
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





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TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 21:16
Analyst	lores
Data File	17NOV10-perc-021 d
Acquisition Method	PercMRM_2 m
Sample Name	G0K020530-1MS, 0314148, 20mL/20mL, 50x
Sample Identification	L9FW81ALS
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P1-A5
Exp. Concentration	0.50
Injection Volume	50

Quantitation Results

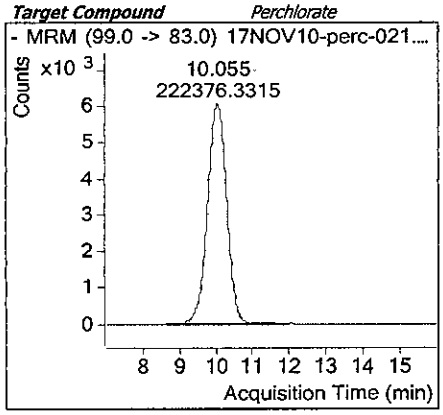
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.055	222376	99	83	666.50908	666.50908	1
Perchlorate-(35Cl18O4)	ISTD	10.051	3853	107	89			1

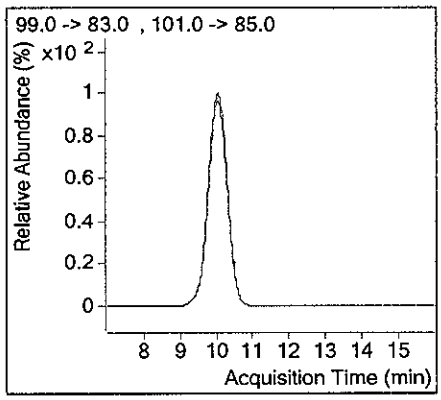
%R NC, MSA ✓

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	71414	101	85	3.11	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	1183	109	91	3.26	2.30	3.80	In Control

Compound Graphics

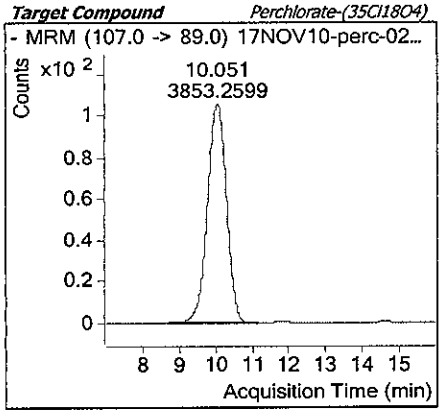
Target Compound *Perchlorate*

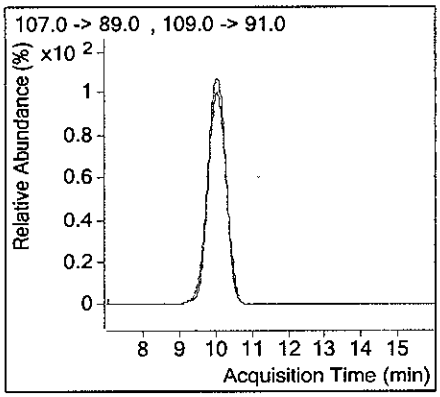




M 11/19/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 21:33
Analyst	lores
Data File	17NOV10-perc-022.d
Acquisition Method	PercMRM_2 m
Sample Name	G0K020530-1MSD, 0314148, 20mL/20mL, 50x
Sample Identification	L9FW81AMD
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P1-A6
Exp. Concentration	0.50
Injection Volume	50

Quantitation Results

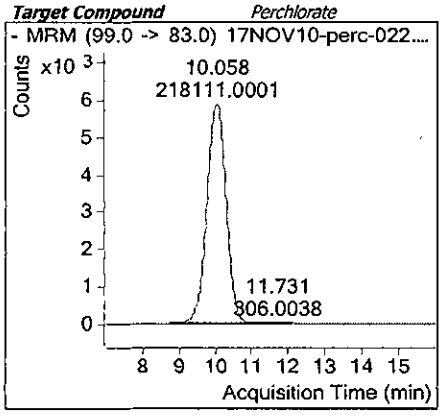
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.058	218111	99	83	637.63612	637.63612	1
Perchlorate-(35Cl18O4)	ISTD	10.049	3950	107	89			1

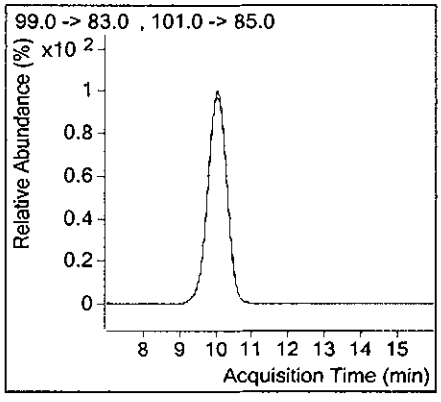
%R NC, MSA ✓

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	70051	101	85	3.11	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	1158	109	91	3.41	2.30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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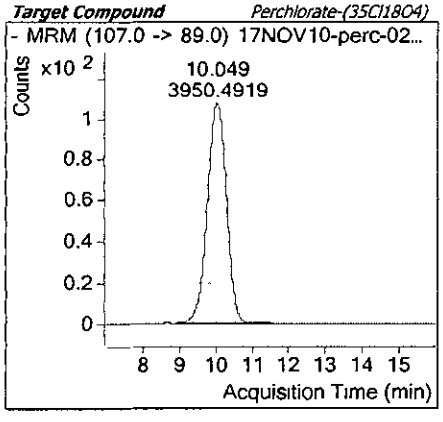
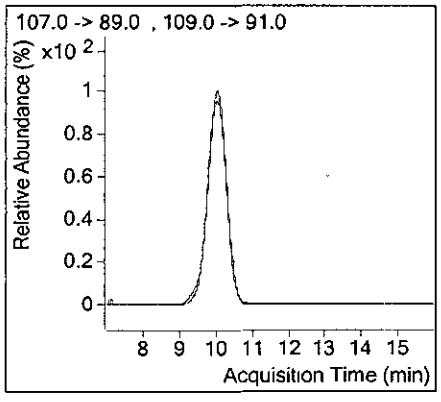
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 21:51
Analyst	lores
Data File	17NOV10-perc-023 d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-2, 0314148, 20mL/20mL, 50x
Sample Identification	L9FXA1AA
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45'55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-A7
Exp. Concentration	
Injection Volume	50

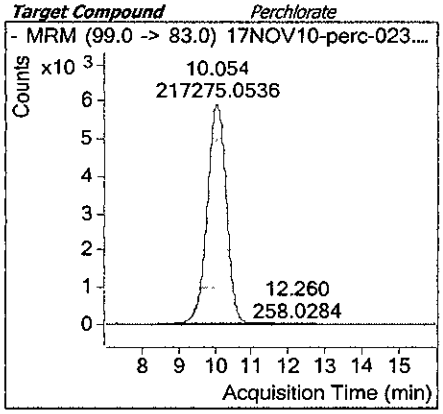
Quantitation Results

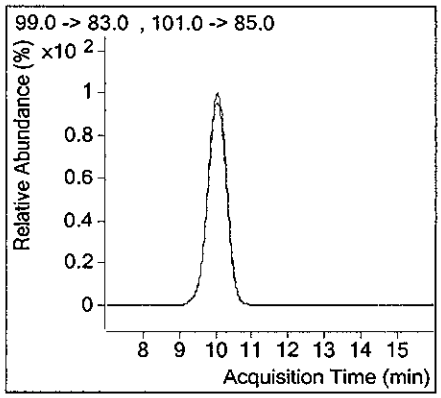
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.054	217275	99	83	625.91066	625.91066	1
Perchlorate-(35Cl18O4)	ISTD	10 053	4009	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	68984	101	85	3.15	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	1219	109	91	3.29	2.30	3.80	In Control

Compound Graphics

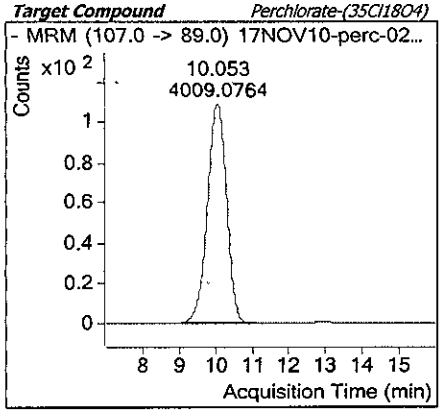
Target Compound *Perchlorate*

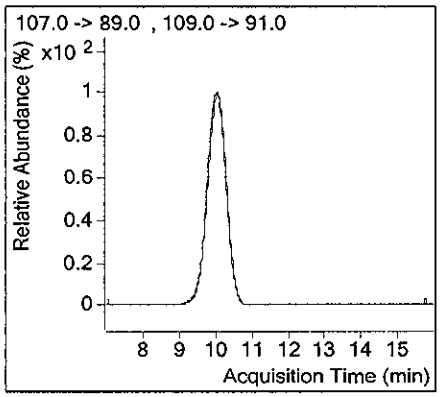




m 11/19/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 22:43
Analyst	lores
Data File	17NOV10-perc-026.d
Acquisition Method	PercMRM_2.m
Sample Name	CCV_5 E100720H Perchlorate Std 2 0ng/mL
Sample Identification	CCV_5
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C6
Exp. Concentration	2.00
Injection Volume	50

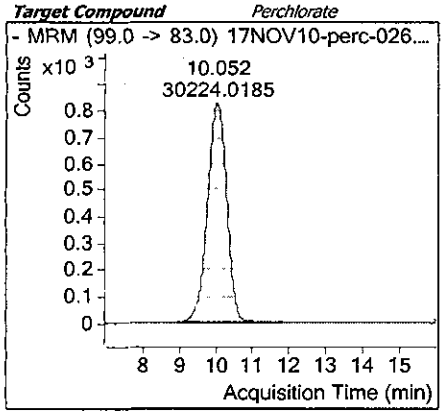
Quantitation Results

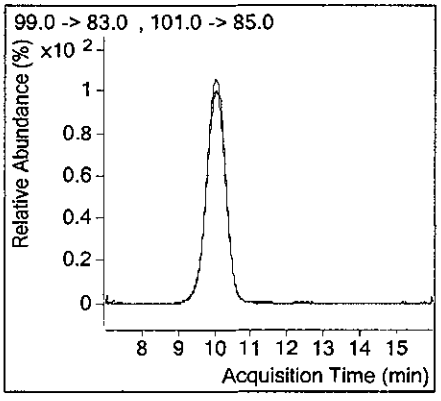
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.052	30224	99	83	1.76798	1.76798	1
Perchlorate-(35Cl18O4)	ISTD	10.044	200124	107	89			1
							-11.6 % Deviation	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	10556	101	85	2.86	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	61434	109	91	3.26	2.30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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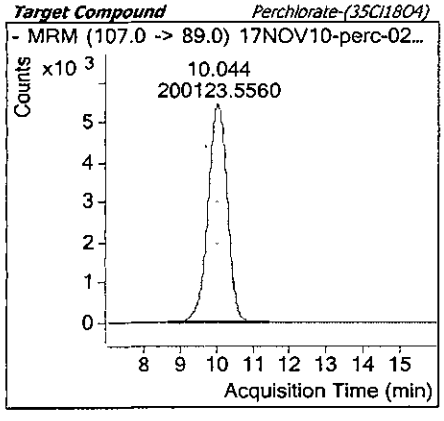
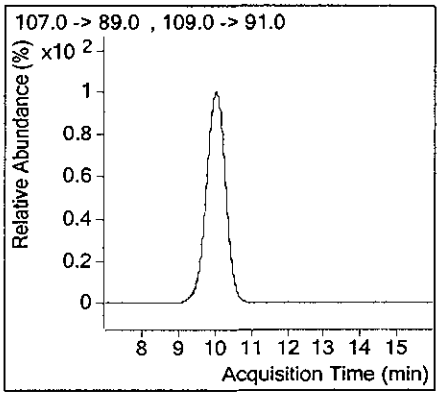
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 23:01
Analyst	lores
Data File	17NOV10-perc-027.d
Acquisition Method	PercMRM_2 m
Sample Name	LODV E100924A Perchlorate Std 0 15ng/mL
Sample Identification	LODV
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45 55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C3
Exp. Concentration	0.15
Injection Volume	50

Quantitation Results

Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.055	2508	99	83	**0.16914**	**0.16914**	1
Perchlorate-(35Cl18O4)	ISTD	10.043	199324	107	89			1

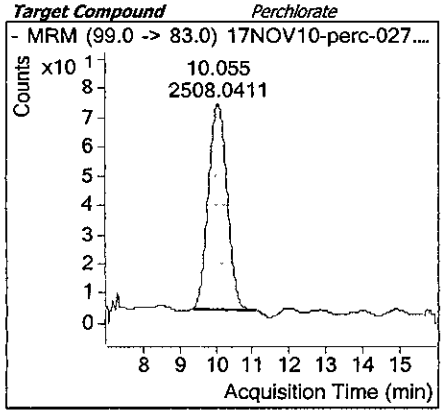
12.8 % Deviation

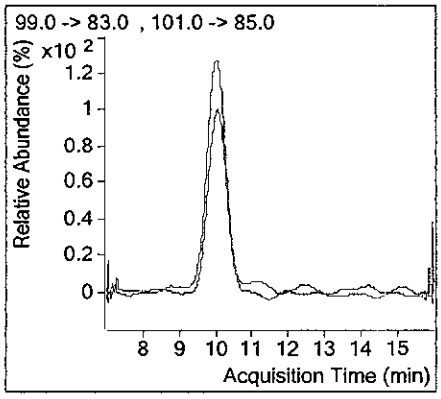
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max
Perchlorate	1152	101	85	2.18	2.30	3.80
Perchlorate-(35Cl18O4)	61409	109	91	3.25	2.30	3.80

Low
In Control

Compound Graphics

Target Compound *Perchlorate*





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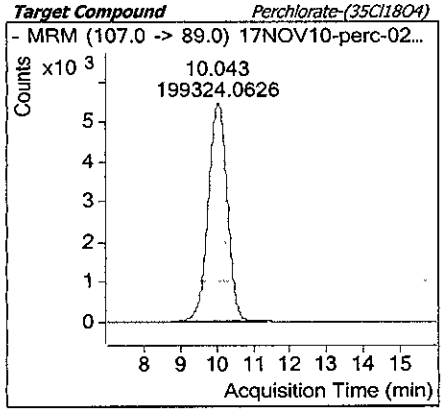
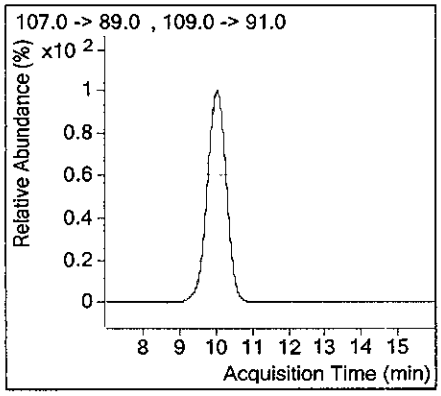
Target Compound *Perchlorate-(35Cl18O4)*





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Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 23:18
Analyst	lores
Data File	17NOV10-perc-028.d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45.55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

Quantitation Results

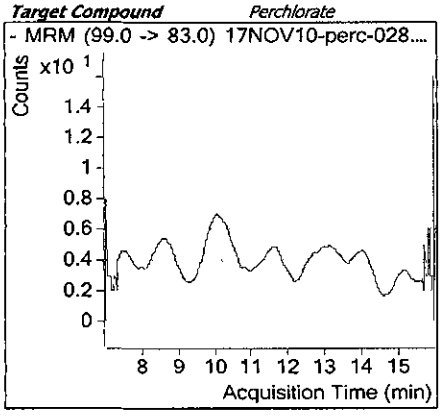
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate-(35Cl18O4)	ISTD	10.046	201465	107	89			1

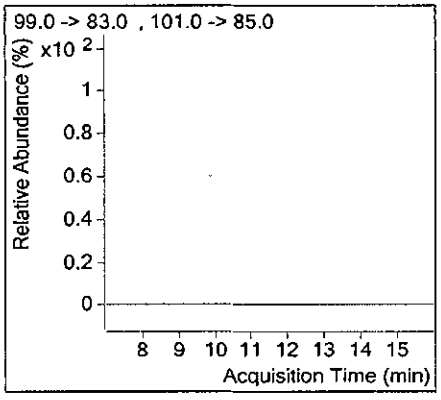
Perchlorate = ND ✓

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	60294	109	91	3.34	2.30	3.80	In Control

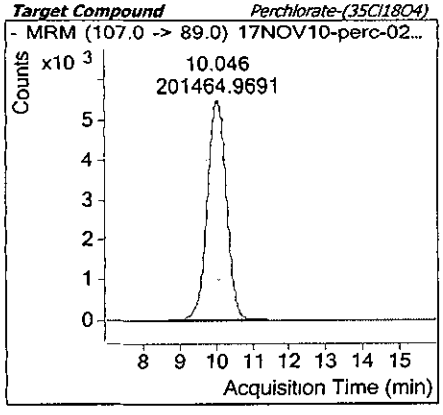
Compound Graphics

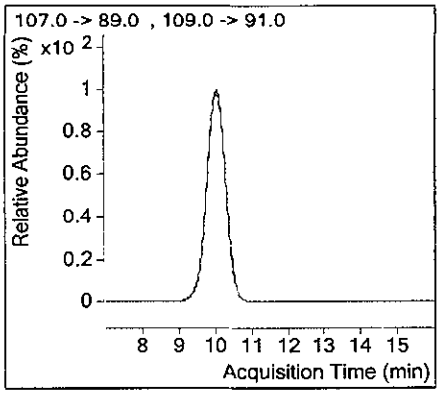
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





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Initial Calibration

Includes (as applicable):

runlog

standard raw data

statistical summary

ms tune data

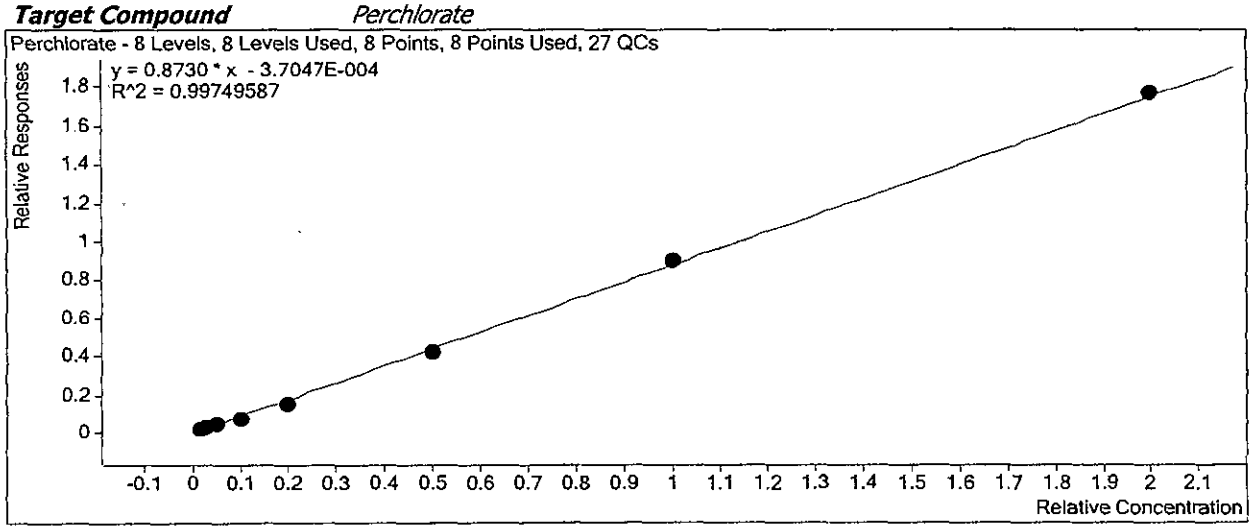
TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Info

Batch Data Path	D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml		
Analysis Time	11/17/2010 2:18 PM	**Analyst Name**	lores
Report Time	11/17/2010 2:21 PM	**Reporter Name**	lores
Last Calib Update	11/17/2010 2:18 PM	**Batch State**	Processed

Calibration Info

Target Compound *Perchlorate*



Weight: 1/x MR 11/17/10

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Sequence Table

Data File	Sample Name	Position	Level	Sample Type	Acq. Date & Time
16NOV10-perc-009.d	Blank, no IS	P2-A9		Sample	11/16/2010 16:56
16NOV10-perc-010.d	Blank + IS	P2-C1		Sample	11/16/2010 17:13
16NOV10-perc-011.d	ICAL-1 E100702D Perchlorate Std 0.15ng/mL	P2-B2	1	Calibration	11/16/2010 17:31
16NOV10-perc-012.d	ICAL-2 E100720E Perchlorate Std 0.30ng/mL	P2-B3	2	Calibration	11/16/2010 17:48
16NOV10-perc-013.d	ICAL-3 E100720F Perchlorate Std 0.50ng/mL	P2-B4	3	Calibration	11/16/2010 18:05
16NOV10-perc-014.d	ICAL-4 E100720G Perchlorate Std 1.0ng/mL	P2-B5	4	Calibration	11/16/2010 18:23
16NOV10-perc-015.d	ICAL-5 E100720H Perchlorate Std 2.0ng/mL	P2-B6	5	Calibration	11/16/2010 18:40
16NOV10-perc-016.d	ICAL-6 E100720I Perchlorate Std 5.0ng/mL	P2-B7	6	Calibration	11/16/2010 18:58
16NOV10-perc-017.d	ICAL-7 E100720J Perchlorate Std 10ng/mL	P2-B8	7	Calibration	11/16/2010 19:15
16NOV10-perc-018.d	ICAL-8 E100720K Perchlorate Std 20ng/mL	P2-B9	8	Calibration	11/16/2010 19:33
16NOV10-perc-019.d	STD_6 Perchlorate Std 5.0ng/mL	P2-A2		Sample	11/16/2010 19:50
16NOV10-perc-020.d	STD_6 Perchlorate Std 5.0ng/mL	P2-A2		Sample	11/16/2010 20:08
16NOV10-perc-021.d	Blank + IS	P2-C1		Sample	11/16/2010 20:25
16NOV10-perc-022.d	ICV E100720C Perchlorate Std 5.0ng/mL	P2-C2	ICV	QC	11/16/2010 20:43
16NOV10-perc-023.d	LODV E100720D Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/16/2010 21:00
16NOV10-perc-024.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/16/2010 21:18
16NOV10-perc-025.d	G0K100000-MB, 0314148, 20mL/20mL, 6850-DOD-L	P1-A1		Sample	11/16/2010 21:35
16NOV10-perc-026.d	G0K100000-LCS, 0314148, 20mL/20mL	P1-A2	LCS_0.5	QC	11/16/2010 21:52
16NOV10-perc-027.d	G0K100000-SMCS, 0314148, 20mL/20mL	P1-A3	LCS_0.5	QC	11/16/2010 22:10
16NOV10-perc-028.d	G0K020530-1, 0314148, 20mL/20mL	P1-A4		Sample	11/16/2010 22:27
16NOV10-perc-029.d	G0K020530-1MS, 0314148, 20mL/20mL	P1-A5	MS_0.5	QC	11/16/2010 22:45
16NOV10-perc-030.d	G0K020530-1MSD, 0314148, 20mL/20mL	P1-A6	MS_0.5	QC	11/16/2010 23:02
16NOV10-perc-031.d	G0K020530-2, 0314148, 20mL/20mL	P1-A7		Sample	11/16/2010 23:20
16NOV10-perc-032.d	G0K020530-3, 0314148, 20mL/20mL	P1-A8		Sample	11/16/2010 23:37
16NOV10-perc-033.d	Q4 LOQ 6850-L, 0314148, 20mL/20mL	P1-A9		Sample	11/16/2010 23:55
16NOV10-perc-034.d	Q4 LOD 6850-L, 0314148, 20mL/20mL	P2-F3		Sample	11/17/2010 00:12

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

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16NOV10-perc-035.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 00:30
16NOV10-perc-036.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 00:47
16NOV10-perc-037.d	Blank + IS	P2-C1		Sample	11/17/2010 01:05
16NOV10-perc-038.d	G0K040000-MB, 0308373, 3.00g/10mL, 6850-DOD-S	P1-B1		Sample	11/17/2010 01:22
16NOV10-perc-039.d	G0K040000-LCS, 0308373, 3.00g/10mL,	P1-B2	LCS_5	QC	11/17/2010 01:39
16NOV10-perc-040.d	G0K040000-SMCS, 0308373, 3.00g/10mL,	P1-B3	LCS_5	QC	11/17/2010 01:57
16NOV10-perc-041.d	G0K020530-4, 0308373, 3.09g/10mL,	P1-B4		Sample	11/17/2010 02:14
16NOV10-perc-042.d	G0K020530-5, 0308373, 3.15g/10mL, 1000X + IS	P1-B5		Sample	11/17/2010 02:32
16NOV10-perc-043.d	G0K020530-6, 0308373, 3.25g/10mL, 5X	P1-B6		Sample	11/17/2010 02:49
16NOV10-perc-044.d	G0K020530-7, 0308373, 3.03g/10mL,	P1-B7		Sample	11/17/2010 03:07
16NOV10-perc-045.d	G0K020530-8, 0308373, 3.19g/10mL,	P1-B8		Sample	11/17/2010 03:24
16NOV10-perc-046.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 03:42
16NOV10-perc-047.d	G0K020530-9, 0308373, 3.00g/10mL,	P1-B9		Sample	11/17/2010 03:59
16NOV10-perc-048.d	G0K020530-10, 0308373, 3.07g/10mL,	P1-C1		Sample	11/17/2010 04:16
16NOV10-perc-049.d	G0K020530-11, 0308373, 3.15g/10mL,	P1-C2		Sample	11/17/2010 04:34
16NOV10-perc-050.d	G0K020530-12, 0308373, 3.00g/10mL, 1000X + IS	P1-C3		Sample	11/17/2010 04:51
16NOV10-perc-051.d	G0K020530-12MS, 0308373, 3.11g/10mL, 1000X + IS	P1-C4	MS_5	QC	11/17/2010 05:09
16NOV10-perc-052.d	G0K020530-12MSD, 0308373, 3.18g/10mL, 1000X + IS	P1-C5	MS_5	QC	11/17/2010 05:26
16NOV10-perc-053.d	G0K020530-13, 0308373, 3.10g/10mL,	P1-C6		Sample	11/17/2010 05:44
16NOV10-perc-054.d	G0K020530-14, 0308373, 3.05g/10mL, 10X	P1-C7		Sample	11/17/2010 06:01
16NOV10-perc-055.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 06:19
16NOV10-perc-056.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 06:36
16NOV10-perc-057.d	Blank + IS	P2-C1		Sample	11/17/2010 06:54
16NOV10-perc-058.d	G0J260000-MB, 0299273, 3.00g/10mL, 6850-DOD-S	P1-C8		Sample	11/17/2010 07:11
16NOV10-perc-059.d	G0J260000-LCS, 0299273, 3.00g/10mL,	P1-C9	LCS_5	QC	11/17/2010 07:29
16NOV10-perc-060.d	G0J260000-SMCS, 0299273, 3.00g/10mL,	P1-D1	LCS_5	QC	11/17/2010 07:46
16NOV10-perc-061.d	A0J210551-1, 0299273, 2.98g/10mL,	P1-D2		Sample	11/17/2010 08:04
16NOV10-perc-062.d	A0J210551-2, 0299273, 3.08g/10mL,	P1-D3		Sample	11/17/2010 08:21
16NOV10-perc-063.d	A0J210551-3, 0299273, 3.01g/10mL,	P1-D4		Sample	11/17/2010 08:38

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

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16NOV10-perc-064.d	A0J210551-3MS, 0299273, 2.98g/10mL,	P1-D5	MS_5	QC	11/17/2010 08:56
16NOV10-perc-065.d	A0J210551-3MSD, 0299273, 3.02g/10mL,	P1-D6	MS_5	QC	11/17/2010 09:13
16NOV10-perc-066.d	A0J210551-4, 0299273, 3.06g/10mL,	P1-D7		Sample	11/17/2010 09:31
16NOV10-perc-067.d	A0J210551-5, 0299273, 3.07g/10mL,	P1-D8		Sample	11/17/2010 09:48
16NOV10-perc-068.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 10:06
16NOV10-perc-069.d	Blank + IS	P2-C1		Sample	11/17/2010 10:23
16NOV10-perc-070.d	A0J210551-6, 0299273, 3.02g/10mL,	P1-D9		Sample	11/17/2010 10:41
16NOV10-perc-071.d	A0J210551-7, 0299273, 2.96g/10mL,	P1-E1		Sample	11/17/2010 10:58
16NOV10-perc-072.d	G0K150000-MB, 0319363, 20mL/20mL, 6850-DOD-L	P1-B1		Sample	11/17/2010 11:16
16NOV10-perc-073.d	G0K150000-LCS, 0319363, 20mL/20mL	P1-B2	LCS_0.5	QC	11/17/2010 11:33
16NOV10-perc-074.d	G0K150000-SMCS, 0319363, 20mL/20mL	P1-B3	LCS_0.5	QC	11/17/2010 11:50
16NOV10-perc-075.d	G0K120447-1, 0319363, 20mL/20mL	P1-B4		Sample	11/17/2010 12:08
16NOV10-perc-076.d	G0K120447-1MS, 0319363, 20mL/20mL	P1-B5	M5_0.5	QC	11/17/2010 12:25
16NOV10-perc-077.d	G0K120447-1MSD, 0319363, 20mL/20mL	P1-B6	MS_0.5	QC	11/17/2010 12:43
16NOV10-perc-078.d	G0K130463-1, 0319363, 20mL/20mL	P1-B7		Sample	11/17/2010 13:00
16NOV10-perc-079.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 13:18
16NOV10-perc-080.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 13:35
16NOV10-perc-081.d	Blank + IS	P2-C1		Sample	11/17/2010 13:53

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Target Compound *Perchlorate*

Calibration STD	Level	Enabled	Response	RF	Exp Conc
16NOV10-perc-011.d	1	☑	3104	1.1149	0.1500
16NOV10-perc-012.d	2	☑	4877	0.8210	0.3000
16NOV10-perc-013.d	3	☑	8532	0.8836	0.5000
16NOV10-perc-014.d	4	☑	15105	0.7193	1.0000
16NOV10-perc-015.d	5	☑	29560	0.7741	2.0000
16NOV10-perc-016.d	6	☑	78435	0.8401	5.0000
16NOV10-perc-017.d	7	☑	157503	0.8944	10.0000
16NOV10-perc-018.d	8	☑	300401	0.8853	20.0000
16NOV10-perc-035.d	CCV5	☑	29789	0.7644	2.0000
16NOV10-perc-055.d	CCV5	☑	30076	0.7567	2.0000
16NOV10-perc-068.d	CCV5	☑	31405	0.7692	2.0000
16NOV10-perc-024.d	CCV6	☑	76957	0.8234	5.0000
16NOV10-perc-046.d	CCV6	☑	74546	0.7982	5.0000
16NOV10-perc-079.d	CCV6	☑	81120	0.8039	5.0000
16NOV10-perc-022.d	ICV	☑	76334	0.7625	5.0000
16NOV10-perc-026.d	LCS_0.5	☑	6947	0.7477	0.5000
16NOV10-perc-027.d	LCS_0.5	☑	8166	0.8406	0.5000
16NOV10-perc-073.d	LCS_0.5	☑	8178	0.8133	0.5000
16NOV10-perc-074.d	LCS_0.5	☑	8058	0.7573	0.5000
16NOV10-perc-039.d	LCS_5	☑	21940	0.2368	5.0000
16NOV10-perc-040.d	LCS_5	☑	21856	0.2375	5.0000
16NOV10-perc-059.d	LCS_5	☑	22047	0.2388	5.0000
16NOV10-perc-060.d	LCS_5	☑	22942	0.2443	5.0000
16NOV10-perc-023.d	LODV	☑	2620	0.9151	0.1500
16NOV10-perc-036.d	LODV	☑	2800	0.9816	0.1500
16NOV10-perc-056.d	LODV	☑	2654	0.9015	0.1500
16NOV10-perc-080.d	LODV	☑	2763	0.8768	0.1500
16NOV10-perc-029.d	MS_0.5	☑	3873506	1359.0119	0.5000
16NOV10-perc-030.d	MS_0.5	☑	3861931	1370.1296	0.5000
16NOV10-perc-076.d	MS_0.5	☑	53198	5.1592	0.5000
16NOV10-perc-077.d	MS_0.5	☑	53492	5.1718	0.5000
16NOV10-perc-051.d	MS_5	☑	68655	565.7531	5.0000
16NOV10-perc-052.d	MS_5	☑	61961	551.9805	5.0000
16NOV10-perc-064.d	MS_5	☑	25833	0.2734	5.0000
16NOV10-perc-065.d	MS_5	☑	25985	0.2850	5.0000

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Target Compound *Perchlorate-(35Cl18O4)*

Calibration STD	Level	Enabled	Response	RF	Exp Conc
16NOV10-perc-011.d	1	☑	185574	18557.4453	10.0000
16NOV10-perc-012.d	2	☑	198021	19802.0565	10.0000
16NOV10-perc-013.d	3	☑	193127	19312.6671	10.0000
16NOV10-perc-014.d	4	☑	209981	20998.0725	10.0000
16NOV10-perc-015.d	5	☑	190942	19094.1577	10.0000
16NOV10-perc-016.d	6	☑	186717	18671.7272	10.0000
16NOV10-perc-017.d	7	☑	176091	17609.0962	10.0000
16NOV10-perc-018.d	8	☑	169654	16965.4387	10.0000
16NOV10-perc-035.d	CCV5	☑	194852	19485.1680	10.0000
16NOV10-perc-055.d	CCV5	☑	198745	19874.4567	10.0000
16NOV10-perc-068.d	CCV5	☑	204132	20413.2175	10.0000
16NOV10-perc-024.d	CCV6	☑	186919	18691.8894	10.0000
16NOV10-perc-046.d	CCV6	☑	186789	18678.9350	10.0000
16NOV10-perc-079.d	CCV6	☑	201806	20180.5889	10.0000
16NOV10-perc-022.d	ICV	☑	200224	20022.3787	10.0000
16NOV10-perc-026.d	LCS_0.5	☑	185831	18583.1393	10.0000
16NOV10-perc-027.d	LCS_0.5	☑	194296	19429.5936	10.0000
16NOV10-perc-073.d	LCS_0.5	☑	201092	20109.1544	10.0000
16NOV10-perc-074.d	LCS_0.5	☑	212801	21280.1128	10.0000
16NOV10-perc-039.d	LCS_5	☑	185333	18533.2631	10.0000
16NOV10-perc-040.d	LCS_5	☑	184079	18407.9438	10.0000
16NOV10-perc-059.d	LCS_5	☑	184685	18468.4518	10.0000
16NOV10-perc-060.d	LCS_5	☑	187799	18779.8515	10.0000
16NOV10-perc-023.d	LODV	☑	190832	19083.2110	10.0000
16NOV10-perc-036.d	LODV	☑	190185	19018.4521	10.0000
16NOV10-perc-056.d	LODV	☑	196302	19630.1666	10.0000
16NOV10-perc-080.d	LODV	☑	210100	21009.9926	10.0000
16NOV10-perc-029.d	MS_0.5	☑	57005	5700.4733	10.0000
16NOV10-perc-030.d	MS_0.5	☑	56373	5637.3229	10.0000
16NOV10-perc-076.d	MS_0.5	☑	206224	20622.4143	10.0000
16NOV10-perc-077.d	MS_0.5	☑	206864	20686.3682	10.0000
16NOV10-perc-051.d	MS_5	☑	242703	24.2703	10000.0000
16NOV10-perc-052.d	MS_5	☑	224505	22.4505	10000.0000
16NOV10-perc-064.d	MS_5	☑	188960	18896.0367	10.0000
16NOV10-perc-065.d	MS_5	☑	182363	18236.2596	10.0000

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path	D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

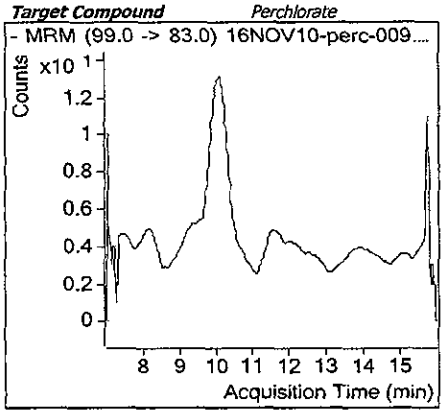
Analysis Information

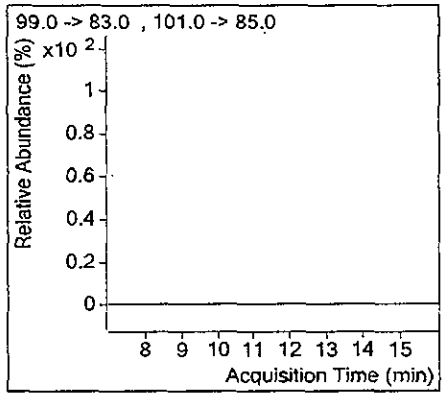
Acquisition Date - Time	11/16/2010 16:56
Analyst	lores
Data File	16NOV10-perc-009 d
Acquisition Method	PercMRM_2.m
Sample Name	Blank, no IS
Sample Identification	Blank
Sample Information	IC-Pak Anion HR 75x4 6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-A9
Exp. Concentration	
Injection Volume	50

Perchlorate = ND

Compound Graphics

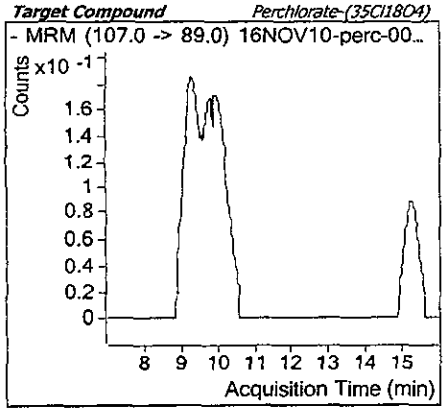
Target Compound *Perchlorate*

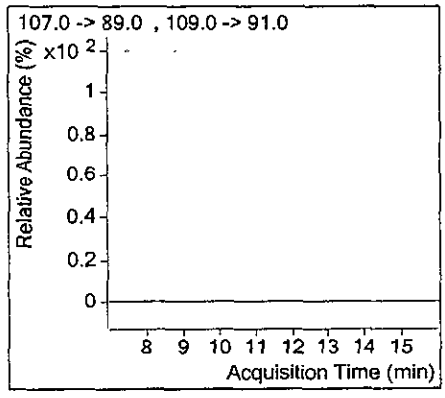




mr 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 17:13
Analyst	lores
Data File	16NOV10-perc-010 d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4 6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

Quantitation Results

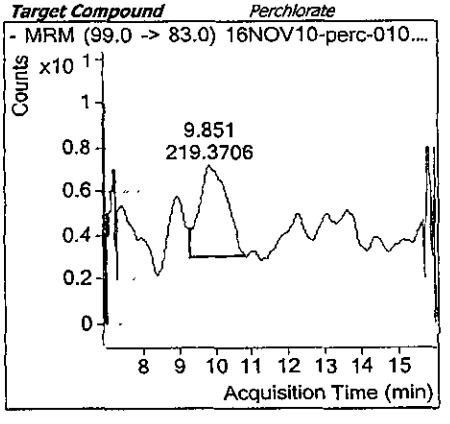
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	9.851	219	99	83	0.01743	0.01743	1
Perchlorate-(35Cl18O4)	ISTD	10.039	190515	107	89			1

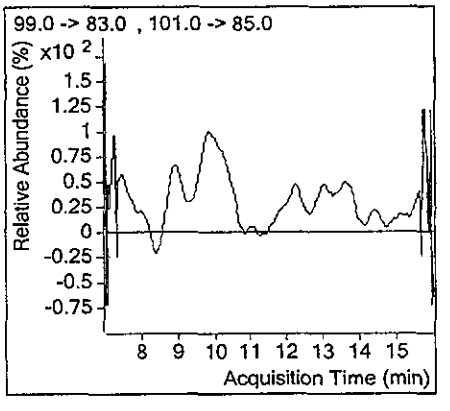
<MDL. = ND

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	59204	109	91	3.22	2.30	3.80	In Control

Compound Graphics

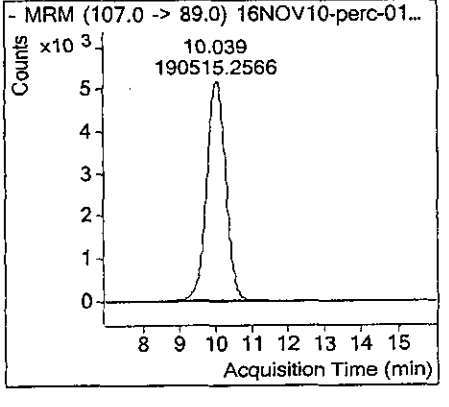
Target Compound *Perchlorate*

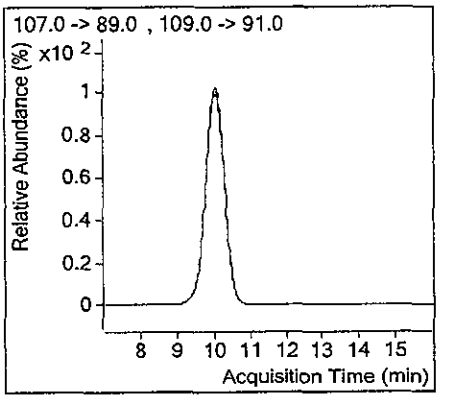




m 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 17:31
Analyst	lores
Data File	16NOV10-perc-011.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-1 E100702D Perchlorate Std 0.15ng/mL
Sample Identification	ICAL-1
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B2
Exp. Concentration	0 15
Injection Volume	50

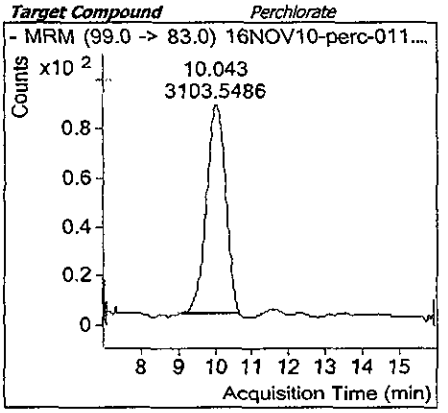
Quantitation Results

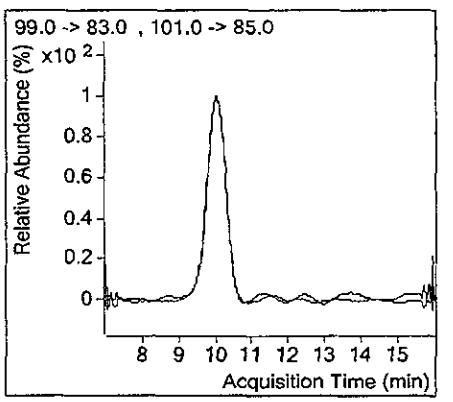
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.043	3104	99	83	0.19581	0.19581	1
Perchlorate-(35Cl18O4)	ISTD	10.042	185574	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	998	101	85	3.11	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	58941	109	91	3.15	2.30	3.80	In Control

Compound Graphics

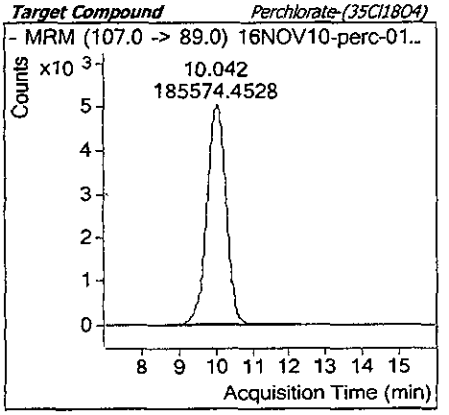
Target Compound *Perchlorate*

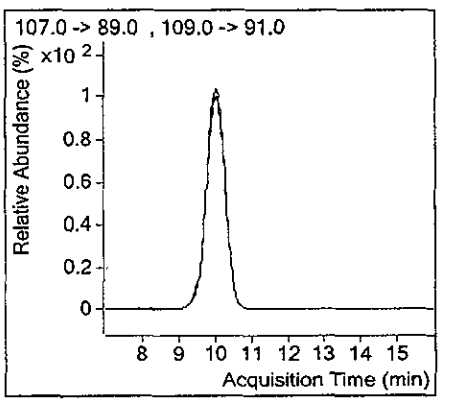




mr 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 17:48
Analyst	lores
Data File	16NOV10-perc-012 d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-2 E100720E Perchlorate Std 0.30ng/mL
Sample Identification	ICAL-2
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350'fl=12
Sample Type	Calibration
Sample Position	P2-B3
Exp. Concentration	0.30
Injection Volume	50

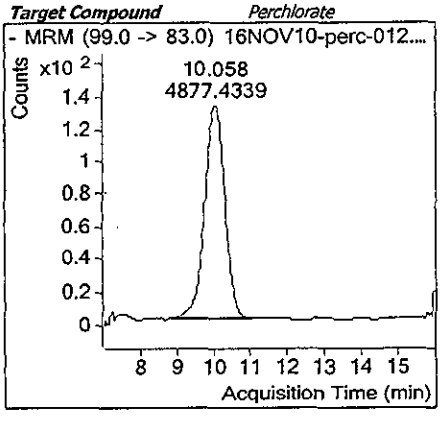
Quantitation Results

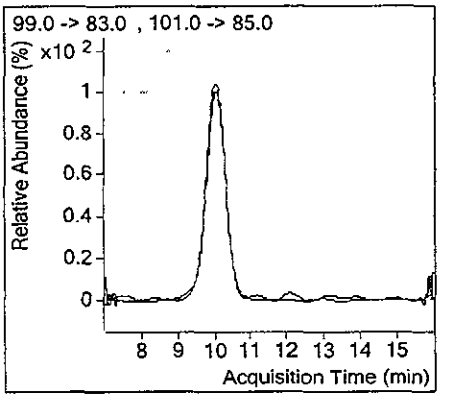
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.058	4877	99	83	**0.28638**	**0.28638**	1
Perchlorate-(35Cl18O4)	ISTD	10.040	198021	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	1685	101	85	2.89	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	61219	109	91	3.23	2.30	3.80	In Control

Compound Graphics

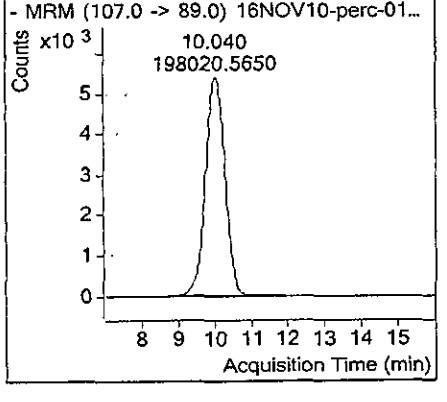
Target Compound *Perchlorate*

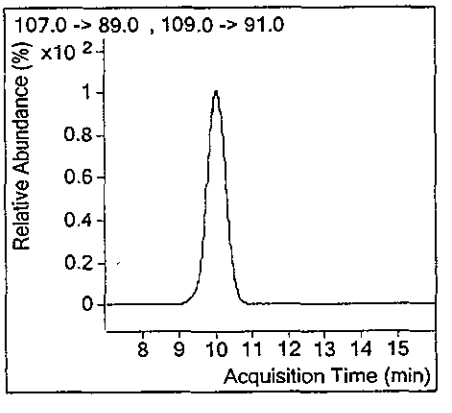




mr 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 18:05
Analyst	lores
Data File	16NOV10-perc-013.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-3 E100720F Perchlorate Std 0.50ng/mL
Sample Identification	ICAL-3
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B4
Exp. Concentration	0.50
Injection Volume	50

Quantitation Results

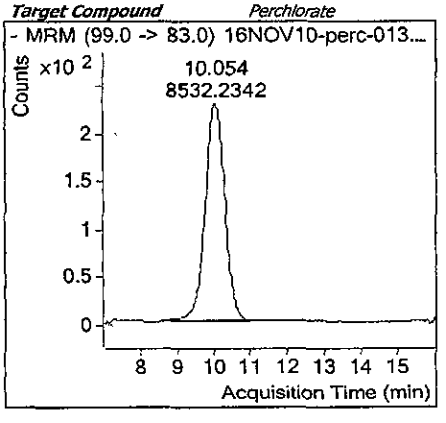
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.054	8532	99	83	0.51030	0.51030	1
Perchlorate-(35Cl18O4)	ISTD	10.042	193127	107	89			1

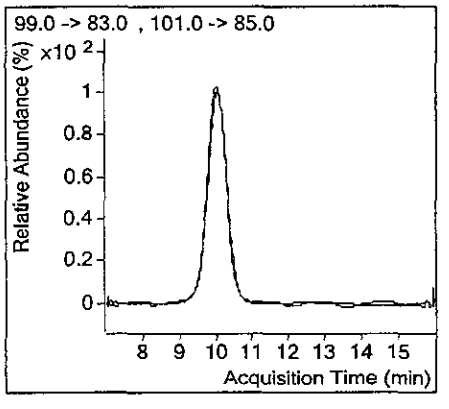
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	2853	101	85	2.99	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	59243	109	91	3.26	2.30	3.80	In Control

Compound Graphics

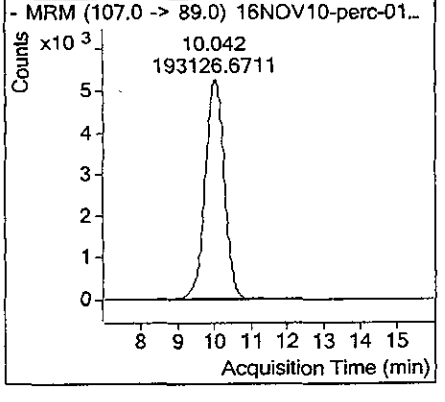
NT 11/17/10

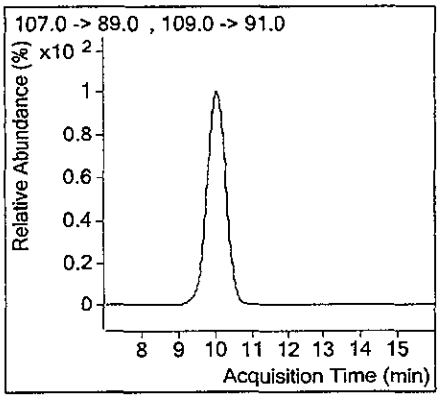
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 18:23
Analyst	lores
Data File	16NOV10-perc-014.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-4 E100720G Perchlorate Std 1.0ng/mL
Sample Identification	ICAL-4
Sample Information	IC-Pak Anion HR 75x4 6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B5
Exp. Concentration	1.00
Injection Volume	50

Quantitation Results

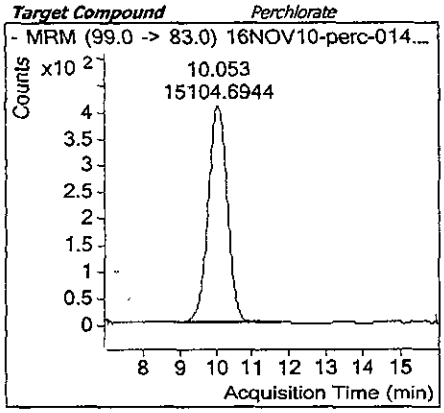
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.053	15105	99	83	**0.82821**	**0.82821**	1
Perchlorate-(35Cl18O4)	ISTD	10.044	209981	107	89			1

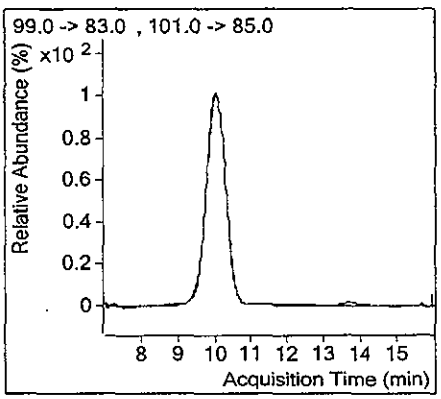
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	5016	101	85	3.01	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	62942	109	91	3.34	2.30	3.80	In Control

Compound Graphics

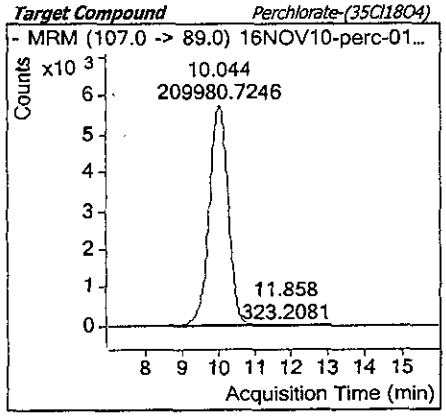
MT 11/17/10

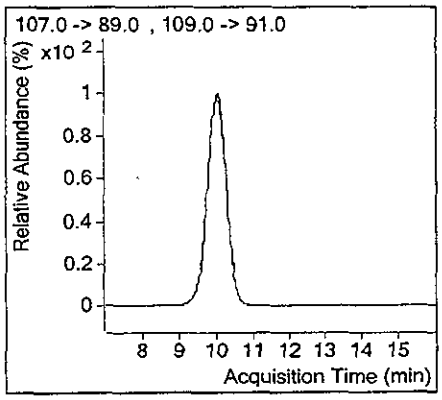
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 18:40
Analyst	lores
Data File	16NOV10-perc-015.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-5 E100720H Perchlorate Std 2.0ng/mL
Sample Identification	ICAL-5
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B6
Exp. Concentration	2.00
Injection Volume	50

Quantitation Results

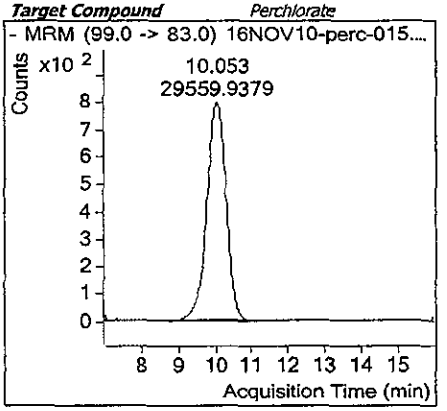
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.053	29560	99	83	1.77752	1.77752	1
Perchlorate-(35Cl18O4)	ISTD	10.046	190942	107	89			1

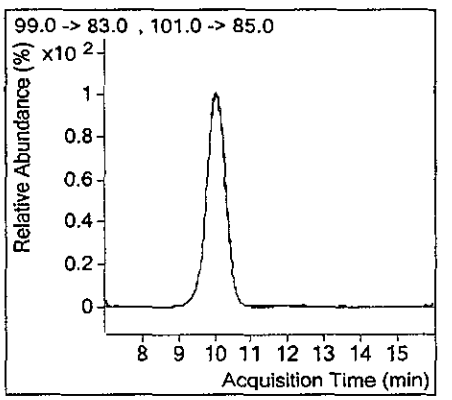
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	10065	101	85	2.94	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	59034	109	91	3.23	2.30	3.80	In Control

Compound Graphics

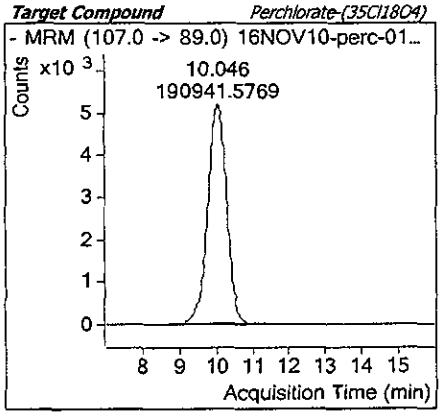
mr 11/17/10

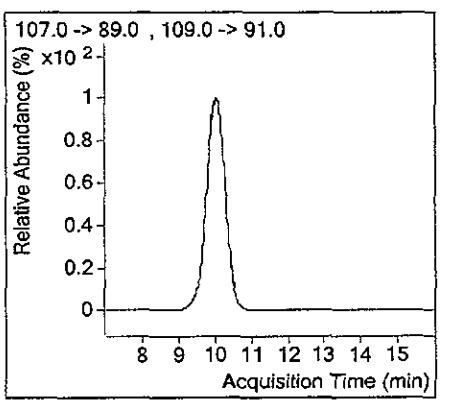
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 18:58
Analyst	lores
Data File	16NOV10-perc-016.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-6 E100720I Perchlorate Std 5.0ng/mL
Sample Identification	ICAL-6
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B7
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

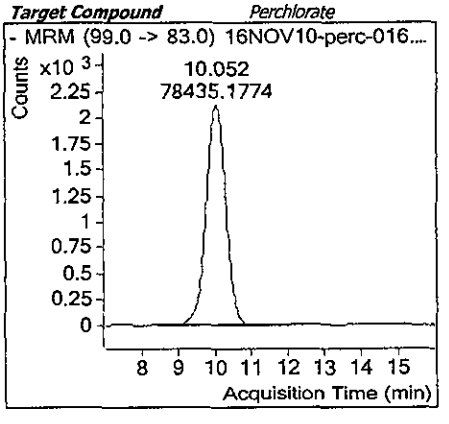
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.052	78435	99	83	4.81597	4.81597	1
Perchlorate-(35Cl18O4)	ISTD	10.045	186717	107	89			1

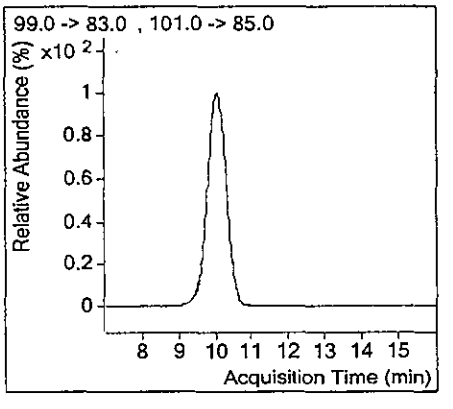
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	25872	101	85	3.03	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	58056	109	91	3.22	2.30	3.80	In Control

Compound Graphics

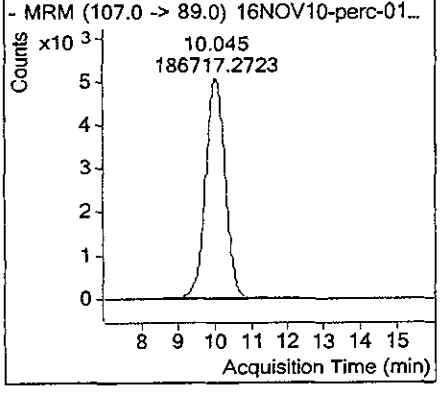
M 11/17/10

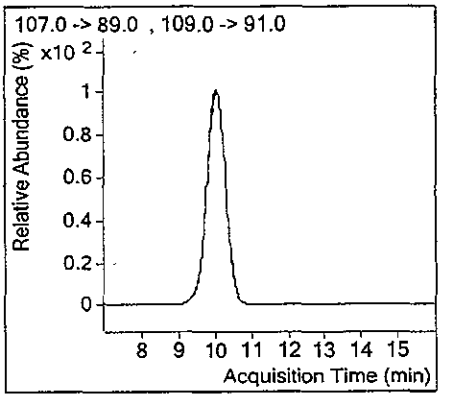
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 19:15
Analyst	lores
Data File	16NOV10-perc-017.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-7 E100720J Perchlorate Std 10ng/mL
Sample Identification	ICAL-7
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B8
Exp. Concentration	10.00
Injection Volume	50

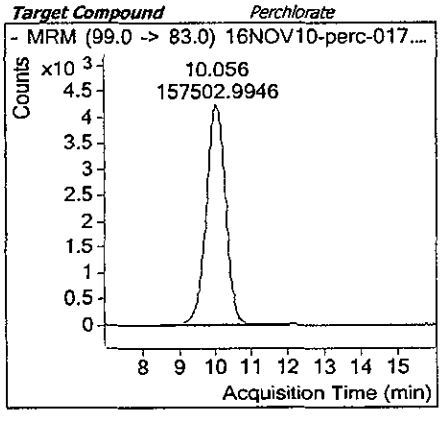
Quantitation Results

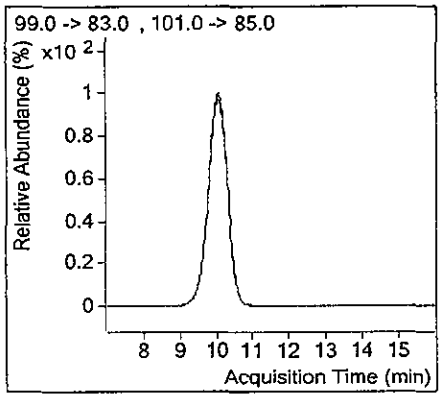
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.056	157503	99	83	10.24958	10.24958	1
Perchlorate-(35Cl18O4)	ISTD	10.047	176091	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	50595	101	85	3.11	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	54786	109	91	3.21	2.30	3.80	In Control

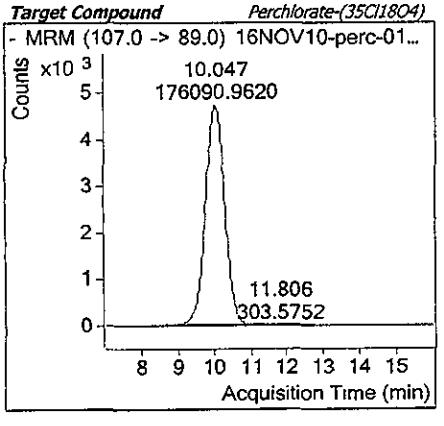
Compound Graphics

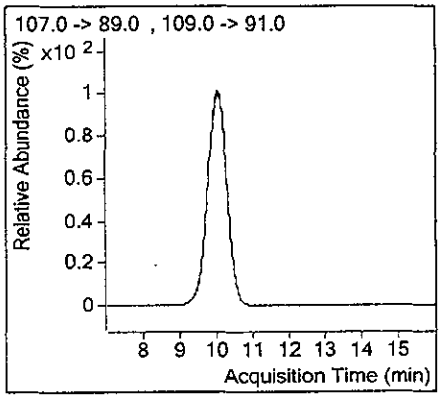
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





no 11/17/10

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 19:33
Analyst	lores
Data File	16NOV10-perc-018.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-8 E100720K Perchlorate Std 20ng/mL
Sample Identification	ICAL-8
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 ft=12
Sample Type	Calibration
Sample Position	P2-B9
Exp. Concentration	20.00
Injection Volume	50

Quantitation Results

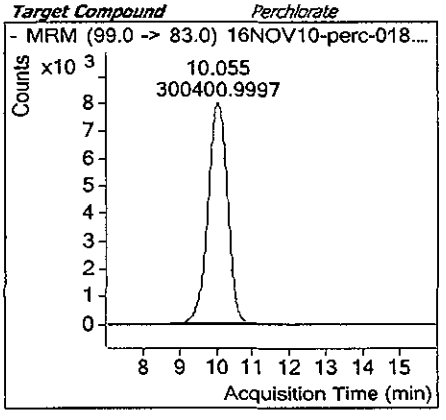
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.055	300401	99	83	20.28624	20.28624	1
Perchlorate-(35Cl18O4)	ISTD	10.046	169654	107	89			1

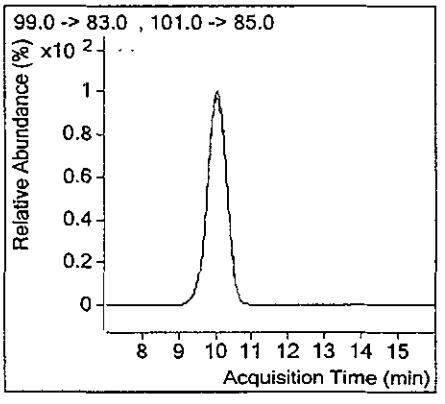
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	96494	101	85	3.11	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	52242	109	91	3.25	2.30	3.80	In Control

Compound Graphics

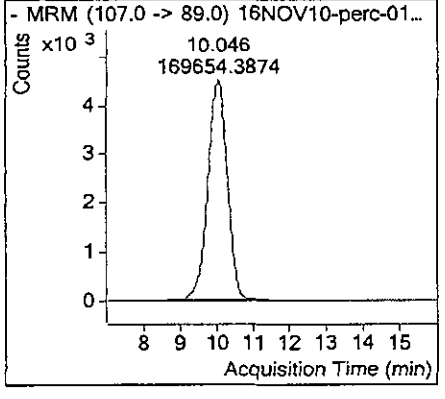
MM 11/17/10

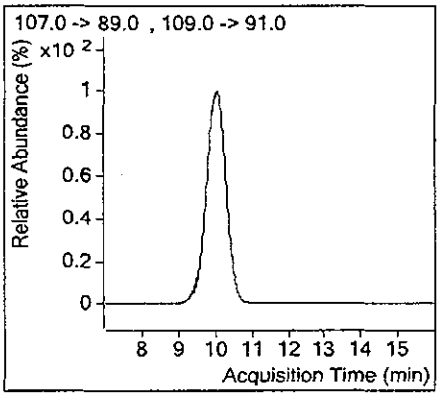
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 20:25
Analyst	lores
Data File	16NOV10-perc-021.d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

Quantitation Results

Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	9.998	330	99	83	0.02379	0.02379	1
Perchlorate-(35Cl18O4)	ISTD	10 050	193688	107	89			1

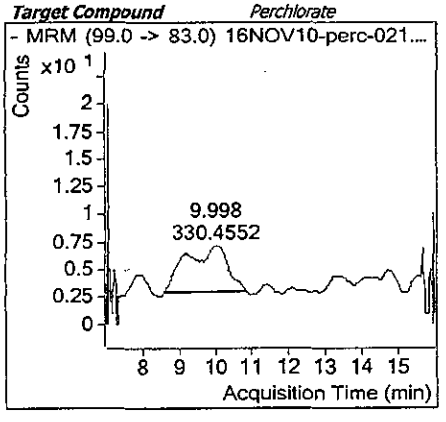
Result is < MDL => ND

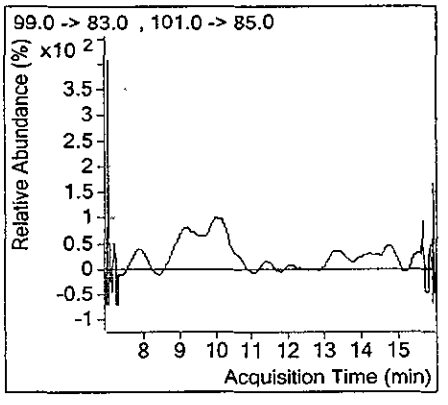
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	59131	109	91	3.28	2.30	3.80	In Control

Compound Graphics

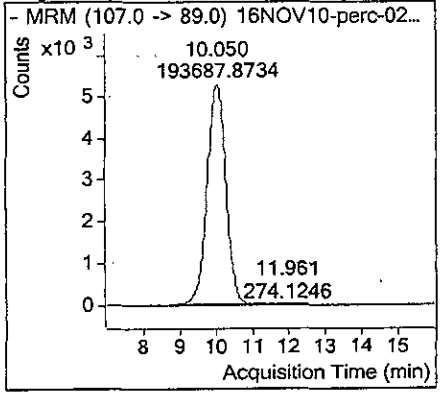
mr 11/17/10

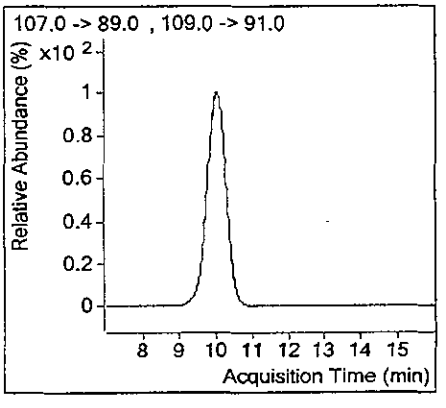
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 20:43
Analyst	lores
Data File	16NOV10-perc-022.d
Acquisition Method	PercMRM_2.m
Sample Name	ICV E100720C Perchlorate Std 5.0ng/mL
Sample Identification	ICV
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45.55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C2
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

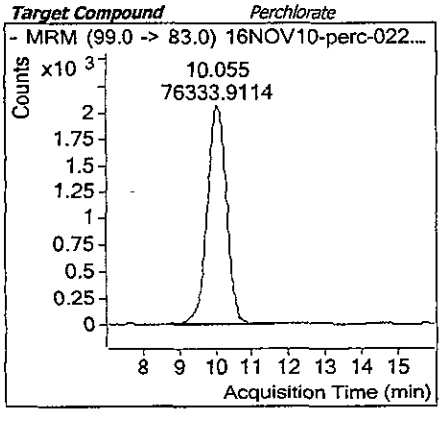
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.055	76334	99	83	4.37117	4.37117	1
Perchlorate-(35Cl18O4)	ISTD	10 047	200224	107	89			1
							-12.6 % Deviation	

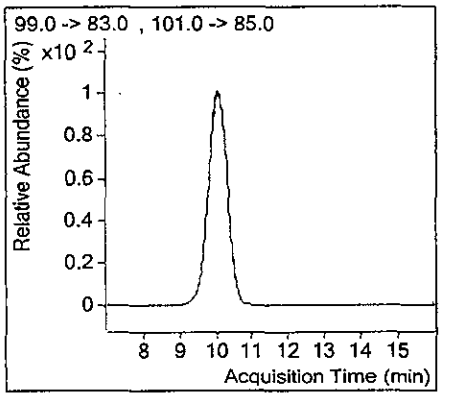
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	25309	101	85	3.02	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	62773	109	91	3.19	2.30	3.80	In Control

Compound Graphics

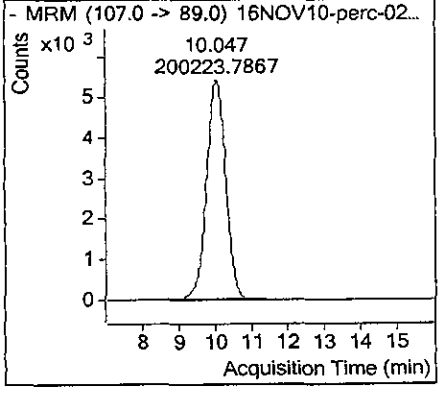
mr 11/17/10

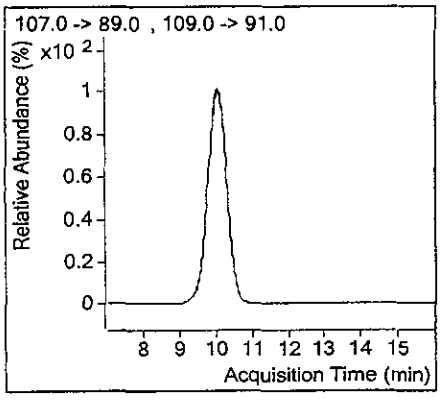
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 21:00
Analyst	lores
Data File	16NOV10-perc-023 d
Acquisition Method	PercMRM_2.m
Sample Name	LODV E100720D Perchlorate Std 0.15ng/mL
Sample Identification	LODV
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C3
Exp. Concentration	0.15
Injection Volume	50

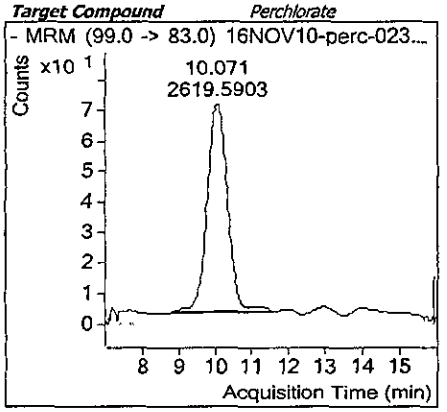
Quantitation Results

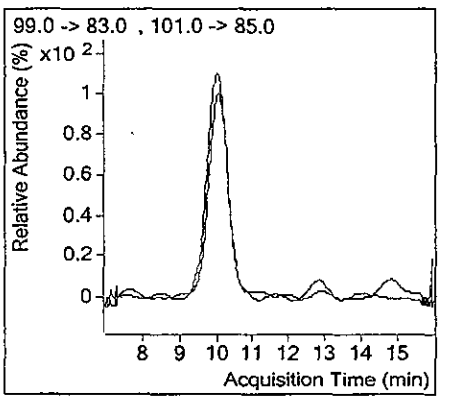
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10 071	2620	99	83	**0.16148**	**0.16148**	1
Perchlorate-(35Cl18O4)	ISTD	10.046	190832	107	89			1
							7.7 % Deviation	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	958	101	85	2.74	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	58252	109	91	3.28	2.30	3.80	In Control

Compound Graphics

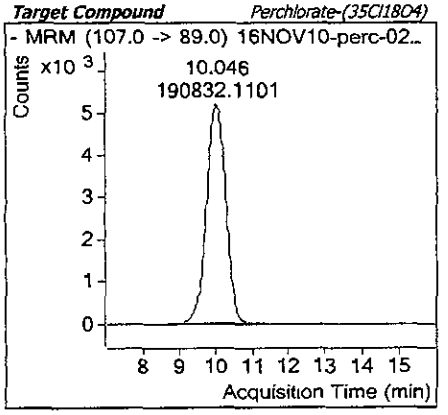
Target Compound *Perchlorate*

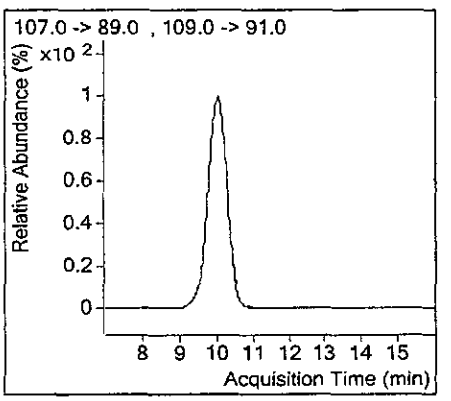




MB 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





QQQ Checktune Report

Instrument Name	Instrument 1	**MS Model**	G6410A
Tune Date & Time	2010-11-16 15:26		
Data Path	D:\MassHunter\Tune\QQQ\atunes.tune.xml		
Ion Source	ESI		
Ionization Mode	ESI		

Negative Results

Analyzer: MS1 ***Polarity: Negative*** ***Width: Unit***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.00	112.99	0.10	0.01	[illegible]	0.70	0.70	0.10	0.00	[illegible]	24534	[illegible]	[illegible]
302.00	302.00	0.10	0.00	[illegible]	0.68	0.70	0.10	-0.02	[illegible]	90979	[illegible]	[illegible]
601.96	601.98	0.10	-0.02	[illegible]	0.68	0.70	0.10	-0.02	[illegible]	1173582	[illegible]	[illegible]
1033.98	1033.99	0.10	-0.01	[illegible]	0.68	0.70	0.10	-0.02	[illegible]	493112	[illegible]	[illegible]
1333.95	1333.97	0.10	-0.02	[illegible]	0.67	0.70	0.10	-0.03	[illegible]	442738	[illegible]	[illegible]
1633.92	1633.95	0.10	-0.03	[illegible]	0.73	0.70	0.10	0.03	[illegible]	516689	[illegible]	[illegible]

Analyzer: MS2 ***Polarity: Negative*** ***Width: Unit***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.01	112.99	0.10	0.02	[illegible]	0.72	0.70	0.10	0.02	[illegible]	75167	[illegible]	[illegible]
301.98	302.00	0.10	-0.02	[illegible]	0.70	0.70	0.10	0.00	[illegible]	87263	[illegible]	[illegible]
601.98	601.98	0.10	0.00	[illegible]	0.71	0.70	0.10	0.01	[illegible]	604513	[illegible]	[illegible]
1034.00	1033.99	0.10	0.01	[illegible]	0.69	0.70	0.10	-0.01	[illegible]	204177	[illegible]	[illegible]
1333.99	1333.97	0.10	0.02	[illegible]	0.69	0.70	0.10	-0.01	[illegible]	320234	[illegible]	[illegible]
1633.94	1633.95	0.10	-0.01	[illegible]	0.75	0.70	0.10	0.05	[illegible]	342000	[illegible]	[illegible]

Analyzer: MS1 ***Polarity: Negative*** ***Width: Wide***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.01	112.99	0.30	0.02	[illegible]	1.17	1.20	0.60	-0.03	[illegible]	28392	[illegible]	[illegible]
301.98	302.00	0.30	-0.02	[illegible]	1.22	1.20	0.60	0.02	[illegible]	120554	[illegible]	[illegible]
601.94	601.98	0.30	-0.04	[illegible]	1.25	1.20	0.60	0.05	[illegible]	1549390	[illegible]	[illegible]
1033.85	1033.99	0.30	-0.14	[illegible]	1.29	1.20	0.60	0.09	[illegible]	815748	[illegible]	[illegible]
1333.85	1333.97	0.30	-0.12	[illegible]	1.28	1.20	0.60	0.08	[illegible]	869811	[illegible]	[illegible]
1633.89	1633.95	0.30	-0.06	[illegible]	1.23	1.20	0.60	0.03	[illegible]	985279	[illegible]	[illegible]

QQQ Checktune Report

Analyzer: MS2 ***Polarity: Negative*** ***Width: Wide***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.03	112.99	0.30	0.04	[illegible]	1.21	1.20	0.60	0.01	[illegible]	102240	[illegible]	[illegible]
301.96	302.00	0.30	-0.04	[illegible]	1.28	1.20	0.60	0.08	[illegible]	126343	[illegible]	[illegible]
601.93	601.98	0.30	-0.05	[illegible]	1.26	1.20	0.60	0.06	[illegible]	985562	[illegible]	[illegible]
1033.95	1033.99	0.30	-0.04	[illegible]	1.23	1.20	0.60	0.03	[illegible]	413611	[illegible]	[illegible]
1333.94	1333.97	0.30	-0.03	[illegible]	1.22	1.20	0.60	0.02	[illegible]	597631	[illegible]	[illegible]
1633.95	1633.95	0.30	0.00	[illegible]	1.20	1.20	0.60	0.00	[illegible]	564396	[illegible]	[illegible]

Analyzer: MS1 ***Polarity: Negative*** ***Width: Widest***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
112.92	112.99	0.50	-0.07	[illegible]	2.73	2.50	1.25	0.23	[illegible]	31875	[illegible]	[illegible]
301.94	302.00	0.50	-0.06	[illegible]	2.75	2.50	1.25	0.25	[illegible]	159882	[illegible]	[illegible]
601.91	601.98	0.50	-0.07	[illegible]	2.83	2.50	1.25	0.33	[illegible]	1894569	[illegible]	[illegible]
1033.86	1033.99	0.50	-0.13	[illegible]	2.83	2.50	1.25	0.33	[illegible]	1097771	[illegible]	[illegible]
1333.89	1333.97	0.50	-0.08	[illegible]	2.77	2.50	1.25	0.27	[illegible]	1232745	[illegible]	[illegible]
1633.99	1633.95	0.50	0.04	[illegible]	2.65	2.50	1.25	0.15	[illegible]	1564595	[illegible]	[illegible]

Analyzer: MS2 ***Polarity: Negative*** ***Width: Widest***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
112.90	112.99	0.50	-0.09	[illegible]	2.60	2.50	1.25	0.10	[illegible]	132707	0	[illegible]
301.89	302.00	0.50	-0.11	[illegible]	2.64	2.50	1.25	0.14	[illegible]	182496	0	[illegible]
601.90	601.98	0.50	-0.08	[illegible]	2.61	2.50	1.25	0.11	[illegible]	1587823	0	[illegible]
1033.98	1033.99	0.50	-0.01	[illegible]	2.46	2.50	1.25	-0.04	[illegible]	849840	0	[illegible]
1333.94	1333.97	0.50	-0.03	[illegible]	2.50	2.50	1.25	0.00	[illegible]	1236220	0	[illegible]
1634.01	1633.95	0.50	0.06	[illegible]	2.39	2.50	1.25	-0.11	[illegible]	1434707	0	[illegible]

[1] *NOTE: 1) Actual abundances depend on many factors and are instrument specific.*
To change the minimum abundance, edit the values on the "Options" sheet.

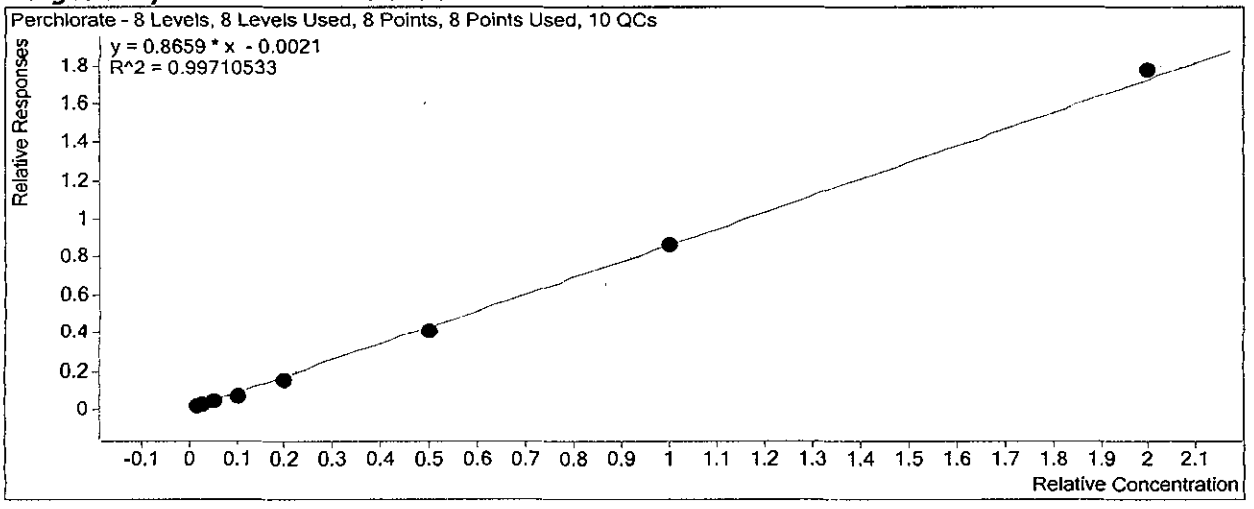
TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Info

Batch Data Path	D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml		
Analysis Time	11/19/2010 1:44 PM	**Analyst Name**	lores
Report Time	11/19/2010 1:45 PM	**Reporter Name**	lores
Last Calib Update	11/19/2010 1:44 PM	**Batch State**	Processed

Calibration Info

Target Compound *Perchlorate*



Weight: 1/x MS 11/19/10

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Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Sequence Table

Data File	Sample Name	Position	Level	Sample Type	Acq. Date & Time
17NOV10-perc-005.d	Blank, no IS	P2-A9		Sample	11/17/2010 16:36
17NOV10-perc-006.d	Blank + IS	P2-C1		Sample	11/17/2010 16:54
17NOV10-perc-007.d	ICAL-1 E100702D Perchlorate Std 0.15ng/mL	P2-B2	1	Calibration	11/17/2010 17:11
17NOV10-perc-008.d	ICAL-2 E100720E Perchlorate Std 0.30ng/mL	P2-B3	2	Calibration	11/17/2010 17:29
17NOV10-perc-009.d	ICAL-3 E100720F Perchlorate Std 0.50ng/mL	P2-B4	3	Calibration	11/17/2010 17:46
17NOV10-perc-010.d	ICAL-4 E100720G Perchlorate Std 1.0ng/mL	P2-B5	4	Calibration	11/17/2010 18:04
17NOV10-perc-011.d	ICAL-5 E100720H Perchlorate Std 2.0ng/mL	P2-B6	5	Calibration	11/17/2010 18:21
17NOV10-perc-012.d	ICAL-6 E100720I Perchlorate Std 5.0ng/mL	P2-B7	6	Calibration	11/17/2010 18:38
17NOV10-perc-013.d	ICAL-7 E100720J Perchlorate Std 10ng/mL	P2-B8	7	Calibration	11/17/2010 18:56
17NOV10-perc-014.d	ICAL-8 E100720K Perchlorate Std 20ng/mL	P2-B9	8	Calibration	11/17/2010 19:13
17NOV10-perc-015.d	Blank + IS	P2-C1		Sample	11/17/2010 19:31
17NOV10-perc-016.d	ICV E100720C Perchlorate Std 5.0ng/mL	P2-C2	ICV	QC	11/17/2010 19:48
17NOV10-perc-017.d	LODV E100720D Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 20:06
17NOV10-perc-018.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 20:23
17NOV10-perc-019.d	G0K100000-MB, 0314148, 20mL/20mL, 6850-DOD-L	P1-A1		Sample	11/17/2010 20:41
17NOV10-perc-020.d	G0K020530-1, 0314148, 20mL/20mL, 50x	P1-A4		Sample	11/17/2010 20:58
17NOV10-perc-021.d	G0K020530-1MS, 0314148, 20mL/20mL, 50x	P1-A5	MS_0.5	QC	11/17/2010 21:16
17NOV10-perc-022.d	G0K020530-1MSD, 0314148, 20mL/20mL, 50x	P1-A6	MS_0.5	QC	11/17/2010 21:33
17NOV10-perc-023.d	G0K020530-2, 0314148, 20mL/20mL, 50x	P1-A7		Sample	11/17/2010 21:51
17NOV10-perc-024.d	Q4 LOQ 6850-L, 0314148, 20mL/20mL	P1-A9		Sample	11/17/2010 22:08
17NOV10-perc-025.d	Q4 LOD 6850-L, 0314148, 20mL/20mL	P2-F3		Sample	11/17/2010 22:26
17NOV10-perc-026.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 22:43
17NOV10-perc-027.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 23:01
17NOV10-perc-028.d	Blank + IS	P2-C1		Sample	11/17/2010 23:18
17NOV10-perc-029.d	A0J210551-1, 0299273, 2.98g/10mL, 50x	P1-D2		Sample	11/17/2010 23:36
17NOV10-perc-030.d	A0J210551-2, 0299273, 3.08g/10mL, 10x	P1-D3		Sample	11/17/2010 23:53

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

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17NOV10-perc-031.d	A0J210551-3, 0299273, 3.01g/10mL,	P1-D4		Sample	11/18/2010 00:11
17NOV10-perc-032.d	A0J210551-3MS, 0299273, 2.98g/10mL,	P1-D5	MS_5	QC	11/18/2010 00:28
17NOV10-perc-033.d	A0J210551-3MSD, 0299273, 3.02g/10mL,	P1-D6	MS_5	QC	11/18/2010 00:45
17NOV10-perc-034.d	A0J210551-4, 0299273, 3.06g/10mL,	P1-D7		Sample	11/18/2010 01:03
17NOV10-perc-035.d	A0J210551-5, 0299273, 3.07g/10mL,	P1-D8		Sample	11/18/2010 01:20
17NOV10-perc-036.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/18/2010 01:38
17NOV10-perc-037.d	A0J210551-8, 0299273, 2.97g/10mL,	P1-E2		Sample	11/18/2010 01:55
17NOV10-perc-038.d	A0J210551-9, 0299273, 3.00g/10mL,	P1-E3		Sample	11/18/2010 02:13

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TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Target Compound *Perchlorate*

Calibration STD	Level	Enabled	Response	RF	Exp Conc
17NOV10-perc-007.d	1	☑	2870	0.9672	0.1500
17NOV10-perc-008.d	2	☑	4846	0.7829	0.3000
17NOV10-perc-009.d	3	☑	8636	0.8651	0.5000
17NOV10-perc-010.d	4	☑	15241	0.6986	1.0000
17NOV10-perc-011.d	5	☑	29981	0.7578	2.0000
17NOV10-perc-012.d	6	☑	78623	0.8153	5.0000
17NOV10-perc-013.d	7	☑	157978	0.8635	10.0000
17NOV10-perc-014.d	8	☑	311448	0.8912	20.0000
17NOV10-perc-026.d	CCV5	☑	30224	0.7551	2.0000
17NOV10-perc-036.d	CCV5	☑	30344	0.7595	2.0000
17NOV10-perc-018.d	CCV6	☑	79842	0.8345	5.0000
17NOV10-perc-016.d	ICV	☑	81686	0.7716	5.0000
17NOV10-perc-017.d	LODV	☑	2688	0.8893	0.1500
17NOV10-perc-027.d	LODV	☑	2508	0.8388	0.1500
17NOV10-perc-021.d	MS_0.5	☑	222376	1154.2244	0.5000
17NOV10-perc-022.d	MS_0.5	☑	218111	1104.2220	0.5000
17NOV10-perc-032.d	MS_5	☑	26521	0.2817	5.0000
17NOV10-perc-033.d	MS_5	☑	26087	0.2902	5.0000

Target Compound *Perchlorate-(35Cl1804)*

Calibration STD	Level	Enabled	Response	RF	Exp Conc
17NOV10-perc-007.d	1	☑	197834	19783.3573	10.0000
17NOV10-perc-008.d	2	☑	206357	20635.6567	10.0000
17NOV10-perc-009.d	3	☑	199654	19965.3657	10.0000
17NOV10-perc-010.d	4	☑	218171	21817.1461	10.0000
17NOV10-perc-011.d	5	☑	197820	19782.0114	10.0000
17NOV10-perc-012.d	6	☑	192874	19287.4113	10.0000
17NOV10-perc-013.d	7	☑	182942	18294.1741	10.0000
17NOV10-perc-014.d	8	☑	174741	17474.0876	10.0000
17NOV10-perc-026.d	CCV5	☑	200124	20012.3556	10.0000
17NOV10-perc-036.d	CCV5	☑	199770	19976.9513	10.0000
17NOV10-perc-018.d	CCV6	☑	191353	19135.3393	10.0000
17NOV10-perc-016.d	ICV	☑	211728	21172.7759	10.0000
17NOV10-perc-017.d	LODV	☑	201498	20149.8484	10.0000
17NOV10-perc-027.d	LODV	☑	199324	19932.4063	10.0000
17NOV10-perc-021.d	MS_0.5	☑	3853	385.3260	10.0000
17NOV10-perc-022.d	MS_0.5	☑	3950	395.0492	10.0000
17NOV10-perc-032.d	MS_5	☑	188263	18826.3384	10.0000
17NOV10-perc-033.d	MS_5	☑	179789	17978.9352	10.0000

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Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 16:36
Analyst	lores
Data File	17NOV10-perc-005.d
Acquisition Method	PercMRM_2.m
Sample Name	Blank, no IS
Sample Identification	Blank
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-A9
Exp. Concentration	
Injection Volume	50

Perchlorate = ND

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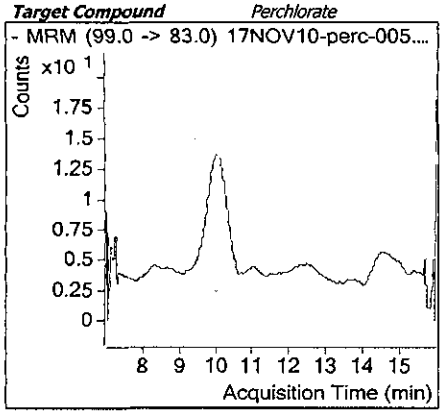
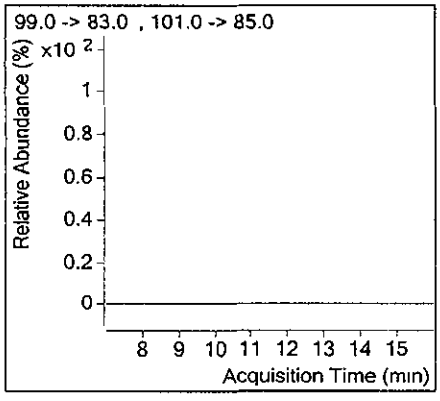
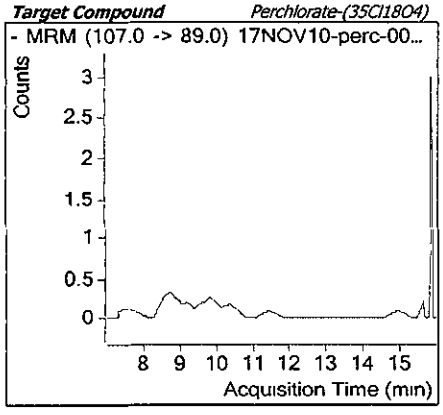
Compound Graphics

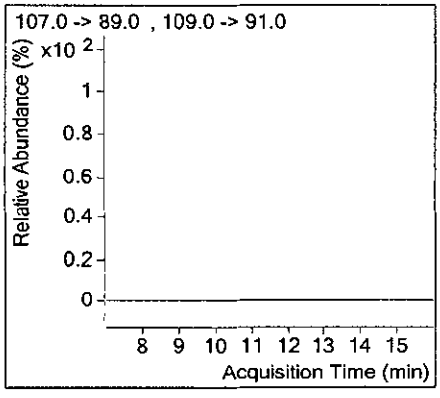
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





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Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 16:54
Analyst	lores
Data File	17NOV10-perc-006.d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

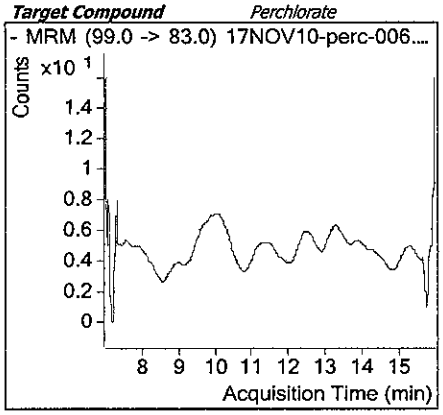
Quantitation Results

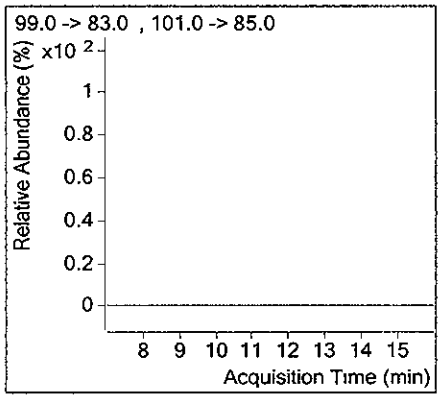
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate-(35Cl18O4)	ISTD	10 050	199978	107	89			1
						Perchlorate = ND		

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	62657	109	91	3.19	2.30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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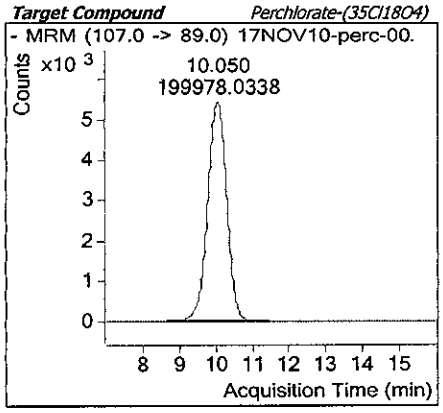
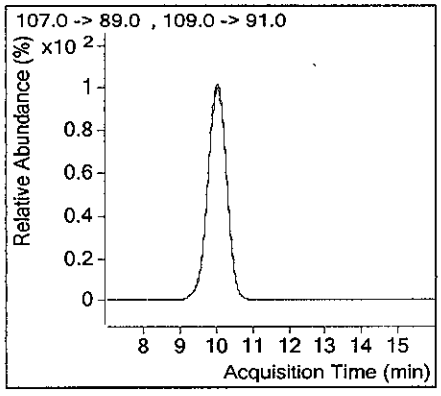
Target Compound *Perchlorate-(35Cl18O4)*





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Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 17:11
Analyst	lores
Data File	17NOV10-perc-007.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-1 E100702D Perchlorate Std 0.15ng/mL
Sample Identification	ICAL-1
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B2
Exp. Concentration	0.15
Injection Volume	50

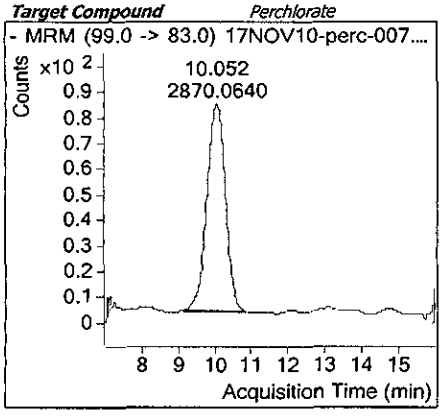
Quantitation Results

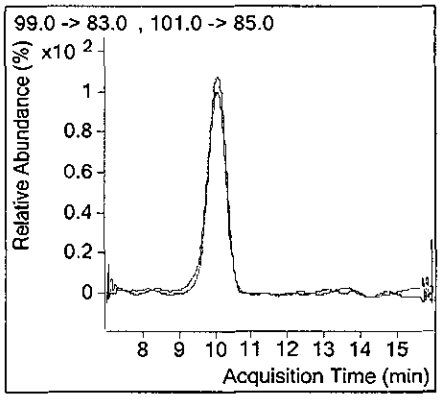
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.052	2870	99	83	0.19136	0.19136	1
Perchlorate-(35Cl18O4)	ISTD	10.046	197834	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	1079	101	85	2.66	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	60805	109	91	3.25	2.30	3.80	In Control

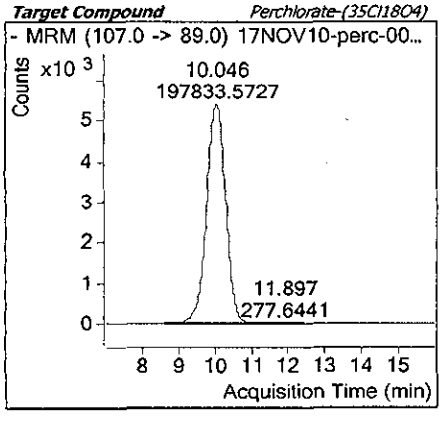
Compound Graphics

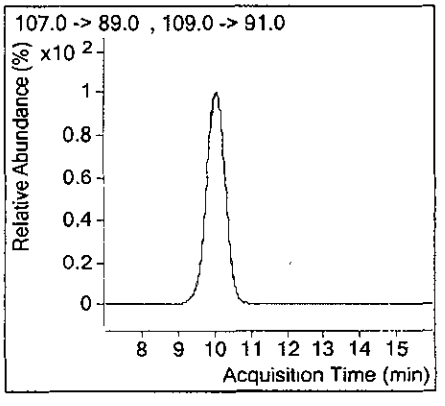
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





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Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 17:29
Analyst	lores
Data File	17NOV10-perc-008 d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-2 E100720E Perchlorate Std 0.30ng/mL
Sample Identification	ICAL-2
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B3
Exp. Concentration	0 30
Injection Volume	50

Quantitation Results

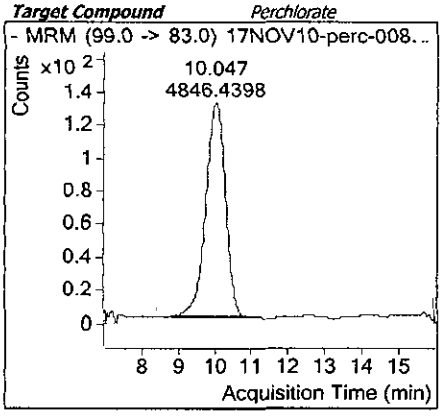
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.047	4846	99	83	0.29505	0.29505	1
Perchlorate-(35Cl18O4)	ISTD	10.046	206357	107	89			1

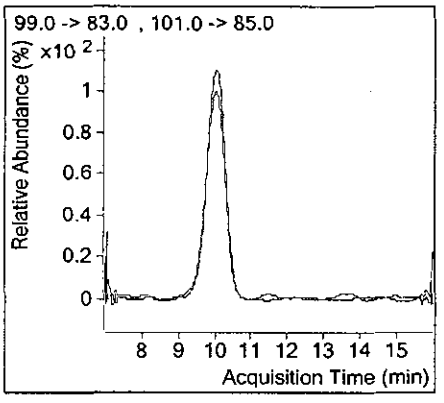
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	1673	101	85	2.90	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	63687	109	91	3.24	2.30	3.80	In Control

Compound Graphics

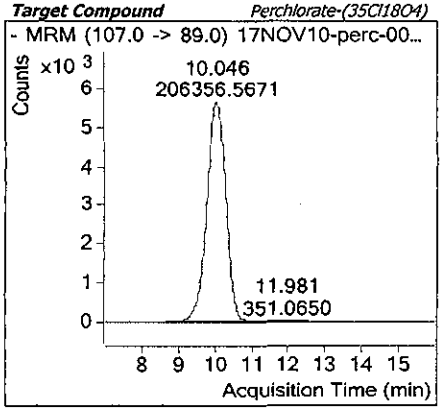
mr 11/19/10

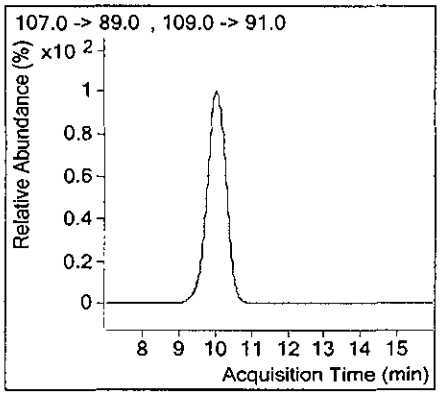
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 17:46
Analyst	lores
Data File	17NOV10-perc-009 d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-3 E100720F Perchlorate Std 0.50ng/mL
Sample Identification	ICAL-3
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45 55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B4
Exp. Concentration	0.50
Injection Volume	50

Quantitation Results

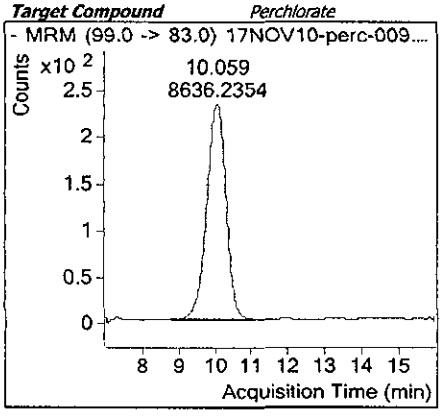
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.059	8636	99	83	0.52337	0.52337	1
Perchlorate-(35Cl18O4)	ISTD	10.049	199654	107	89			1

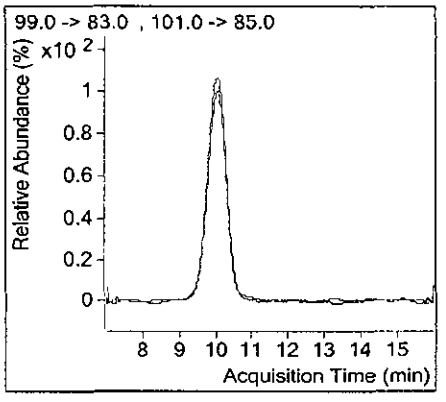
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	3028	101	85	2.85	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	61488	109	91	3.25	2.30	3.80	In Control

Compound Graphics

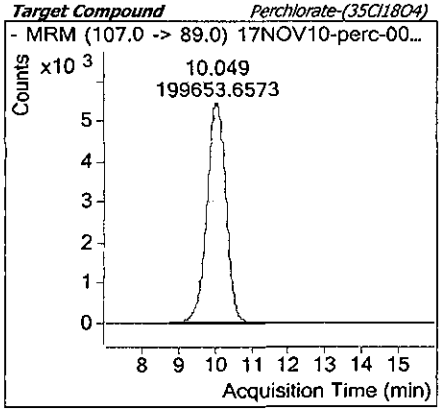
m 11/19/10

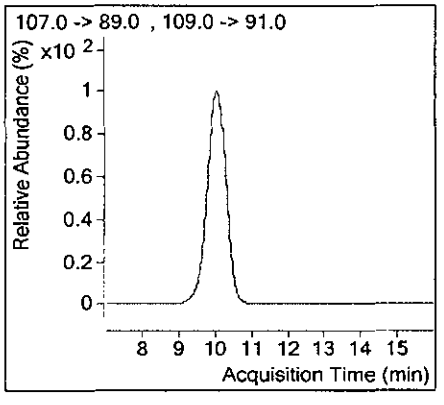
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 18:04
Analyst	lores
Data File	17NOV10-perc-010.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-4 E100720G Perchlorate Std 1.0ng/mL
Sample Identification	ICAL-4
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B5
Exp. Concentration	1.00
Injection Volume	50

Quantitation Results

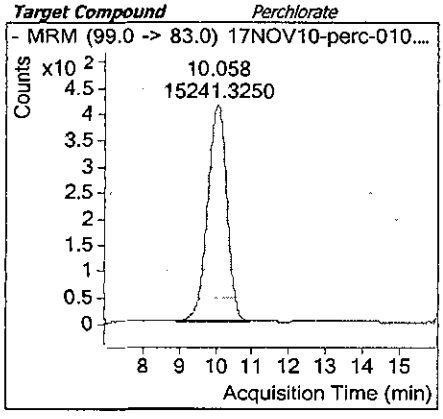
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.058	15241	99	83	0.83060	0.83060	1
Perchlorate-(35Cl18O4)	ISTD	10.045	218171	107	89			1

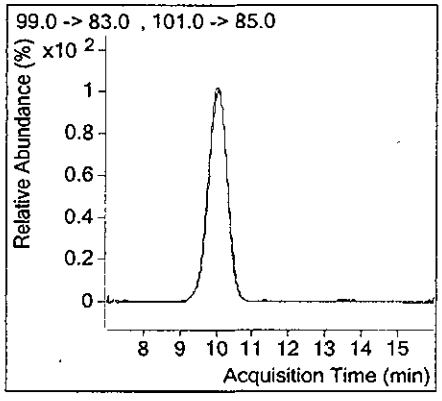
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	5098	101	85	2.99	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	65977	109	91	3.31	2.30	3.80	In Control

Compound Graphics

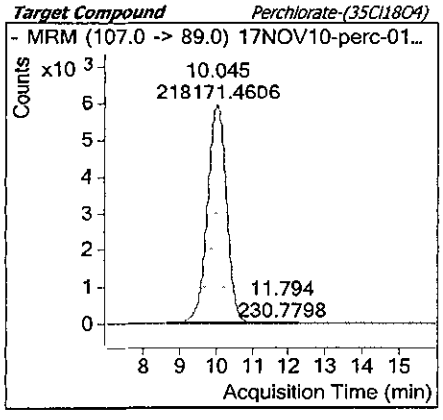
mr 11/19/10

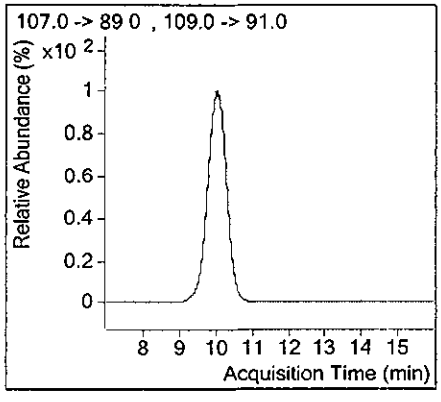
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 18:21
Analyst	lores
Data File	17NOV10-perc-011 d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-5 E100720H Perchlorate Std 2.0ng/mL
Sample Identification	ICAL-5
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B6
Exp. Concentration	2.00
Injection Volume	50

Quantitation Results

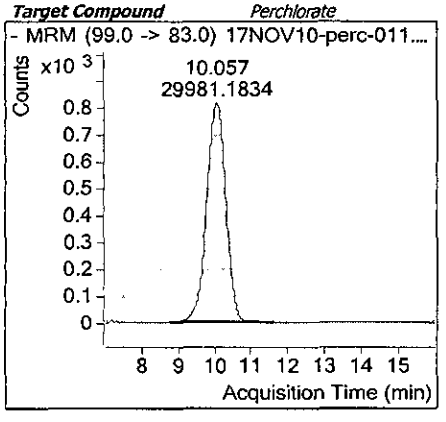
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.057	29981	99	83	1.77411	1.77411	1
Perchlorate-(35Cl18O4)	ISTD	10.051	197820	107	89			1

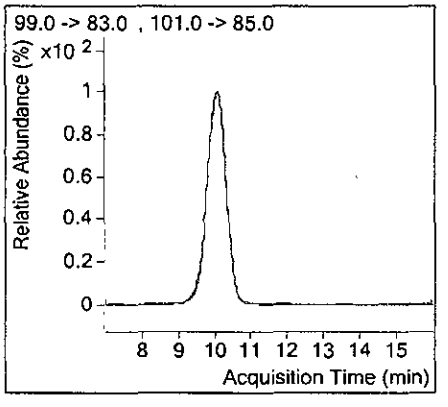
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	10122	101	85	2.96	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	61404	109	91	3.22	2.30	3.80	In Control

m 11/19/10

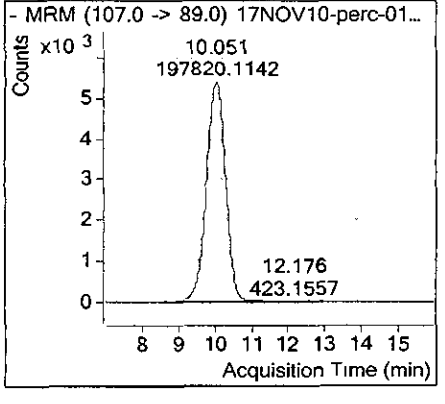
Compound Graphics

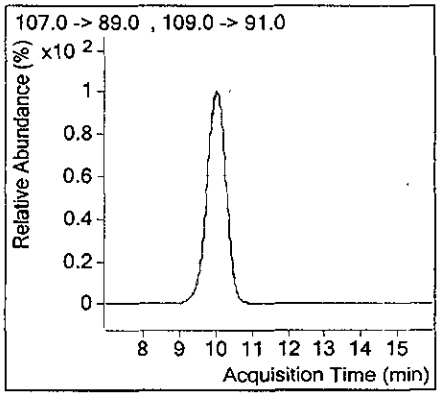
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 18:38
Analyst	lores
Data File	17NOV10-perc-012 d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-6 E100720I Perchlorate Std 5.0ng/mL
Sample Identification	ICAL-6
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B7
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

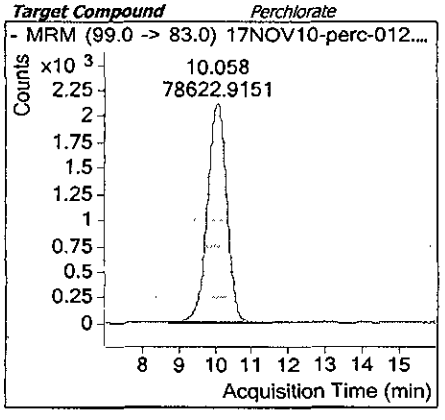
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.058	78623	99	83	4.73149	4.73149	1
Perchlorate-(35Cl18O4)	ISTD	10.050	192874	107	89			1

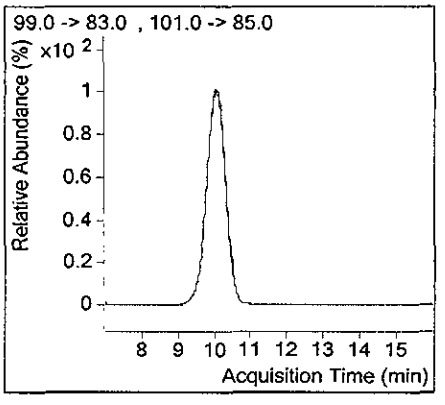
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	26356	101	85	2.98	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	60577	109	91	3.18	2.30	3.80	In Control

Compound Graphics

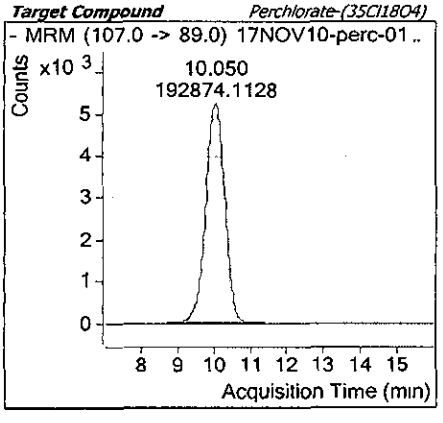
mr 11/19/10

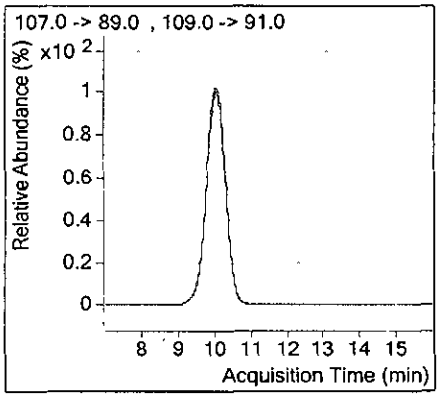
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 18:56
Analyst	lores
Data File	17NOV10-perc-013.d
Acquisition Method	PercMRM_2 m
Sample Name	ICAL-7 E100720J Perchlorate Std 10ng/mL
Sample Identification	ICAL-7
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45.55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B8
Exp. Concentration	10.00
Injection Volume	50

Quantitation Results

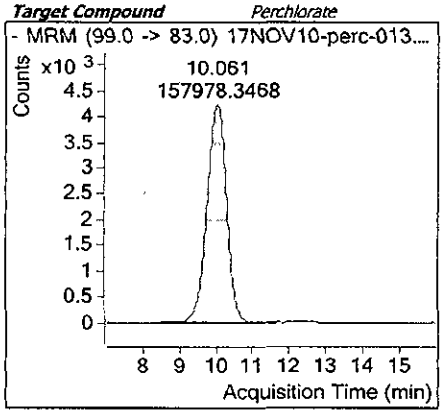
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.061	157978	99	83	9.99658	9.99658	1
Perchlorate-(35Cl18O4)	ISTD	10.056	182942	107	89			1

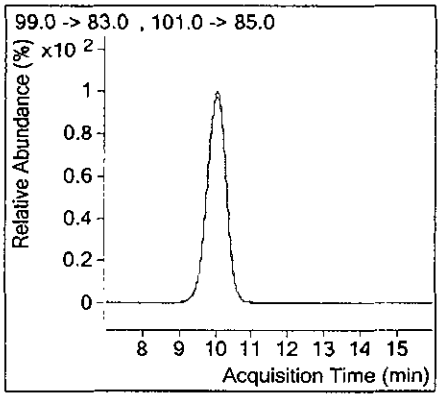
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	51337	101	85	3.08	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	57075	109	91	3.21	2.30	3.80	In Control

Compound Graphics

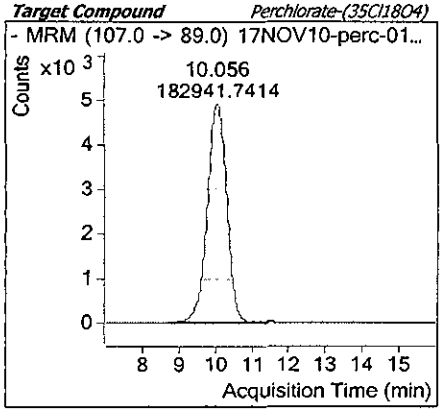
m 11/19/10

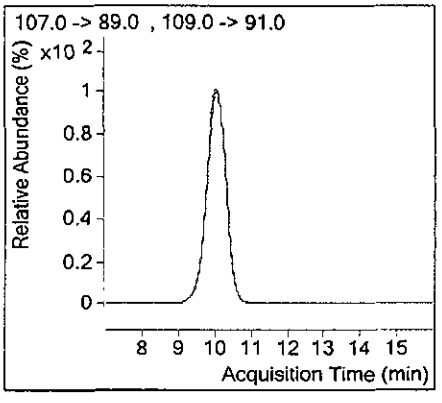
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 19:13
Analyst	lores
Data File	17NOV10-perc-014.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-8 E100720K Perchlorate Std 20ng/mL
Sample Identification	ICAL-8
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B9
Exp. Concentration	20.00
Injection Volume	50

Quantitation Results

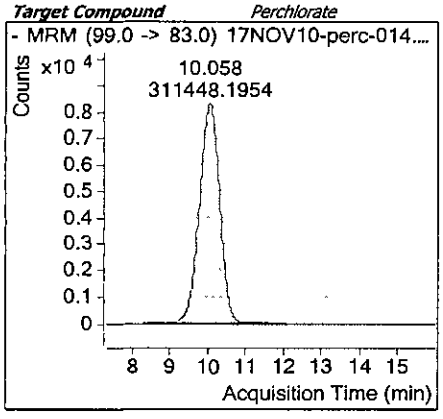
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.058	311448	99	83	**20.60744**	**20.60744**	1
Perchlorate-(35Cl18O4)	ISTD	10.053	174741	107	89			1

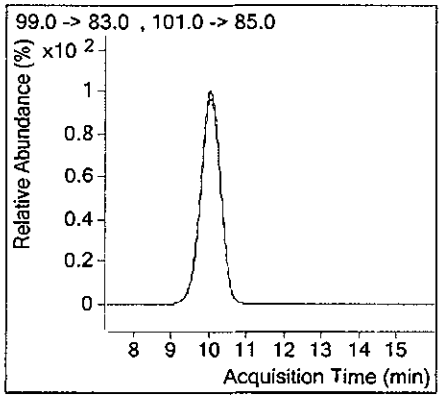
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	99668	101	85	3.12	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	54426	109	91	3.21	2.30	3.80	In Control

Compound Graphics

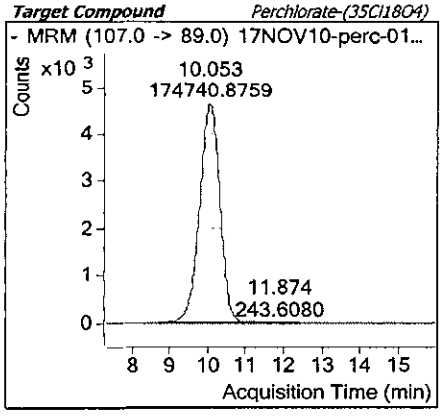
m 11/19/10

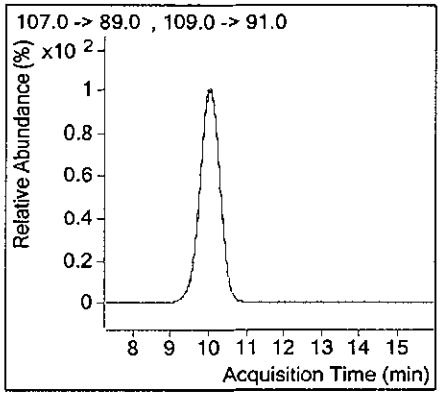
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 19:31
Analyst	lores
Data File	17NOV10-perc-015 d
Acquisition Method	PercMRM_2 m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

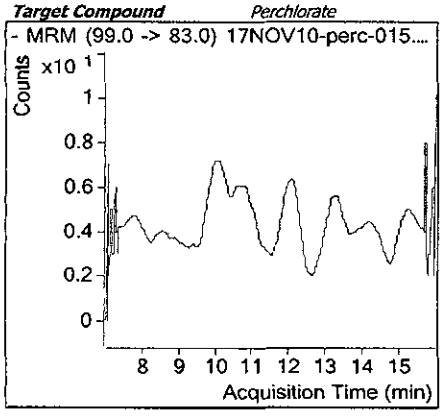
Quantitation Results

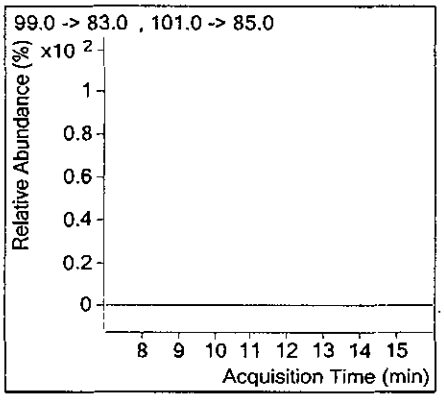
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate-(35Cl18O4)	ISTD	10.055	202273	107	89			1
							Perchlorate = ND	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	61627	109	91	3.28	2.30	3 80	In Control

Compound Graphics

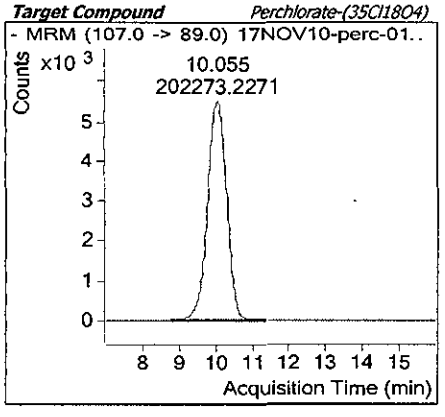
Target Compound *Perchlorate*

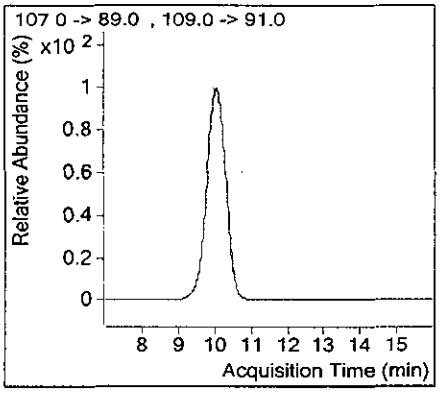




m 11/19/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 19:48
Analyst	lores
Data File	17NOV10-perc-016.d
Acquisition Method	PercMRM_2.m
Sample Name	ICV E100720C Perchlorate Std 5.0ng/mL
Sample Identification	ICV
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C2
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

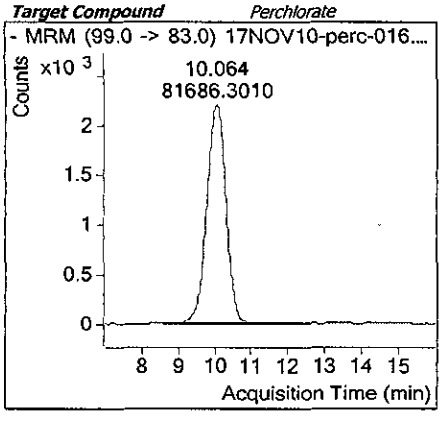
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.064	81686	99	83	4.47938	4.47938	1
Perchlorate-(35Cl18O4)	ISTD	10.055	211728	107	89			1
							-10.4 % Deviation	

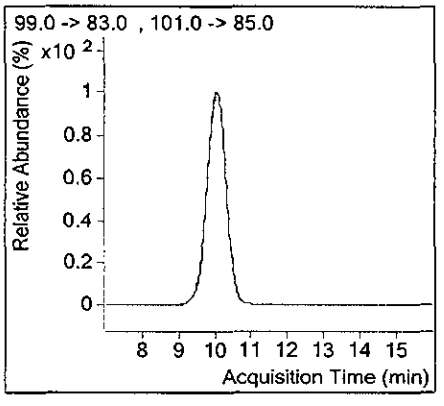
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	27344	101	85	2.99	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	65339	109	91	3.24	2.30	3.80	In Control

Compound Graphics

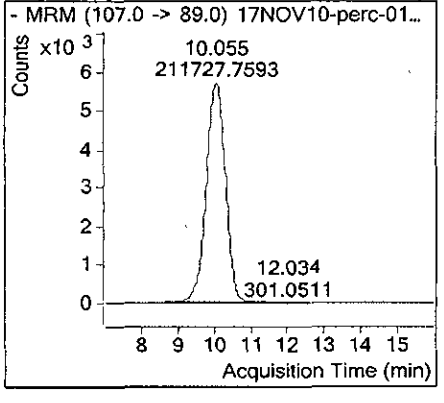
mr 11/19/10

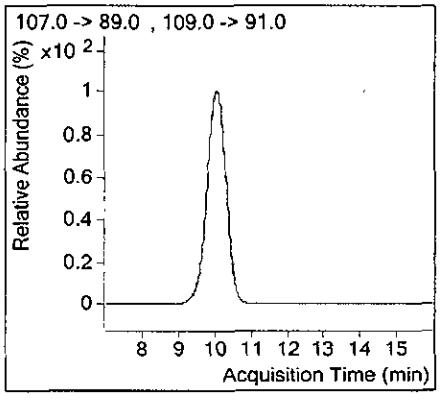
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\17NOV2010\QuantResults\17November2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 20:06
Analyst	lores
Data File	17NOV10-perc-017.d
Acquisition Method	PercMRM_2.m
Sample Name	LODV E100720D Perchlorate Std 0 15ng/mL
Sample Identification	LODV
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C3
Exp. Concentration	0.15
Injection Volume	50

Quantitation Results

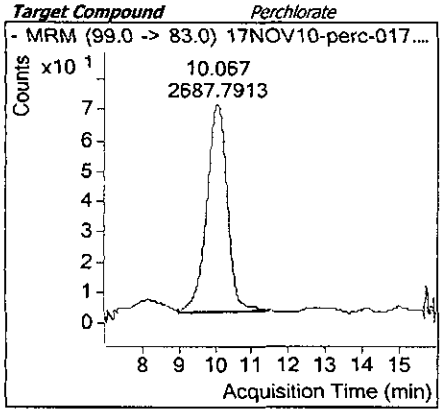
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.067	2688	99	83	**0.17787**	**0.17787**	1
Perchlorate-(35Cl18O4)	ISTD	10.053	201498	107	89			1
							18.6 % Deviation	

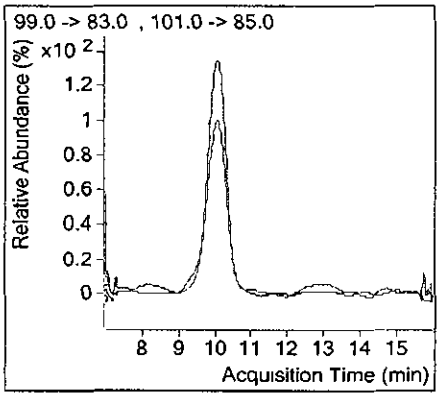
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	1137	101	85	2.36	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	61462	109	91	3.28	2.30	3.80	In Control

Compound Graphics

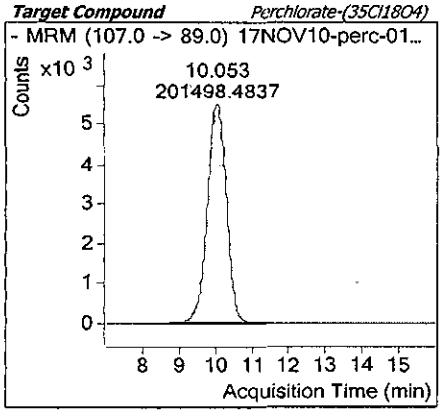
mr 11/19/10

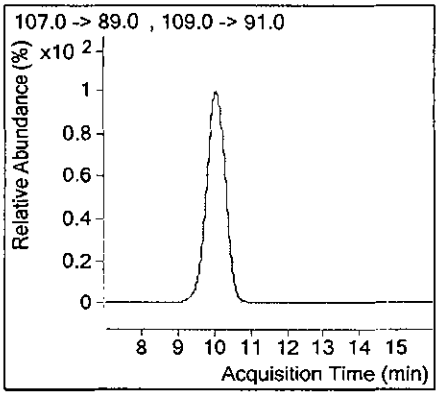
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





QQQ Checktune Report

Instrument Name	Instrument 1	**MS Model**	G6410A
Tune Date & Time	2010-11-17 14:57		
Data Path	D:\MassHunter\Tune\QQQ\atunes.tune.xml		
Ion Source	ESI		
Ionization Mode	ESI		

Negative Results

Analyzer: MS1 ***Polarity: Negative*** ***Width: Unit***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.00	112.99	0.10	0.01	[illegible]	0.70	0.70	0.10	0.00	[illegible]	26929	0	[illegible]
302.00	302.00	0.10	0.00	[illegible]	0.68	0.70	0.10	-0.02	[illegible]	87624	0	[illegible]
601.95	601.98	0.10	-0.03	[illegible]	0.68	0.70	0.10	-0.02	[illegible]	1080356	0	[illegible]
1033.98	1033.99	0.10	-0.01	[illegible]	0.70	0.70	0.10	0.00	[illegible]	484556	0	[illegible]
1333.94	1333.97	0.10	-0.03	[illegible]	0.69	0.70	0.10	-0.01	[illegible]	423820	0	[illegible]
1633.91	1633.95	0.10	-0.04	[illegible]	0.75	0.70	0.10	0.05	[illegible]	483030	0	[illegible]

Analyzer: MS2 ***Polarity: Negative*** ***Width: Unit***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
112.99	112.99	0.10	0.00	[illegible]	0.72	0.70	0.10	0.02	[illegible]	75683	0	[illegible]
301.97	302.00	0.10	-0.03	[illegible]	0.70	0.70	0.10	0.00	[illegible]	80785	0	[illegible]
601.96	601.98	0.10	-0.02	[illegible]	0.71	0.70	0.10	0.01	[illegible]	546974	0	[illegible]
1033.99	1033.99	0.10	0.00	[illegible]	0.70	0.70	0.10	0.00	[illegible]	193849	0	[illegible]
1333.97	1333.97	0.10	0.00	[illegible]	0.70	0.70	0.10	0.00	[illegible]	300135	0	[illegible]
1633.91	1633.95	0.10	-0.04	[illegible]	0.77	0.70	0.10	0.07	[illegible]	320285	0	[illegible]

Analyzer: MS1 ***Polarity: Negative*** ***Width: Wide***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.01	112.99	0.30	0.02	[illegible]	1.16	1.20	0.60	-0.04	[illegible]	31379	[illegible]	[illegible]
301.98	302.00	0.30	-0.02	[illegible]	1.22	1.20	0.60	0.02	[illegible]	114139	[illegible]	[illegible]
601.94	601.98	0.30	-0.04	[illegible]	1.26	1.20	0.60	0.06	[illegible]	1413157	[illegible]	[illegible]
1033.85	1033.99	0.30	-0.14	[illegible]	1.31	1.20	0.60	0.11	[illegible]	782292	[illegible]	[illegible]
1333.84	1333.97	0.30	-0.13	[illegible]	1.31	1.20	0.60	0.11	[illegible]	827735	[illegible]	[illegible]
1633.88	1633.95	0.30	-0.07	[illegible]	1.23	1.20	0.60	0.03	[illegible]	927088	[illegible]	[illegible]

QQQ Checktune Report

Analyzer:* *MS2 ***Polarity:* *Negative*** ***Width:* *Wide***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.00	112.99	0.30	0.01	Pass	1.22	1.20	0.60	0.02		99123		
301.93	302.00	0.30	-0.07	Pass	1.28	1.20	0.60	0.08		118133		
601.91	601.98	0.30	-0.07	Pass	1.26	1.20	0.60	0.06		888159		
1033.92	1033.99	0.30	-0.07	Pass	1.25	1.20	0.60	0.05		387302		
1333.90	1333.97	0.30	-0.07	Pass	1.24	1.20	0.60	0.04		557416		
1633.93	1633.95	0.30	-0.02	Pass	1.20	1.20	0.60	0.00		541771		

Analyzer:* *MS1 ***Polarity:* *Negative*** ***Width:* *Widest***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
112.92	112.99	0.50	-0.07		2.73	2.50	1.25	0.23		36319		
301.94	302.00	0.50	-0.06		2.72	2.50	1.25	0.22		149970		
601.90	601.98	0.50	-0.08		2.85	2.50	1.25	0.35		1662023		
1033.85	1033.99	0.50	-0.14		2.84	2.50	1.25	0.34		1037312		
1333.89	1333.97	0.50	-0.08		2.78	2.50	1.25	0.28		1162706		
1633.97	1633.95	0.50	0.02		2.66	2.50	1.25	0.16		1445976		

Analyzer:* *MS2 ***Polarity:* *Negative*** ***Width:* *Widest***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
112.86	112.99	0.50	-0.13		2.60	2.50	1.25	0.10		130784		
301.87	302.00	0.50	-0.13		2.62	2.50	1.25	0.12		171003		
601.88	601.98	0.50	-0.10		2.62	2.50	1.25	0.12		1419300		
1033.96	1033.99	0.50	-0.03		2.48	2.50	1.25	-0.02		800669		
1333.90	1333.97	0.50	-0.07		2.52	2.50	1.25	0.02		1163734		
1633.99	1633.95	0.50	0.04		2.40	2.50	1.25	-0.10		1349457		

[1] *NOTE:* *1) Actual abundances depend on many factors and are instrument specific.*
To change the minimum abundance, edit the values on the "Options" sheet.

Sample Extraction/Preparation Log Copies and Checklists

RQC058

TestAmerica Laboratories, Inc.
EXTRACTION BENCH WORKSHEET

Run Date: 11/10/10
Time: 14:50:56

LEV 1	LEV 2		LEV 1	LEV 2	
Y	_	Blank	Y	_	Weights/Volumes
Y	_	Check	Y	_	Spike & Surrogate Worksheet
Y	_	MS/MSD	Y	_	Vial contains correct volume
			_	_	Labels, greenbars, worksheets
					computer batch: correct & all match
			_	_	Anomalies to Extraction Method

_ Expanded Deliverable
_ COC Completed
Y Bench Sheet Copied
_ Package Submitted to AnalyticalGroup
_ Bench Sheet Copied per COC

Extractionist: 002448 Tuan Q. Phan

Concentrationist: 002448 Tuan Q. Phan

Reviewer/Date: PHANT / 11/10/10

QC BATCH: 0314148

PREP DATE: 11/10/10 8:00
COMP DATE: 11/10/10 11:00

Perchlorate by LC/MS/MS
FILTRATION (DISS)

EXTR EXPR	ANL DUE	LOT#,MSRUN#/ WORK ORDER	TEST FLGS	EXT	MTH	MATRIX	INIT/FIN WT/VOL	INIT	PH"S ADJI	ADJ2	SOLVENTS EXTRACTION	VOL	EXCHANGE	VOL	SPIKE STANDARD/ SURROGATE ID
0/00/00	11/18/10	G0K020530-001 0314083 **L9FW8-1-AA**	D	87	71	WATER	**20mL** 20.00mL	NA	NA	NA	WATER	20.0		.0	200UL-10LCMS0313-01
COMMENTS:															
0/00/00	11/18/10	G0K020530-001 0314083 **L9FW8-1-ALS**	D	87	71	WATER	**20mL** 20.00mL	NA	NA	NA	WATER	20.0		.0	100UL-E100805C 200UL-10LCMS0313-01
COMMENTS:															
0/00/00	11/18/10	G0K020530-001 0314083 **L9FW8-1-AMD**	D	87	71	WATER	**20mL** 20.00mL	NA	NA	NA	WATER	20.0		.0	100UL-E100805C 200UL-10LCMS0313-01
COMMENTS:															
0/00/00	11/18/10	G0K020530-002 0314083 **L9FXA-1-AA**	D	87	71	WATER	**20mL** 20.00mL	NA	NA	NA	WATER	20.0		.0	200UL-10LCMS0313-01
COMMENTS:															
0/00/00	11/18/10	G0K020530-003 0314083 **L9FXC-1-AA**	D	87	71	WATER	**20mL** 20.00mL	NA	NA	NA	WATER	20.0		.0	200UL-10LCMS0313-01
COMMENTS:															
0/00/00	0/00/00	G0K100000-148 **L9RPG-1-AAB**		87	71	WATER	**20mL** 20.00mL	NA	NA	NA	WATER	20.0		.0	200UL-10LCMS0313-01
COMMENTS:															
0/00/00	0/00/00	G0K100000-148 **L9RPG-1-ACC**		87	71	WATER	**20mL** 20.00mL	NA	NA	NA	WATER	20.0		.0	100UL-E100805C 200UL-10LCMS0313-01
COMMENTS:															

RQC058

TestAmerica Laboratories, Inc.
EXTRACTION BENCH WORKSHEET

Run Date: 11/10/10
Time: 14:50:56

QC BATCH: 0314148

PREP DATE: 11/10/10 8:00
COMP DATE: 11/10/10 11:00

EXTR EXPR	ANL DUE	LOT#,MSRUN#/ WORK ORDER	TEST FLGS	EXT	MTH	MATRIX	INIT/FIN WT/VOL	INIT	PH"S ADJ1	ADJ2	SOLVENTS EXTRACTION	VOL	EXCHANGE	VOL	SPIKE STANDARD/ SURROGATE ID
0/00/00	0/00/00	G0K100000-148 **L9RPG-1-ADC**		87	71	WATER	**20mL** 20.00mL	NA	**NA**	**NA**	WATER	20.0		.0	100UL-E100805C 200UL-10LCMS0313-01

COMMENTS:

SMCS 3844-035A, MILLIPORE WATER DISPENSED 11/05/10
0.45 FILTER MILLIORE LOT R0KA63096, 0.20 FILTER MILLEX LOT R0EA35631
DIONEX ONGUARD BA/AG/H LOT 101008-2.5

R = RUSH C = CLP
E = EPA 600 D = EXP.DEL)
M = CLIENT REQ MS/MSD

NUMBER OF WORK ORDERS IN BATCH: 8

IM

TestAmerica West Sacramento
ESC-Extraction Master Sheet

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Holding Time Due: 11/24/10 Project Due: 11/18/10
BATCH #: 0314148 Initiated By: TP Date: 11/10/10
Test #: Perchlorate-L 6850 DOD Extn Comp'd By: TP Date: 11/10/10

QC Code	Lot ID	Sample #	Sample Size (mL) / Initial Mass	Final Volume (mL) / Final Mass	Chlorine checked
	MB		20.00	20.00	N/A
C	LCS		20.00	20.00	
	G0K020530	01	20.00	20.00	
S		1MS	20.00	20.00	
D		1MSD	20.00	20.00	
		02	20.00	20.00	
		03	20.00	20.00	
C	SMCS		20.00	20.00	
	LOQ		20.00	20.00	N/A
	LOD		20.00	20.00	N/A
	TP 11/10/10				

SOP No.: WS-LC-0012
EXTRACTION COMMENTS:
Multi-incremental Sampling/Date: N/A
Dried/Date N/A Ground//Date N/A
Sonicated - Start: N/A End: N/A Date: N/A
Cleanup by/Date TP 11/10/10 Dilution by/Date N/A
Final Vialling /Date TP 11/10/10
Millipore Water Dispensed / Date 11/5/10
SPE Cartridge: Waters Lot # N/A
SMCS - 3844-03A

QC Codes	Standard Information				
	Volume	STD ID	Exp. Date	STD Name/Conc.	ppm/ppb
All	200uL	10LCMS0313-01	5/4/11	Perch ISTD	
C,S,D,L	100uL	E100805E	1/20/11	Perch Spike 0.1ug/mL	
LOQ	100uL	E100805E	1/20/11	Perch Spike 0.1ug/mL	
LOD	20uL	E100805E	1/20/11	Perch Spike 0.1ug/mL	

Spiked By / Date: TP 11/10/10 Witnessed By / Date: WS 11-10-10

QC Codes: B = MB, C = LCS, L = LCSD, S = MS, D = SD, FB = Filter Blank

Q:\FORMS\QA-413 ESC EXTRACTION.DOC QA-413 RE 1/29/10

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento

Preparation Data Review Checklist

Prep Batch(es) 0314148 **Test:** Perchlorate-L

Prep Date: 11/10/10 **Holding Times:** 11/24/10 **NCM:** Y (N)

A. Spike Witness/Batch setup	Spike Witness	Reviewer
1. **Holding times checked?** NCMs filed as appropriate	✓	✓
2. QAS checked for QC instructions (LCS, LCSD, MS,MSD, etc)	✓	✓
3. Amount of samples in hood match amount of samples on bench sheet. Sample IDS match.	✓	NA
4. Worksheets have been checked for required spiking compounds	✓	✓
5. Spiking volumes are correctly documented	✓	✓
6. Std ID numbers on spike labels match numbers on bench sheet	✓	NA
7. Expiration dates have been checked	✓	✓
8. Calibration expiration dates on pipettors have been checked	✓	NA
9. Spiker and spike witness have signed and dated bench sheet	✓	✓
B. Weights and Volumes		
1. Recorded weights are in anticipated range	NA	✓
2. Balance upload or raw data for weights is included	NA	✓
3. Weights and volumes have been transcribed correctly to LIMS.	NA	✓
4. Weights are not targeted to meet exact weights.	NA	✓
5. Each weight or volume measurement is a unique record (no dittos or line downs)	NA	✓
C. Standards and Reagents		
1. Lot numbers for all reagents, including clean up stages, are recorded.	NA	✓
2. Are dates and analysts for cleanups recorded?	NA	✓
3. Are correct IDs used for standards? Are expiration dates to day/month/year, when listed?	NA	✓
D. Documentation		
1. Are all nonconformances documented appropriately?	NA	✓
2. QuantIMs entry correct, including dates and times.	NA	✓
3. Are all fields completed?	NA	✓

Spike witness: WS Date: 11-10-10

2nd Level Reviewer: [signature] Date: 11/10/10

Comments:

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica West Sacramento

LCMS Data Review Checklist

Lot ID: G0K020530 **Test:** 6850 DOD-L **PM:** KMD

Prep Batch(es) 0314148

A. Calibration/Instrument Run QC	Analyst	Reviewer	N/A
1. ICAL or ICAL Summary and CCV included.	✓	✓	
2. ICAL, CCV Frequency & Criteria met.	✓	✓	
3. Peaks correctly ID'd by data system.	✓	✓	
4. Copy of logbook for ICAL included	✓	✓	
5. Tune check frequency & criteria met and copy included.	✓	✓	
6. Method Number is identified on data.	✓	✓	
B. QA/QC			
1. Method blank, LCS/LCSD and MS/SD frequencies met.	✓	✓	
2. LCS/LCSD and MB data is included.	✓	✓	
3. LCS/LCSD and MB data are within control limits. If not, NCM is present in Clouseau.	✓	✓	
4. MS/MSD data complete.	✓	✓	
5. Holding Times were met. E: 11/24/10	✓	✓	
6. IS/Surrogate recoveries meet criteria or properly noted.	✓	✓	
C. Sample Analysis			
1. Logbook copies for all injections made, including ICV standards and ICAL.	✓	✓	
2. Logbooks/prep sheets properly filled out.	✓	✓	
3. Manual Integrations reviewed and appropriate.			✓
4. All raw data for samples is included (applies to unused data as well)	✓	✓	
5. All analytes correctly reported.	✓	✓	
6. Correct reporting limits used. (based on client request, prep factors, and dilutions)	✓	✓	
D. Documentation			
1. Are all nonconformances documented appropriately?	✓	✓	
2. Quantims entry correct, including dates and times.	✓	✓	
3. Appropriate footnotes used.	✓	✓	
4. Report sheets included and error-free.	✓	✓	

Analyst: [signature] Date: 11/19/10

2nd Level Reviewer: [signature] Date: 11-19-2010

Comments:

SOLID, 6850/DOD Handbook, Perchlorate

Raw Data Package

Run/Batch Data

Includes (as applicable):

runlogs

continuing calibration standards

interference/performance check standards

continuing calibration blanks

method blanks

lcs

ms/sd

sample raw data

ms tune data

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Sequence Table

Data File	Sample Name	Position	Level	Sample Type	Acq. Date & Time
16NOV10-perc-009.d	Blank, no IS	P2-A9		Sample	11/16/2010 16:56
16NOV10-perc-010.d	Blank + IS	P2-C1		Sample	11/16/2010 17:13
16NOV10-perc-011.d	ICAL-1 E100702D Perchlorate Std 0.15ng/mL	P2-B2	1	Calibration	11/16/2010 17:31
16NOV10-perc-012.d	ICAL-2 E100720E Perchlorate Std 0.30ng/mL	P2-B3	2	Calibration	11/16/2010 17:48
16NOV10-perc-013.d	ICAL-3 E100720F Perchlorate Std 0.50ng/mL	P2-B4	3	Calibration	11/16/2010 18:05
16NOV10-perc-014.d	ICAL-4 E100720G Perchlorate Std 1.0ng/mL	P2-B5	4	Calibration	11/16/2010 18:23
16NOV10-perc-015.d	ICAL-5 E100720H Perchlorate Std 2.0ng/mL	P2-B6	5	Calibration	11/16/2010 18:40
16NOV10-perc-016.d	ICAL-6 E100720I Perchlorate Std 5.0ng/mL	P2-B7	6	Calibration	11/16/2010 18:58
16NOV10-perc-017.d	ICAL-7 E100720J Perchlorate Std 10ng/mL	P2-B8	7	Calibration	11/16/2010 19:15
16NOV10-perc-018.d	ICAL-8 E100720K Perchlorate Std 20ng/mL	P2-B9	8	Calibration	11/16/2010 19:33
16NOV10-perc-019.d	STD_6 Perchlorate Std 5.0ng/mL	P2-A2		Sample	11/16/2010 19:50
16NOV10-perc-020.d	STD_6 Perchlorate Std 5.0ng/mL	P2-A2		Sample	11/16/2010 20:08
16NOV10-perc-021.d	Blank + IS	P2-C1		Sample	11/16/2010 20:25
16NOV10-perc-022.d	ICV E100720C Perchlorate Std 5.0ng/mL	P2-C2	ICV	QC	11/16/2010 20:43
16NOV10-perc-023.d	LODV E100720D Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/16/2010 21:00
16NOV10-perc-024.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/16/2010 21:18
16NOV10-perc-025.d	G0K100000-MB, 0314148, 20mL/20mL, 6850-DOD-L	P1-A1		Sample	11/16/2010 21:35
16NOV10-perc-026.d	G0K100000-LCS, 0314148, 20mL/20mL	P1-A2	LCS_0.5	QC	11/16/2010 21:52
16NOV10-perc-027.d	G0K100000-SMCS, 0314148, 20mL/20mL	P1-A3	LCS_0.5	QC	11/16/2010 22:10
16NOV10-perc-028.d	G0K020530-1, 0314148, 20mL/20mL	P1-A4		Sample	11/16/2010 22:27
16NOV10-perc-029.d	G0K020530-1MS, 0314148, 20mL/20mL	P1-A5	MS_0.5	QC	11/16/2010 22:45
16NOV10-perc-030.d	G0K020530-1MSD, 0314148, 20mL/20mL	P1-A6	MS_0.5	QC	11/16/2010 23:02
16NOV10-perc-031.d	G0K020530-2, 0314148, 20mL/20mL	P1-A7		Sample	11/16/2010 23:20
16NOV10-perc-032.d	G0K020530-3, 0314148, 20mL/20mL	P1-A8		Sample	11/16/2010 23:37
16NOV10-perc-033.d	Q4 LOQ 6850-L, 0314148, 20mL/20mL	P1-A9		Sample	11/16/2010 23:55
16NOV10-perc-034.d	Q4 LOD 6850-L, 0314148, 20mL/20mL	P2-F3		Sample	11/17/2010 00:12

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

16NOV10-perc-035.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 00:30
16NOV10-perc-036.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 00:47
16NOV10-perc-037.d	Blank + IS	P2-C1		Sample	11/17/2010 01:05
16NOV10-perc-038.d	G0K040000-MB, 0308373, 3.00g/10mL, 6850-DOD-S	P1-B1		Sample	11/17/2010 01:22
16NOV10-perc-039.d	G0K040000-LCS, 0308373, 3.00g/10mL,	P1-B2	LCS_5	QC	11/17/2010 01:39
16NOV10-perc-040.d	G0K040000-SMCS, 0308373, 3.00g/10mL,	P1-B3	LCS_5	QC	11/17/2010 01:57
16NOV10-perc-041.d	G0K020530-4, 0308373, 3.09g/10mL,	P1-B4		Sample	11/17/2010 02:14
16NOV10-perc-042.d	G0K020530-5, 0308373, 3.15g/10mL, 1000X + IS	P1-B5		Sample	11/17/2010 02:32
16NOV10-perc-043.d	G0K020530-6, 0308373, 3.25g/10mL, 5X	P1-B6		Sample	11/17/2010 02:49
16NOV10-perc-044.d	G0K020530-7, 0308373, 3.03g/10mL,	P1-B7		Sample	11/17/2010 03:07
16NOV10-perc-045.d	G0K020530-8, 0308373, 3.19g/10mL,	P1-B8		Sample	11/17/2010 03:24
16NOV10-perc-046.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 03:42
16NOV10-perc-047.d	G0K020530-9, 0308373, 3.00g/10mL,	P1-B9		Sample	11/17/2010 03:59
16NOV10-perc-048.d	G0K020530-10, 0308373, 3.07g/10mL,	P1-C1		Sample	11/17/2010 04:16
16NOV10-perc-049.d	G0K020530-11, 0308373, 3.15g/10mL,	P1-C2		Sample	11/17/2010 04:34
16NOV10-perc-050.d	G0K020530-12, 0308373, 3.00g/10mL, 1000X + IS	P1-C3		Sample	11/17/2010 04:51
16NOV10-perc-051.d	G0K020530-12MS, 0308373, 3.11g/10mL, 1000X + IS	P1-C4	MS_5	QC	11/17/2010 05:09
16NOV10-perc-052.d	G0K020530-12MSD, 0308373, 3.18g/10mL, 1000X + IS	P1-C5	MS_5	QC	11/17/2010 05:26
16NOV10-perc-053.d	G0K020530-13, 0308373, 3.10g/10mL,	P1-C6		Sample	11/17/2010 05:44
16NOV10-perc-054.d	G0K020530-14, 0308373, 3.05g/10mL, 10X	P1-C7		Sample	11/17/2010 06:01
16NOV10-perc-055.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 06:19
16NOV10-perc-056.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 06:36
16NOV10-perc-057.d	Blank + IS	P2-C1		Sample	11/17/2010 06:54
16NOV10-perc-058.d	G0J260000-MB, 0299273, 3.00g/10mL, 6850-DOD-S	P1-C8		Sample	11/17/2010 07:11
16NOV10-perc-059.d	G0J260000-LCS, 0299273, 3.00g/10mL,	P1-C9	LCS_5	QC	11/17/2010 07:29
16NOV10-perc-060.d	G0J260000-SMCS, 0299273, 3.00g/10mL,	P1-D1	LCS_5	QC	11/17/2010 07:46
16NOV10-perc-061.d	A0J210551-1, 0299273, 2.98g/10mL,	P1-D2		Sample	11/17/2010 08:04
16NOV10-perc-062.d	A0J210551-2, 0299273, 3.08g/10mL,	P1-D3		Sample	11/17/2010 08:21
16NOV10-perc-063.d	A0J210551-3, 0299273, 3.01g/10mL,	P1-D4		Sample	11/17/2010 08:38

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

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16NOV10-perc-064.d	A0J210551-3MS, 0299273, 2.98g/10mL,	P1-D5	MS_5	QC	11/17/2010 08:56
16NOV10-perc-065.d	A0J210551-3MSD, 0299273, 3.02g/10mL,	P1-D6	MS_5	QC	11/17/2010 09:13
16NOV10-perc-066.d	A0J210551-4, 0299273, 3.06g/10mL,	P1-D7		Sample	11/17/2010 09:31
16NOV10-perc-067.d	A0J210551-5, 0299273, 3.07g/10mL,	P1-D8		Sample	11/17/2010 09:48
16NOV10-perc-068.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 10:06
16NOV10-perc-069.d	Blank + IS	P2-C1		Sample	11/17/2010 10:23
16NOV10-perc-070.d	A0J210551-6, 0299273, 3.02g/10mL,	P1-D9		Sample	11/17/2010 10:41
16NOV10-perc-071.d	A0J210551-7, 0299273, 2.96g/10mL,	P1-E1		Sample	11/17/2010 10:58
16NOV10-perc-072.d	G0K150000-MB, 0319363, 20mL/20mL, 6850-DOD-L	P1-B1		Sample	11/17/2010 11:16
16NOV10-perc-073.d	G0K150000-LCS, 0319363, 20mL/20mL	P1-B2	LCS_0.5	QC	11/17/2010 11:33
16NOV10-perc-074.d	G0K150000-SMCS, 0319363, 20mL/20mL	P1-B3	LCS_0.5	QC	11/17/2010 11:50
16NOV10-perc-075.d	G0K120447-1, 0319363, 20mL/20mL	P1-B4		Sample	11/17/2010 12:08
16NOV10-perc-076.d	G0K120447-1MS, 0319363, 20mL/20mL	P1-B5	MS_0.5	QC	11/17/2010 12:25
16NOV10-perc-077.d	G0K120447-1MSD, 0319363, 20mL/20mL	P1-B6	MS_0.5	QC	11/17/2010 12:43
16NOV10-perc-078.d	G0K130463-1, 0319363, 20mL/20mL	P1-B7		Sample	11/17/2010 13:00
16NOV10-perc-079.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 13:18
16NOV10-perc-080.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 13:35
16NOV10-perc-081.d	Blank + IS	P2-C1		Sample	11/17/2010 13:53

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Quantitation Results

Compound *Perchlorate*

Data File	Compound	Sample Type	Exp Conc	Response	Accuracy	Final Conc.
16NOV10-perc-009.d	Perchlorate	Sample				
16NOV10-perc-010.d	Perchlorate	Sample		219		
16NOV10-perc-011.d	Perchlorate	Calibration	0.1500	3104	130.5	
16NOV10-perc-012.d	Perchlorate	Calibration	0.3000	4877	95.5	
16NOV10-perc-013.d	Perchlorate	Calibration	0.5000	8532	102.1	
16NOV10-perc-014.d	Perchlorate	Calibration	1.0000	15105	82.8	
16NOV10-perc-015.d	Perchlorate	Calibration	2.0000	29560	88.9	
16NOV10-perc-016.d	Perchlorate	Calibration	5.0000	78435	96.3	
16NOV10-perc-017.d	Perchlorate	Calibration	10.0000	157503	102.5	
16NOV10-perc-018.d	Perchlorate	Calibration	20.0000	300401	101.4	
16NOV10-perc-019.d	Perchlorate	Sample				
16NOV10-perc-020.d	Perchlorate	Sample				
16NOV10-perc-021.d	Perchlorate	Sample		330		
16NOV10-perc-022.d	Perchlorate	QC	5.0000	76334	87.4	
16NOV10-perc-023.d	Perchlorate	QC	0.1500	2620	107.7	
16NOV10-perc-024.d	Perchlorate	QC	5.0000	76957	94.4	
16NOV10-perc-025.d	Perchlorate	Sample				
16NOV10-perc-026.d	Perchlorate	QC	0.5000	6947	86.5	
16NOV10-perc-027.d	Perchlorate	QC	0.5000	8166	97.1	
16NOV10-perc-028.d	Perchlorate	Sample		3880167		
16NOV10-perc-029.d	Perchlorate	QC	0.5000	3873506	155668.3	
16NOV10-perc-030.d	Perchlorate	QC	0.5000	3861931	156941.7	
16NOV10-perc-031.d	Perchlorate	Sample		3875610		
16NOV10-perc-032.d	Perchlorate	Sample		1092		
16NOV10-perc-033.d	Perchlorate	Sample		7879		
16NOV10-perc-034.d	Perchlorate	Sample		1944		

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16NOV10-perc-035.d	Perchlorate	QC	2.0000	29789	87.8
16NOV10-perc-036.d	Perchlorate	QC	0.1500	2800	115.3
16NOV10-perc-037.d	Perchlorate	Sample			
16NOV10-perc-038.d	Perchlorate	Sample			
16NOV10-perc-039.d	Perchlorate	QC	5.0000	21940	27.2
16NOV10-perc-040.d	Perchlorate	QC	5.0000	21856	27.3
16NOV10-perc-041.d	Perchlorate	Sample		349	
16NOV10-perc-042.d	Perchlorate	Sample		45942	
16NOV10-perc-043.d	Perchlorate	Sample		176119	
16NOV10-perc-044.d	Perchlorate	Sample		2535	
16NOV10-perc-045.d	Perchlorate	Sample		46480	
16NOV10-perc-046.d	Perchlorate	QC	5.0000	74546	91.5
16NOV10-perc-047.d	Perchlorate	Sample		17573	
16NOV10-perc-048.d	Perchlorate	Sample		126988	
16NOV10-perc-049.d	Perchlorate	Sample		128041	
16NOV10-perc-050.d	Perchlorate	Sample		63694	
16NOV10-perc-051.d	Perchlorate	QC	5.0000	68655	64888.8
16NOV10-perc-052.d	Perchlorate	QC	5.0000	61961	63311.2
16NOV10-perc-053.d	Perchlorate	Sample		7917	
16NOV10-perc-054.d	Perchlorate	Sample		96830	
16NOV10-perc-055.d	Perchlorate	QC	2.0000	30076	86.9
16NOV10-perc-056.d	Perchlorate	QC	0.1500	2654	106.1
16NOV10-perc-057.d	Perchlorate	Sample		279	
16NOV10-perc-058.d	Perchlorate	Sample			
16NOV10-perc-059.d	Perchlorate	QC	5.0000	22047	27.4
16NOV10-perc-060.d	Perchlorate	QC	5.0000	22942	28.1
16NOV10-perc-061.d	Perchlorate	Sample		4032236	
16NOV10-perc-062.d	Perchlorate	Sample		964939	
16NOV10-perc-063.d	Perchlorate	Sample		3020	

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

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16NOV10-perc-064.d	Perchlorate	QC	5.0000	25833	31.4
16NOV10-perc-065.d	Perchlorate	QC	5.0000	25985	32.7
16NOV10-perc-066.d	Perchlorate	Sample		16366	
16NOV10-perc-067.d	Perchlorate	Sample		1703	
16NOV10-perc-068.d	Perchlorate	QC	2.0000	31405	88.3
16NOV10-perc-069.d	Perchlorate	Sample			
16NOV10-perc-070.d	Perchlorate	Sample		12043	
16NOV10-perc-071.d	Perchlorate	Sample		6274	
16NOV10-perc-072.d	Perchlorate	Sample			
16NOV10-perc-073.d	Perchlorate	QC	0.5000	8178	94.0
16NOV10-perc-074.d	Perchlorate	QC	0.5000	8058	87.6
16NOV10-perc-075.d	Perchlorate	Sample		45208	
16NOV10-perc-076.d	Perchlorate	QC	0.5000	53198	591.8
16NOV10-perc-077.d	Perchlorate	QC	0.5000	53492	593.2
16NOV10-perc-078.d	Perchlorate	Sample		93364	
16NOV10-perc-079.d	Perchlorate	QC	5.0000	81120	92.2
16NOV10-perc-080.d	Perchlorate	QC	0.1500	2763	103.3
16NOV10-perc-081.d	Perchlorate	Sample			

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Quantitation Results

Compound *Perchlorate-(35Cl18O4)*

Data File	Compound	Sample Type	Exp Conc	Response	Accuracy	Final Conc.
16NOV10-perc-009.d	Perchlorate-(35Cl18O4)	Sample				
16NOV10-perc-010.d	Perchlorate-(35Cl18O4)	Sample		190515		
16NOV10-perc-011.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	185574		
16NOV10-perc-012.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	198021		
16NOV10-perc-013.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	193127		
16NOV10-perc-014.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	209981		
16NOV10-perc-015.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	190942		
16NOV10-perc-016.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	186717		
16NOV10-perc-017.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	176091		
16NOV10-perc-018.d	Perchlorate-(35Cl18O4)	Calibration	10.0000	169654	188763.3	Averge ICAL IS area response
16NOV10-perc-019.d	Perchlorate-(35Cl18O4)	Sample			-100.0	Run not needed
16NOV10-perc-020.d	Perchlorate-(35Cl18O4)	Sample			-100.0	Run not needed
16NOV10-perc-021.d	Perchlorate-(35Cl18O4)	Sample		193688	2.6	% Dev from average
16NOV10-perc-022.d	Perchlorate-(35Cl18O4)	QC	10.0000	200224	6.1	
16NOV10-perc-023.d	Perchlorate-(35Cl18O4)	QC	10.0000	190832	1.1	
16NOV10-perc-024.d	Perchlorate-(35Cl18O4)	QC	10.0000	186919	-1.0	
16NOV10-perc-025.d	Perchlorate-(35Cl18O4)	Sample		187015	-0.9	
16NOV10-perc-026.d	Perchlorate-(35Cl18O4)	QC	10.0000	185831	-1.6	
16NOV10-perc-027.d	Perchlorate-(35Cl18O4)	QC	10.0000	194296	2.9	
16NOV10-perc-028.d	Perchlorate-(35Cl18O4)	Sample		57084	-69.8	See 50X dilution
16NOV10-perc-029.d	Perchlorate-(35Cl18O4)	QC	10.0000	57005	-69.8	See 50X dilution
16NOV10-perc-030.d	Perchlorate-(35Cl18O4)	QC	10.0000	56373	-70.1	See 50X dilution
16NOV10-perc-031.d	Perchlorate-(35Cl18O4)	Sample		59265	-68.6	See 50X dilution
16NOV10-perc-032.d	Perchlorate-(35Cl18O4)	Sample		195568	3.6	
16NOV10-perc-033.d	Perchlorate-(35Cl18O4)	Sample		191420	1.4	
16NOV10-perc-034.d	Perchlorate-(35Cl18O4)	Sample		188321	-0.2	

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

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16NOV10-perc-035.d	Perchlorate-(35Cl18O4)	QC	10.0000	194852	3.2	
16NOV10-perc-036.d	Perchlorate-(35Cl18O4)	QC	10.0000	190185	0.8	
16NOV10-perc-037.d	Perchlorate-(35Cl18O4)	Sample		193918	2.7	
16NOV10-perc-038.d	Perchlorate-(35Cl18O4)	Sample		189384	0.3	
16NOV10-perc-039.d	Perchlorate-(35Cl18O4)	QC	10.0000	185333	-1.8	
16NOV10-perc-040.d	Perchlorate-(35Cl18O4)	QC	10.0000	184079	-2.5	
16NOV10-perc-041.d	Perchlorate-(35Cl18O4)	Sample		182079	-3.5	
16NOV10-perc-042.d	Perchlorate-(35Cl18O4)	Sample		213495	13.1	
16NOV10-perc-043.d	Perchlorate-(35Cl18O4)	Sample		33733	-10.6	
16NOV10-perc-044.d	Perchlorate-(35Cl18O4)	Sample		182991	-3.1	5x Dilution
16NOV10-perc-045.d	Perchlorate-(35Cl18O4)	Sample		177772	-5.8	
16NOV10-perc-046.d	Perchlorate-(35Cl18O4)	QC	10.0000	186789	-1.0	
16NOV10-perc-047.d	Perchlorate-(35Cl18O4)	Sample		187055	-0.9	
16NOV10-perc-048.d	Perchlorate-(35Cl18O4)	Sample		177923	-5.7	
16NOV10-perc-049.d	Perchlorate-(35Cl18O4)	Sample		172295	-8.7	
16NOV10-perc-050.d	Perchlorate-(35Cl18O4)	Sample		215870	14.4	
16NOV10-perc-051.d	Perchlorate-(35Cl18O4)	QC	10000.0000	242703	28.6	
16NOV10-perc-052.d	Perchlorate-(35Cl18O4)	QC	10000.0000	224505	18.9	
16NOV10-perc-053.d	Perchlorate-(35Cl18O4)	Sample		188452	-0.2	
16NOV10-perc-054.d	Perchlorate-(35Cl18O4)	Sample		18752	-0.7	10x Dilution
16NOV10-perc-055.d	Perchlorate-(35Cl18O4)	QC	10.0000	198745	5.3	
16NOV10-perc-056.d	Perchlorate-(35Cl18O4)	QC	10.0000	196302	4.0	
16NOV10-perc-057.d	Perchlorate-(35Cl18O4)	Sample		200694	6.3	
16NOV10-perc-058.d	Perchlorate-(35Cl18O4)	Sample		189443	0.4	
16NOV10-perc-059.d	Perchlorate-(35Cl18O4)	QC	10.0000	184685	-2.2	
16NOV10-perc-060.d	Perchlorate-(35Cl18O4)	QC	10.0000	187799	-0.5	
16NOV10-perc-061.d	Perchlorate-(35Cl18O4)	Sample		53074	-71.9	See 50X dilution
16NOV10-perc-062.d	Perchlorate-(35Cl18O4)	Sample		119064	-36.9	
16NOV10-perc-063.d	Perchlorate-(35Cl18O4)	Sample		186101	-1.4	

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16NOV10-perc-064.d	Perchlorate-(35Cl18O4)	QC	10000.0000	188960	0.1
16NOV10-perc-065.d	Perchlorate-(35Cl18O4)	QC	10000.0000	182363	-3.4
16NOV10-perc-066.d	Perchlorate-(35Cl18O4)	Sample		184053	-2.5
16NOV10-perc-067.d	Perchlorate-(35Cl18O4)	Sample		184681	-2.2
16NOV10-perc-068.d	Perchlorate-(35Cl18O4)	QC	10.0000	204132	8.1
16NOV10-perc-069.d	Perchlorate-(35Cl18O4)	Sample		202103	7.1
16NOV10-perc-070.d	Perchlorate-(35Cl18O4)	Sample		185444	-1.8
16NOV10-perc-071.d	Perchlorate-(35Cl18O4)	Sample		196456	4.1
16NOV10-perc-072.d	Perchlorate-(35Cl18O4)	Sample		205854	9.1
16NOV10-perc-073.d	Perchlorate-(35Cl18O4)	QC	10.0000	201092	6.5
16NOV10-perc-074.d	Perchlorate-(35Cl18O4)	QC	10.0000	212801	12.7
16NOV10-perc-075.d	Perchlorate-(35Cl18O4)	Sample		203683	7.9
16NOV10-perc-076.d	Perchlorate-(35Cl18O4)	QC	10.0000	206224	9.3
16NOV10-perc-077.d	Perchlorate-(35Cl18O4)	QC	10.0000	206864	9.6
16NOV10-perc-078.d	Perchlorate-(35Cl18O4)	Sample		201928	7.0
16NOV10-perc-079.d	Perchlorate-(35Cl18O4)	QC	10.0000	201806	6.9
16NOV10-perc-080.d	Perchlorate-(35Cl18O4)	QC	10.0000	210100	11.3
16NOV10-perc-081.d	Perchlorate-(35Cl18O4)	Sample		214743	13.8

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 00:30
Analyst	lores
Data File	16NOV10-perc-035.d
Acquisition Method	PercMRM_2.m
Sample Name	CCV_5 E100720H Perchlorate Std 2.0ng/mL
Sample Identification	CCV_5
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C6
Exp. Concentration	2.00
Injection Volume	50

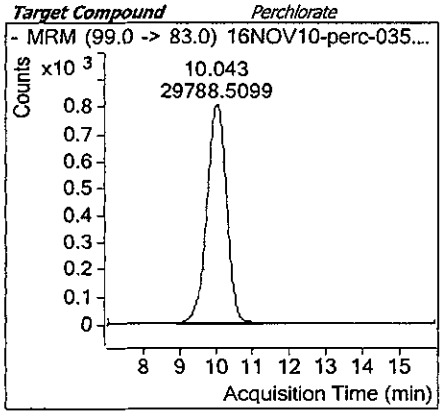
Quantitation Results

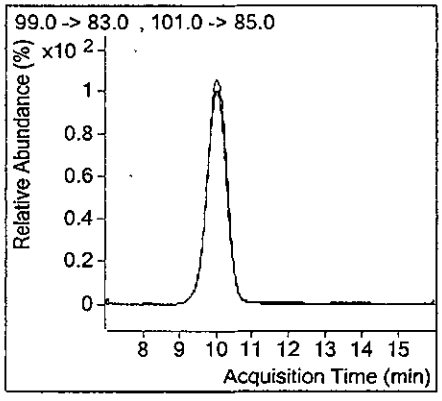
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.043	29789	99	83	1.75538	1.75538	1
Perchlorate-(35Cl18O4)	ISTD	10.033	194852	107	89			1
							-12.2 % Deviation	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	10553	101	85	2.82	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	58875	109	91	3.31	2.30	3.80	In Control

Compound Graphics

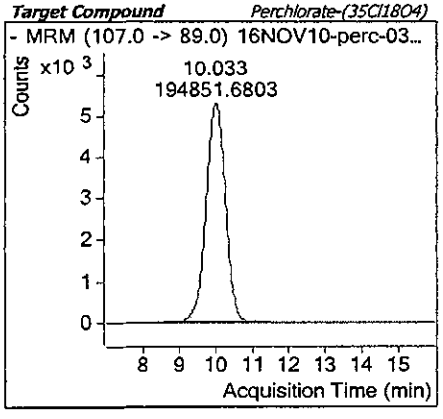
Target Compound *Perchlorate*

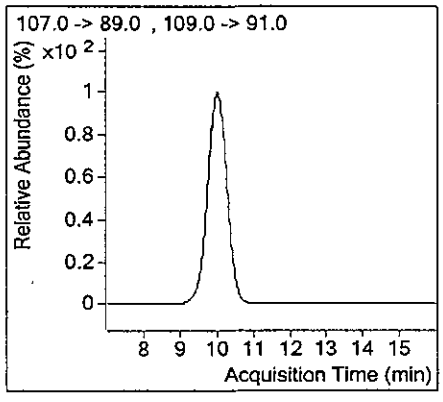




✓ mr 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 00:47
Analyst	lores
Data File	16NOV10-perc-036.d
Acquisition Method	PercMRM_2 m
Sample Name	LODV E100924A Perchlorate Std 0.15ng/mL
Sample Identification	LODV
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C3
Exp. Concentration	0.15
Injection Volume	50

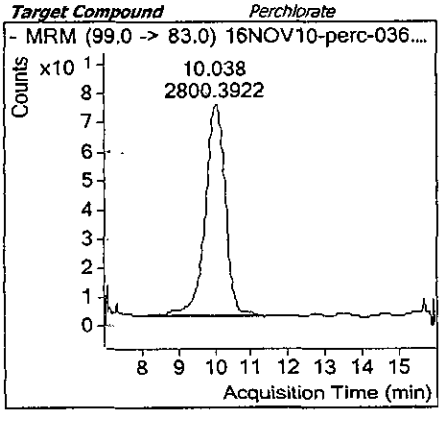
Quantitation Results

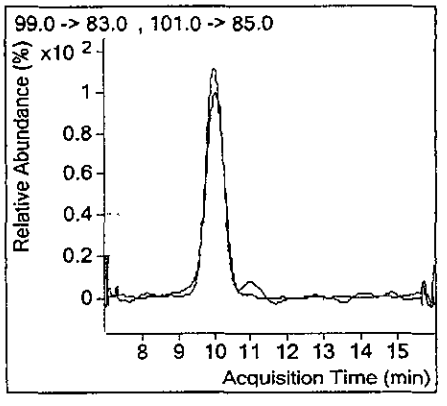
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.038	2800	99	83	0.17291	0.17291	1
Perchlorate-(35Cl18O4)	ISTD	10.032	190185	107	89			1
							15.3 % Deviation	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	980	101	85	2.86	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	59992	109	91	3.17	2.30	3.80	In Control

Compound Graphics

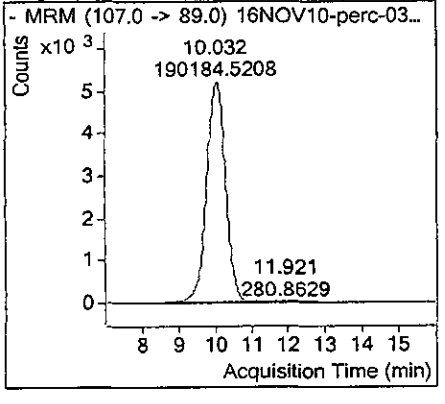
Target Compound *Perchlorate*

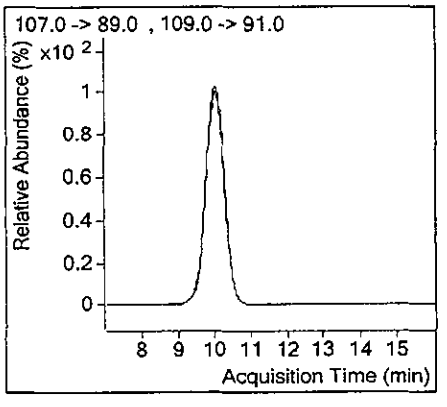




✓ m 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 01:05
Analyst	lores
Data File	16NOV10-perc-037 d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

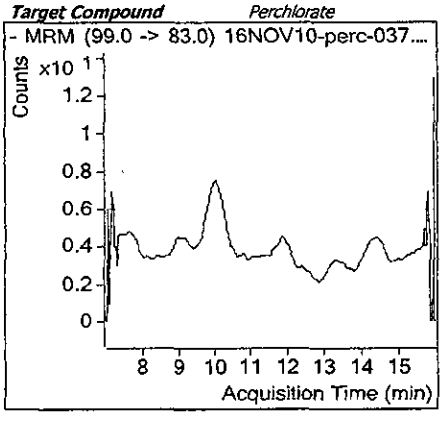
Quantitation Results

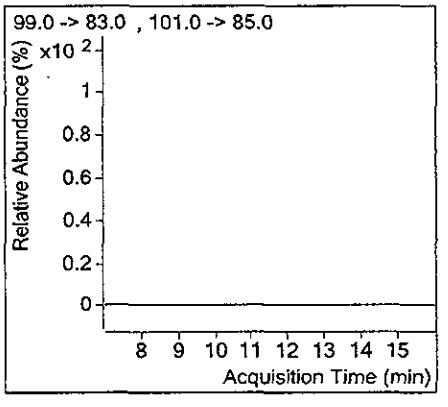
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate-(35Cl18O4)	ISTD	10.033	193918	107	89			1
						Perchlorate = ND		

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	60642	109	91	3.20	2.30	3.80	In Control

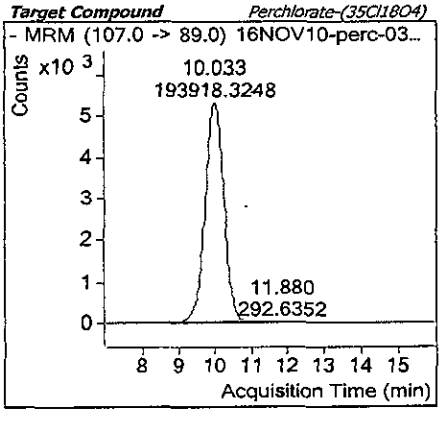
Compound Graphics

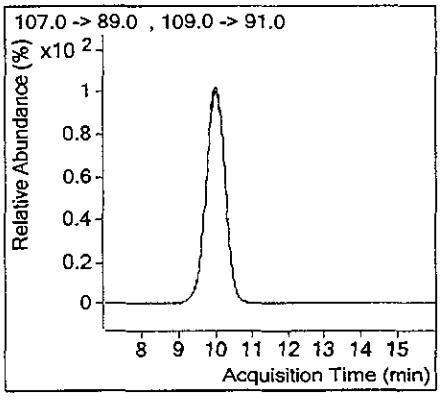
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





MS 11/17/10

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 01:22
Analyst	lores
Data File	16NOV10-perc-038.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K040000-MB, 0308373, 3.00g/10mL, 6850-DOD-S
Sample Identification	L9J9K1AAB
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-B1
Exp. Concentration	
Injection Volume	50

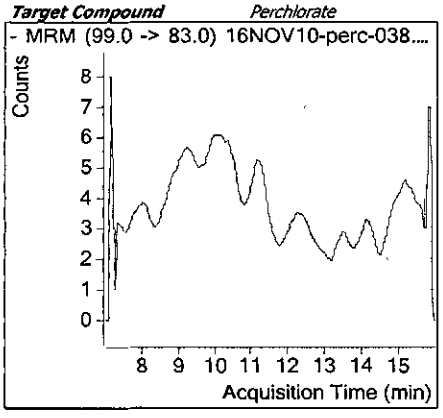
Quantitation Results

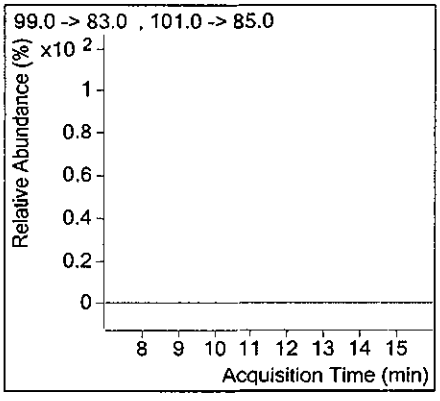
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate-(35Cl18O4)	ISTD	10 029	189384	107	89			1
						Perchlorate = ND		

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	56587	109	91	3.35	2.30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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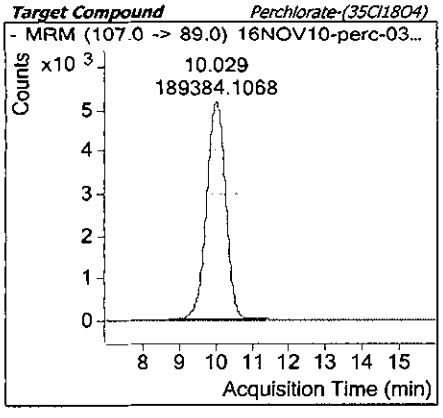
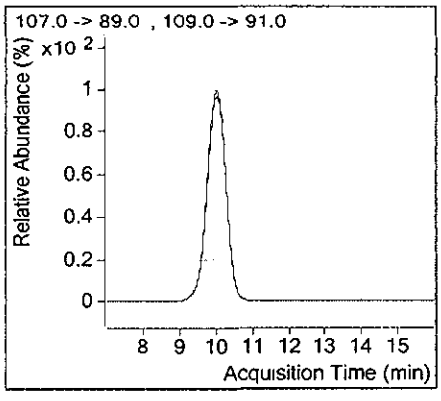
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 01:39
Analyst	lores
Data File	16NOV10-perc-039 d
Acquisition Method	PercMRM_2 m
Sample Name	G0K040000-LCS, 0308373, 3.00g/10mL,
Sample Identification	L9J9K1ACC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45.55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P1-B2
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

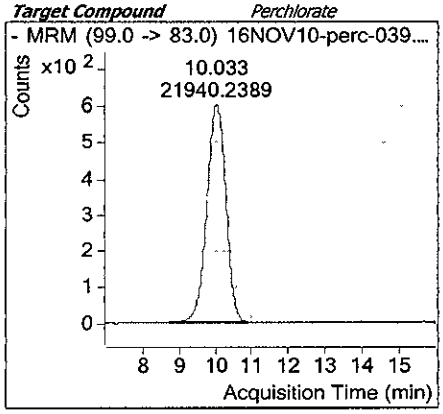
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.033	21940	99	83		1.36026	1.36026	1
Perchlorate-(35Cl18O4)	ISTD	10 029	185333	107	89				1
						Result =	4.53419 ug/Kg	90.7 % Recovery	

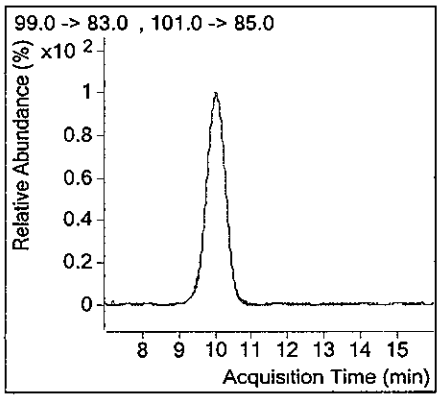
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	7307	101	85	3 00	2 30	3.80	In Control
Perchlorate-(35Cl18O4)	58085	109	91	3.19	2 30	3.80	In Control

Compound Graphics

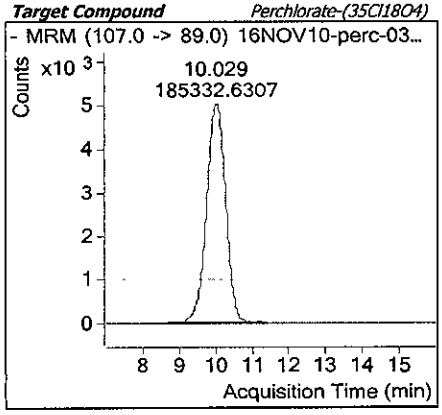
m 11/17/10

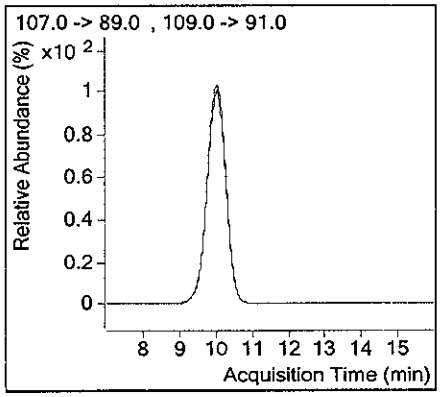
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 01:57
Analyst	lores
Data File	16NOV10-perc-040 d
Acquisition Method	PercMRM_2.m
Sample Name	G0K040000-SMCS, 0308373, 3.00g/10mL,
Sample Identification	L9J9K1ADC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P1-B3
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

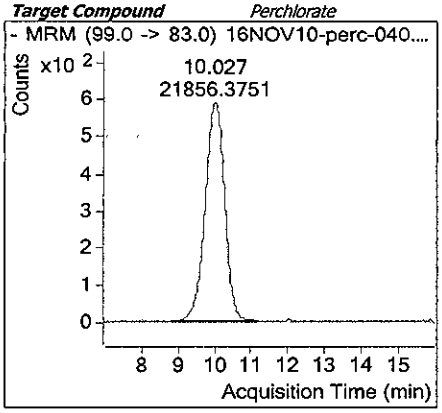
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.027	21856	99	83		1.36427	1.36427	1
Perchlorate-(35Cl18O4)	ISTD	10.023	184079	107	89				1
						Result =	**4.54757 ug/Kg**	**91.0 % Recovery**	

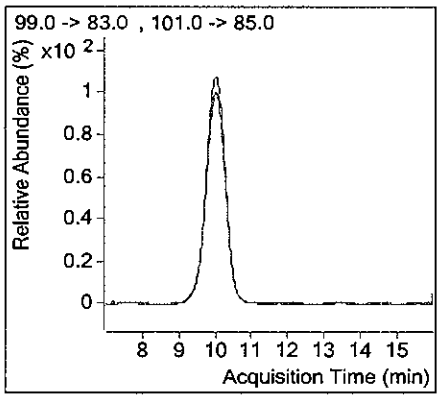
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	7662	101	85	2.85	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	56639	109	91	3.25	2.30	3.80	In Control

Compound Graphics

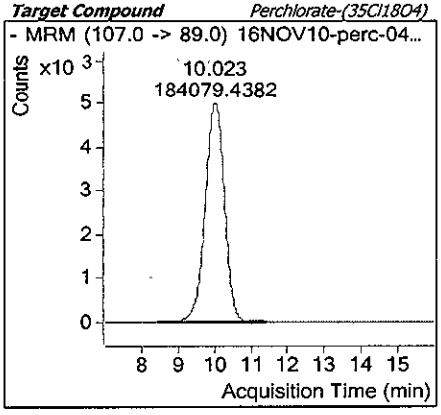
m 11/17/10

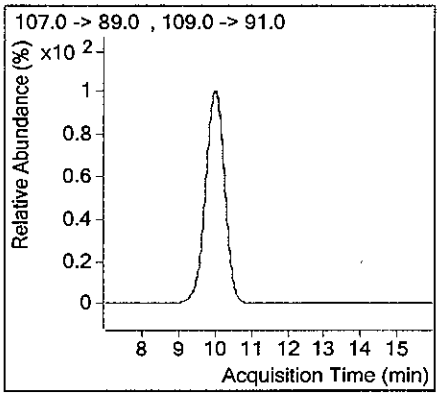
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 02:14
Analyst	lores
Data File	16NOV10-perc-041 d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-4, 0308373, 3.09g/10mL,
Sample Identification	L9FXD1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45 55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-B4
Exp. Concentration	
Injection Volume	50

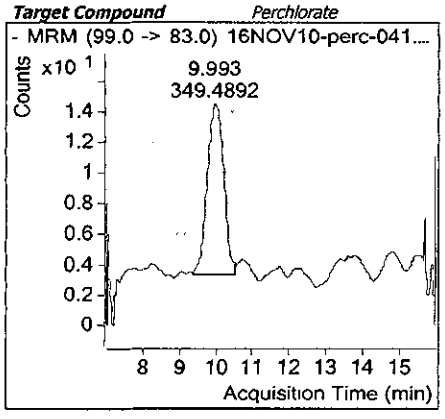
Quantitation Results

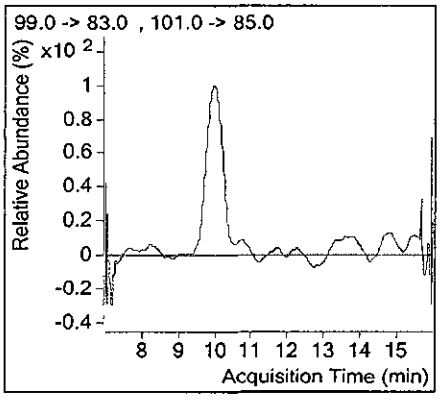
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	9.993	349	99	83		0.02623	0.02623	1
Perchlorate-(35Cl18O4)	ISTD	10.027	182079	107	89				1
						Result =	0.08489 ug/Kg	Result is < MDL => ND	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	56703	109	91	3.21	2.30	3.80	In Control

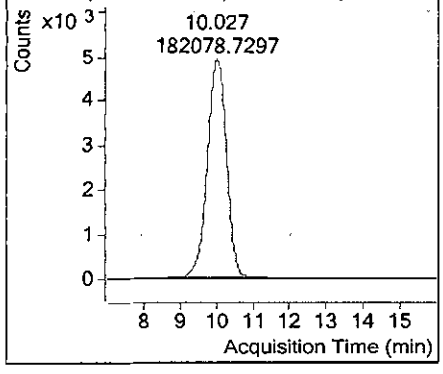
Compound Graphics

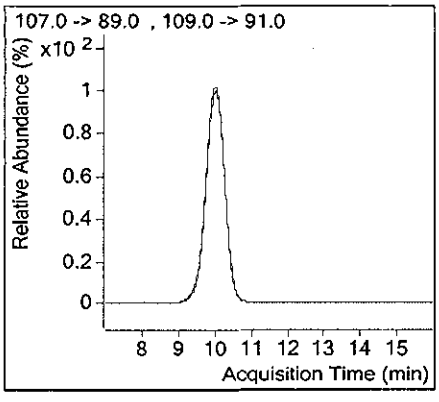
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





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TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 02:32
Analyst	lores
Data File	16NOV10-perc-042 d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-5, 0308373, 3 15g/10mL, 1000X + IS
Sample Identification	L9FXE1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-B5
Exp. Concentration	
Injection Volume	50

Quantitation Results

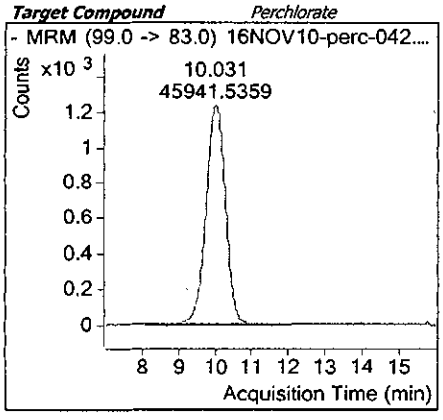
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10 031	45942	99	83		2469.09966	2.46910	1000
Perchlorate-(35Cl18O4)	ISTD	10 023	213495	107	89				1000
						Result =	7838.41162 ug/Kg		

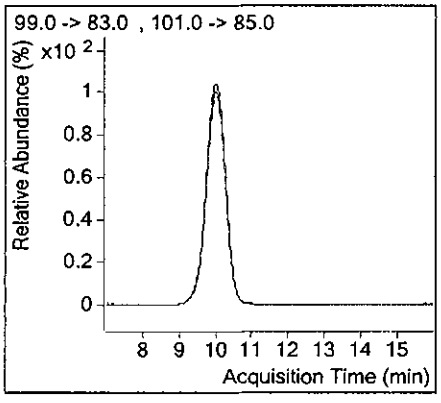
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	15878	101	85	2.89	2 30	3 80	In Control
Perchlorate-(35Cl18O4)	65866	109	91	3.24	2 30	3 80	In Control

m 11/17/10

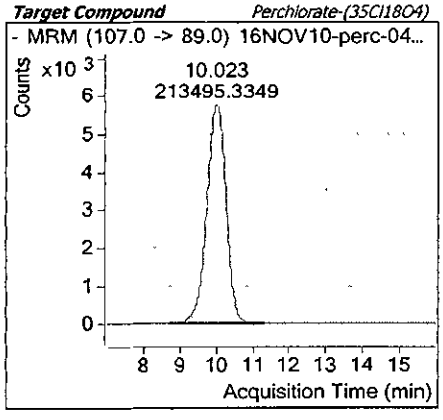
Compound Graphics

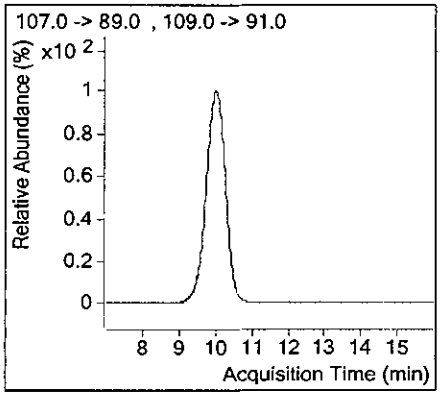
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 02:49
Analyst	lores
Data File	16NOV10-perc-043 d
Acquisition Method	PercMRM_2 m
Sample Name	G0K020530-6, 0308373, 3 25g/10ml, 5X
Sample Identification	L9FXF1AC
Sample Information	IC-Pak Anion HR 75x4 6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-B6
Exp. Concentration	
Injection Volume	50

Quantitation Results

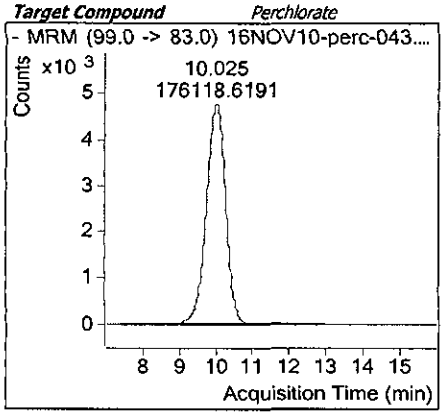
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.025	176119	99	83		59.80718	59.80718	1
Perchlorate-(35Cl18O4)	ISTD	10.021	33733	107	89				1
						Result =	184.02209 ug/Kg		

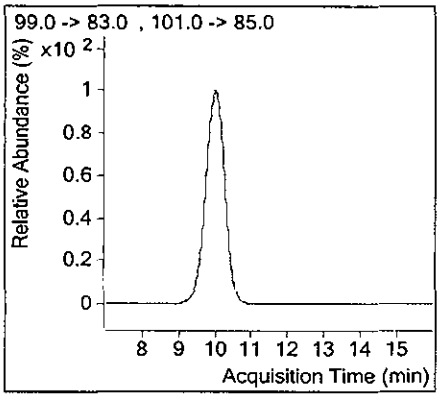
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	57442	101	85	3.07	2 30	3.80	In Control
Perchlorate-(35Cl18O4)	10723	109	91	3.15	2.30	3.80	In Control

Compound Graphics

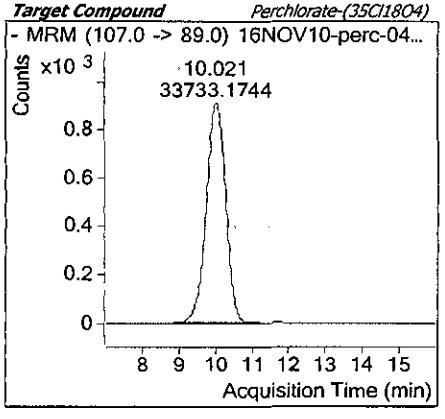
m 11/17/10

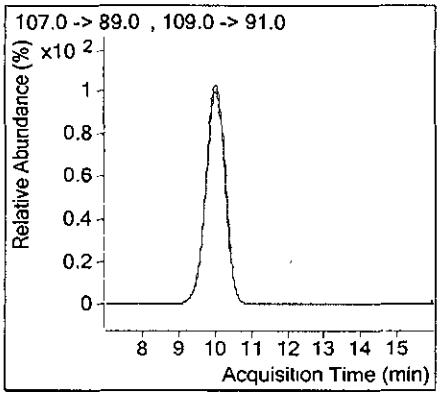
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 03:07
Analyst	lores
Data File	16NOV10-perc-044.d
Acquisition Method	PercMRM_2 m
Sample Name	G0K020530-7, 0308373, 3.03g/10mL,
Sample Identification	L9FXG1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45.55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-B7
Exp. Concentration	
Injection Volume	50

Quantitation Results

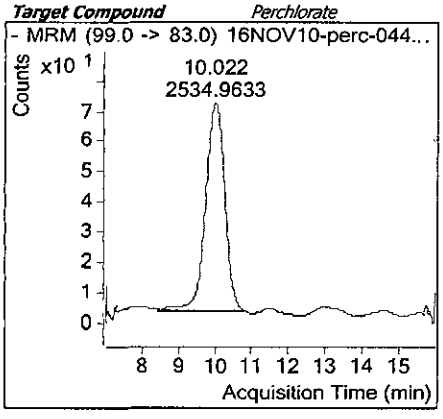
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.022	2535	99	83		0.16292	0.16292	1
Perchlorate-(35Cl18O4)	ISTD	10.016	182991	107	89				1
						Result =	0.53769 ug/Kg	**Result is J-Flag**	

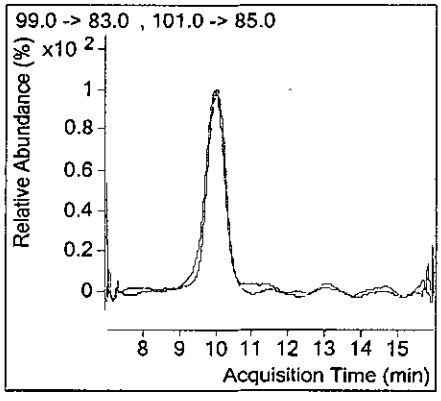
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	921	101	85	2.75	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	56085	109	91	3.26	2.30	3.80	In Control

Compound Graphics

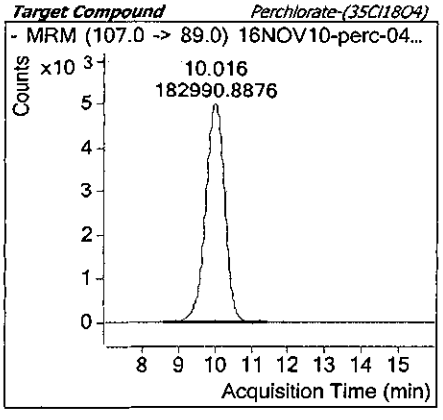
mr 11/17/10

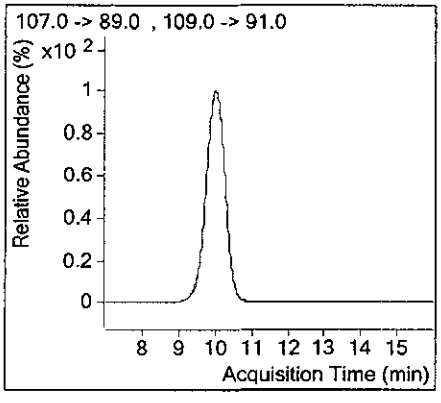
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 03:24
Analyst	lores
Data File	16NOV10-perc-045.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-8, 0308373, 3.19g/10mL,
Sample Identification	L9FXH1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-B8
Exp. Concentration	
Injection Volume	50

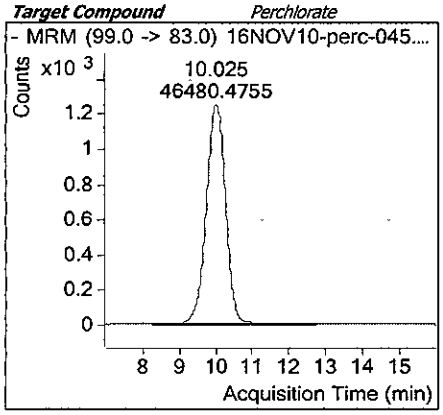
Quantitation Results

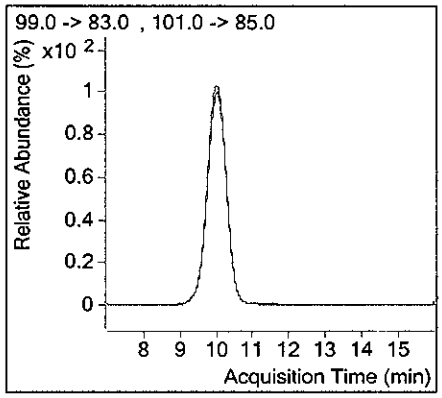
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.025	46480	99	83		2.99915	2.99915	1
Perchlorate-(35Cl18O4)	ISTD	10.016	177772	107	89				1
						Result =	9.40171 ug/Kg		

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	15935	101	85	2.92	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	53917	109	91	3.30	2.30	3.80	In Control

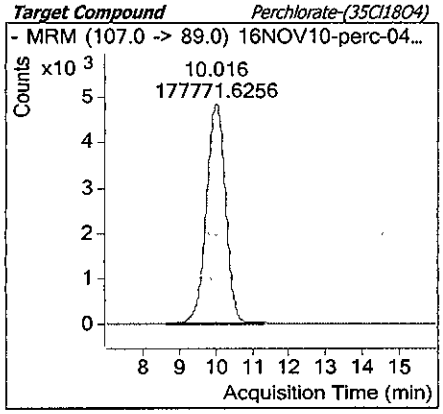
Compound Graphics

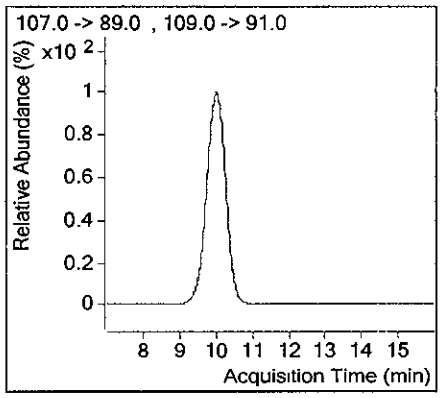
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





m 11/17/10

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 03:42
Analyst	lores
Data File	16NOV10-perc-046.d
Acquisition Method	PercMRM_2.m
Sample Name	CCV_6 E100720I Perchlorate Std 5.0ng/mL
Sample Identification	CCV_6
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C7
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

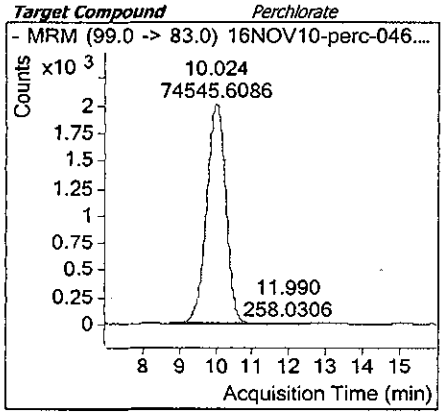
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.024	74546	99	83	**4.57559**	**4.57559**	1
Perchlorate-(35Cl18O4)	ISTD	10.017	186789	107	89			1
							-8.5 % Deviation	

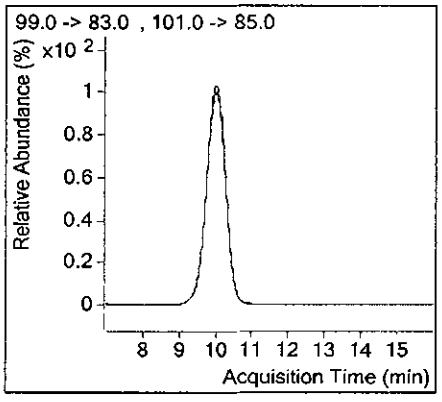
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	25168	101	85	2.96	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	57302	109	91	3.26	2.30	3.80	In Control

Compound Graphics

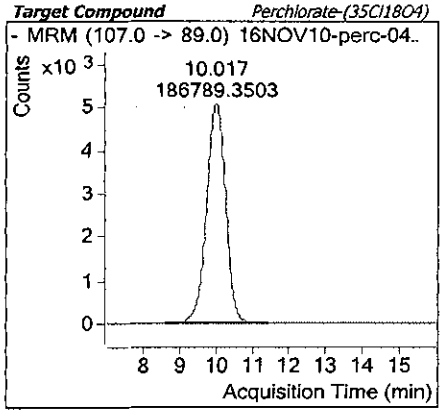
MD 11/17/10

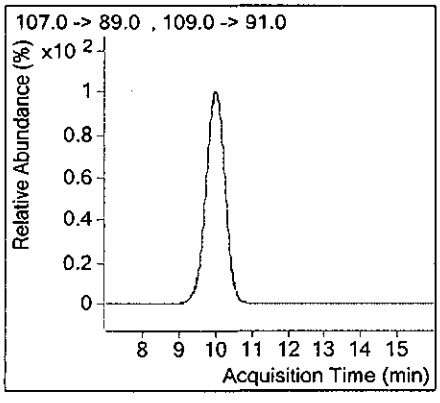
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 03:59
Analyst	lores
Data File	16NOV10-perc-047.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-9, 0308373, 3.00g/10mL,
Sample Identification	L9FXJ1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-B9
Exp. Concentration	
Injection Volume	50

Quantitation Results

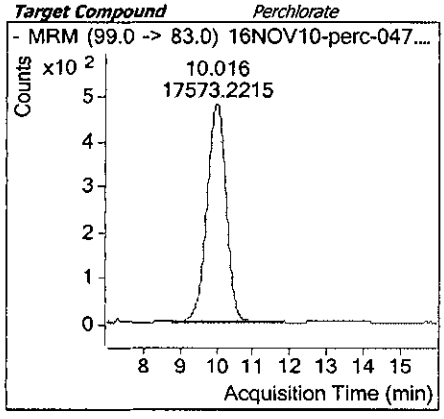
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.016	17573	99	83		1.08035	1.08035	1
Perchlorate-(35Cl18O4)	ISTD	10.011	187055	107	89				1
						Result =	**3.60118 ug/Kg**	**Result is J-Flag**	

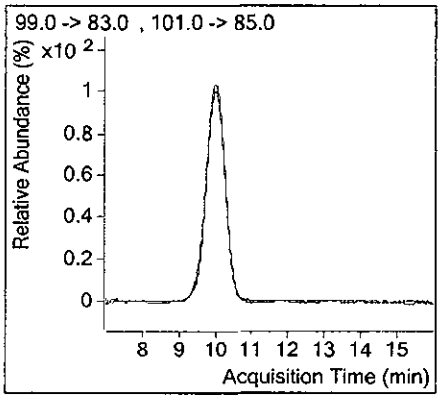
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	5979	101	85	2.94	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	57468	109	91	3.25	2.30	3.80	In Control

Compound Graphics

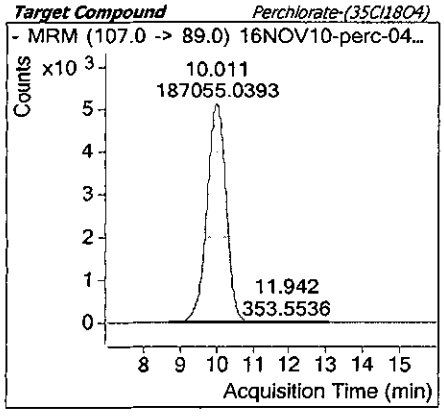
mr 11/17/10

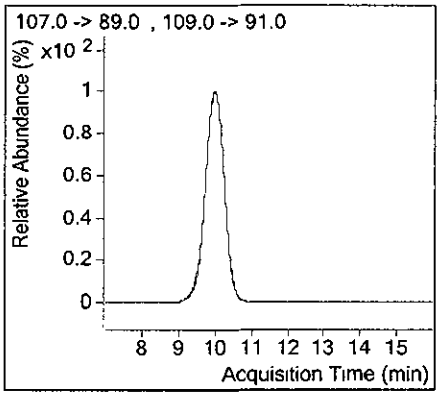
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 04:16
Analyst	lores
Data File	16NOV10-perc-048.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-10, 0308373, 3.07g/10mL,
Sample Identification	L9FXL1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-C1
Exp. Concentration	
Injection Volume	50

Quantitation Results

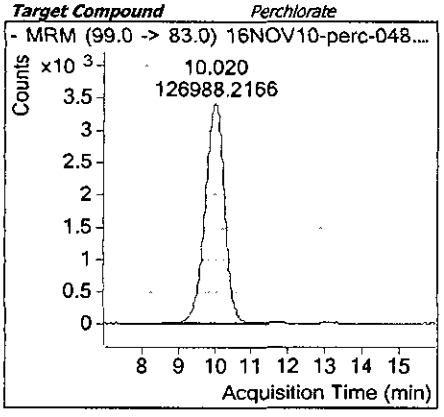
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10 020	126988	99	83		8.17960	8.17960	1
Perchlorate-(35Cl18O4)	ISTD	10.014	177923	107	89				1
						Result =	26.64366 ug/Kg		

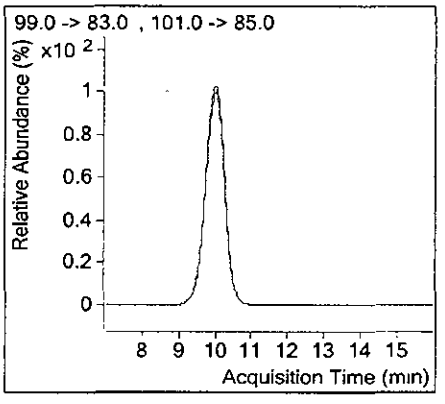
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	43240	101	85	2.94	2.30	3 80	In Control
Perchlorate-(35Cl18O4)	54460	109	91	3 27	2.30	3.80	In Control

Compound Graphics

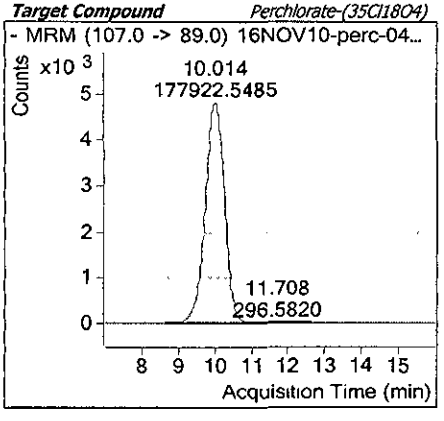
m 11/17/10

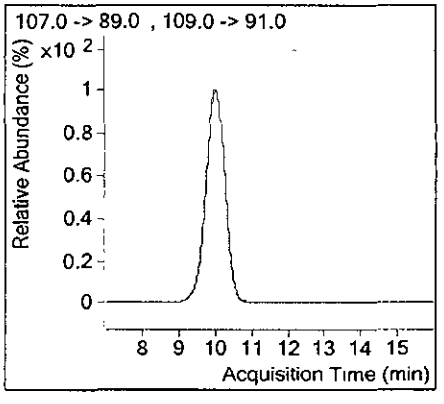
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 04:34
Analyst	lores
Data File	16NOV10-perc-049.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-11, 0308373, 3.15g/10mL,
Sample Identification	L9FXM1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-C2
Exp. Concentration	
Injection Volume	50

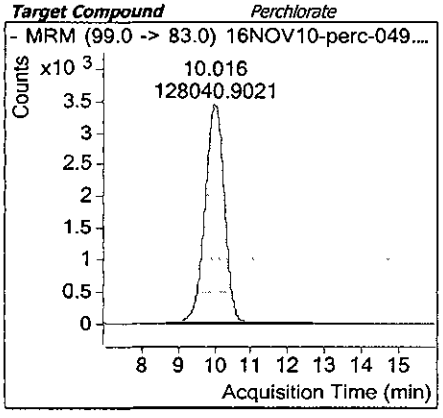
Quantitation Results

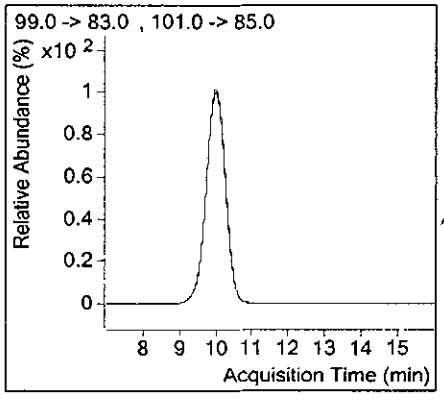
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10 016	128041	99	83		8.51663	8.51663	1
Perchlorate-(35Cl18O4)	ISTD	10 009	172295	107	89				1
						Result =	27.03693 ug/Kg		

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	42799	101	85	2.99	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	53317	109	91	3.23	2 30	3.80	In Control

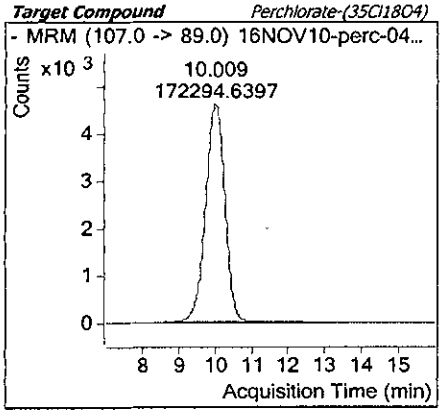
Compound Graphics

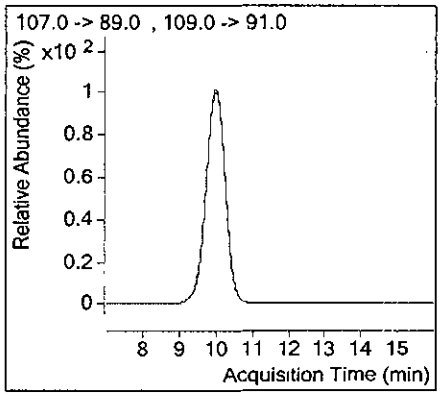
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





11/17/10

$$X = \frac{Y - b}{m}$$

$$X_A = \left[\frac{\frac{Y_A}{Y_{IS}} - b}{m}\right] X_{IS}$$

$$Perc = \frac{\left[\frac{128041}{172295} + 0.00037047\right] 10}{0.8730}$$

$$= 8.5168 \times \frac{10\ mL}{3.15\ g}$$

$$= 27.037\ \mu g/kg \checkmark$$

11-19-2010

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 04:51
Analyst	lores
Data File	16NOV10-perc-050.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-12, 0308373, 3.00g/10mL, 1000X + IS
Sample Identification	L9FXN1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-C3
Exp. Concentration	
Injection Volume	50

Quantitation Results

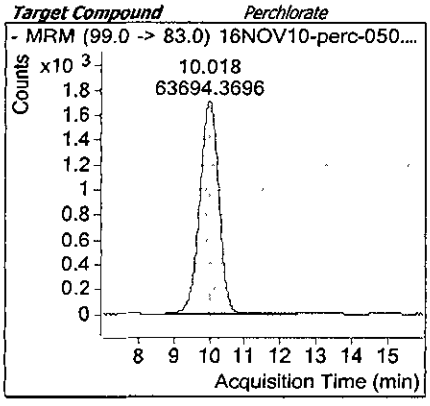
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.018	63694	99	83	3383.98152	3.38398	1000
Perchlorate-(35Cl18O4)	ISTD	10.008	215870	107	89			1000

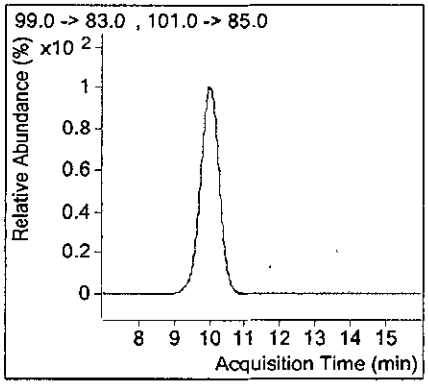
Result = 11279.93840 ug/Kg

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	20965	101	85	3.04	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	66052	109	91	3.27	2.30	3.80	In Control

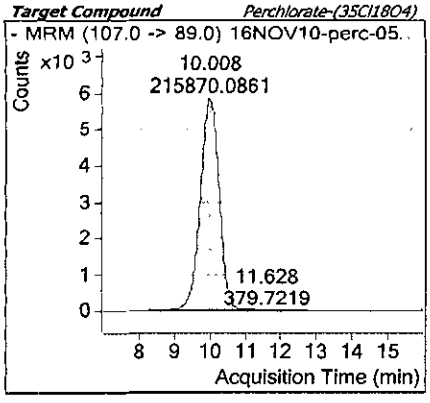
Compound Graphics

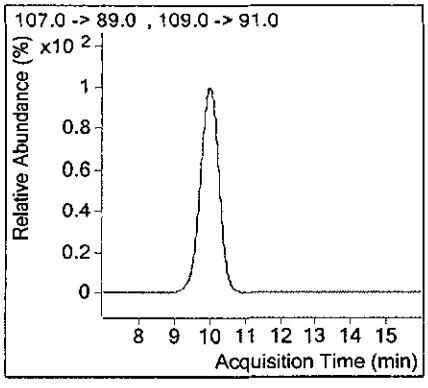
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





m 11/17/10

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 05:09
Analyst	lores
Data File	16NOV10-perc-051.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-12MS, 0308373, 3.11g/10mL, 1000X + IS
Sample Identification	L9FXN1AMS
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P1-C4
Exp. Concentration	5 00
Injection Volume	50

Quantitation Results

m 11/19/10

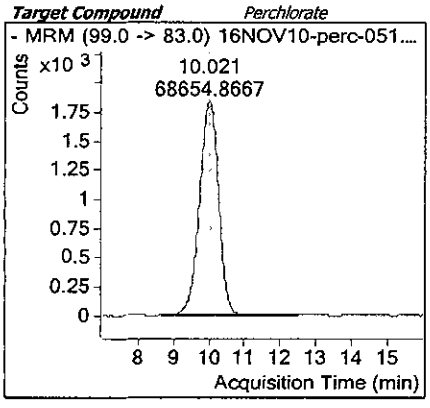
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.021	68655	99	83		3244.44036	3.24444	1000
Perchlorate-(35Cl18O4)	ISTD	10.011	242703	107	89				1000
						Result =	10432.28412 ug/Kg	%R NC, ~~MSB~~ MSA	

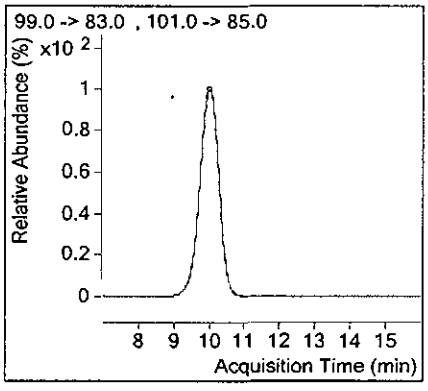
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	22977	101	85	2.99	2.30	3 80	In Control
Perchlorate-(35Cl18O4)	73011	109	91	3.32	2.30	3.80	In Control

Compound Graphics

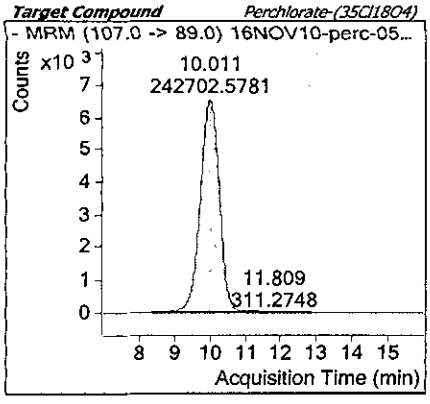
m 11/17/10

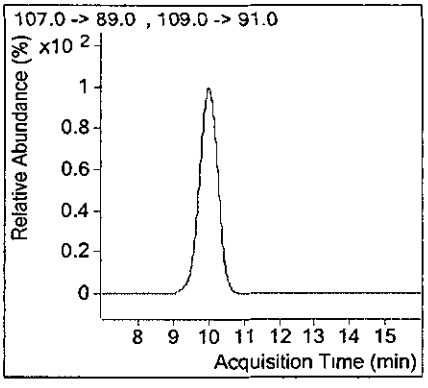
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 05:26
Analyst	lores
Data File	16NOV10-perc-052.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-12MSD, 0308373, 3.18g/10mL, 1000X + IS
Sample Identification	L9FXN1AND
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P1-C5
Exp. Concentration	5 00
Injection Volume	50

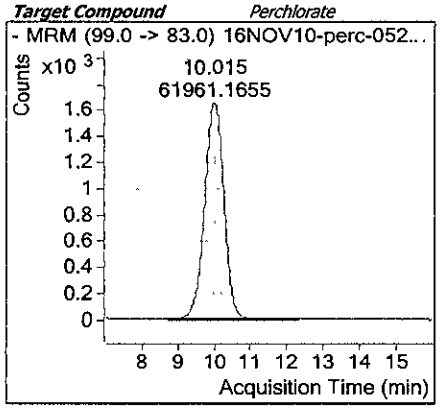
Quantitation Results

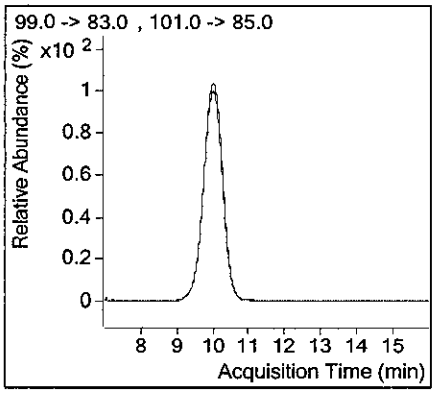
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.015	61961	99	83		3165.56173	3.16556	1000
Perchlorate-(35Cl18O4)	ISTD	10.010	224505	107	89				1000
						Result =	9954.59664 ug/Kg	%R NC, MSB	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	20952	101	85	2.96	2.30	3 80	In Control
Perchlorate-(35Cl18O4)	69779	109	91	3.22	2.30	3.80	In Control

Compound Graphics

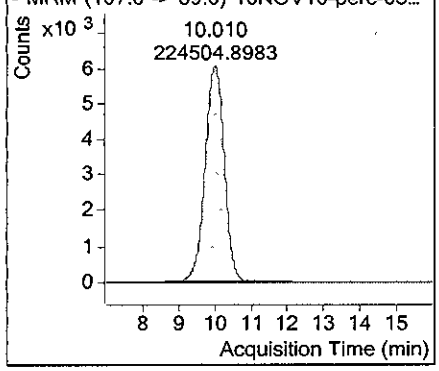
Target Compound *Perchlorate*

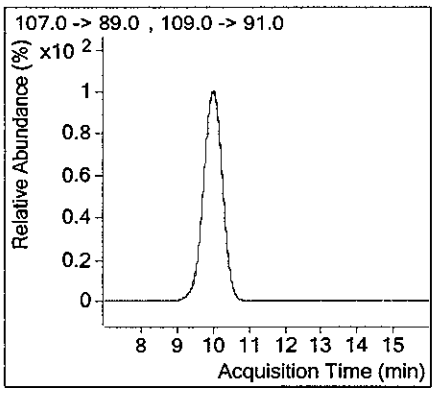




m 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 05:44
Analyst	lores
Data File	16NOV10-perc-053.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-13, 0308373, 3.10g/10mL,
Sample Identification	L9FXQ1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-C6
Exp. Concentration	
Injection Volume	50

Quantitation Results

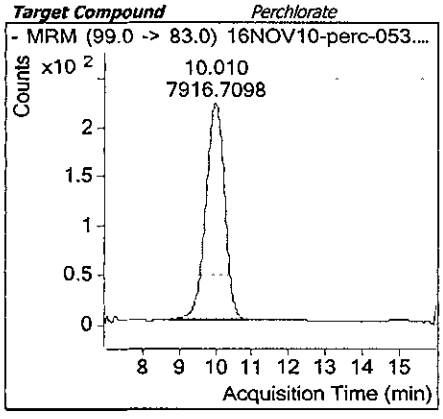
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.010	7917	99	83		0.48544	0.48544	1
Perchlorate-(35Cl18O4)	ISTD	10.006	188452	107	89				1
						Result =	1.56592 ug/Kg	Result is J-Flag	

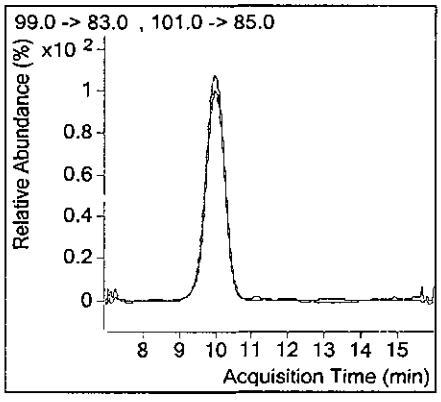
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	2884	101	85	2.75	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	57819	109	91	3.26	2.30	3.80	In Control

Compound Graphics

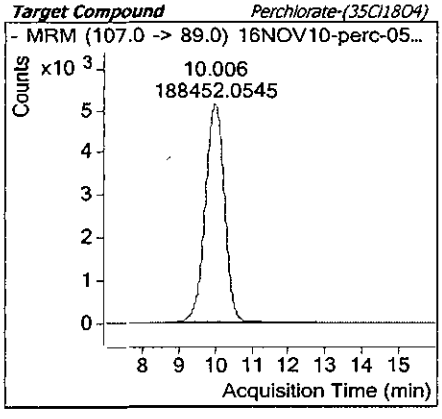
mr 11/17/10

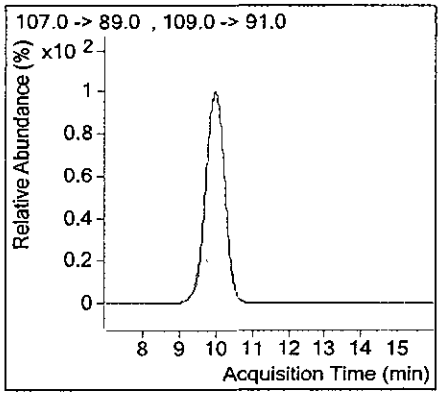
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 06:01
Analyst	lores
Data File	16NOV10-perc-054.d
Acquisition Method	PercMRM_2.m
Sample Name	G0K020530-14, 0308373, 3.05g/10mL, 10X
Sample Identification	L9FXW1AC
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45.55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P1-C7
Exp. Concentration	
Injection Volume	50

Quantitation Results

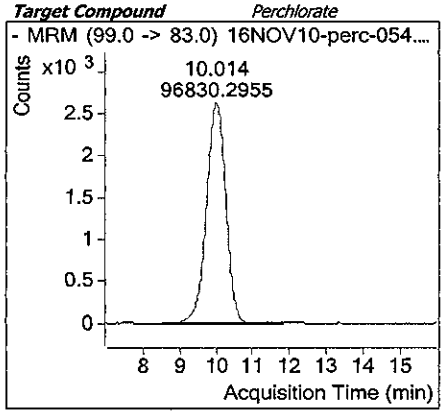
Name	Type	RT	Area	Precursor	Product		Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10 014	96830	99	83		59.15264	59.15264	1
Perchlorate-(35Cl18O4)	ISTD	10 008	18752	107	89				1
						Result =	193.94309 ug/Kg		

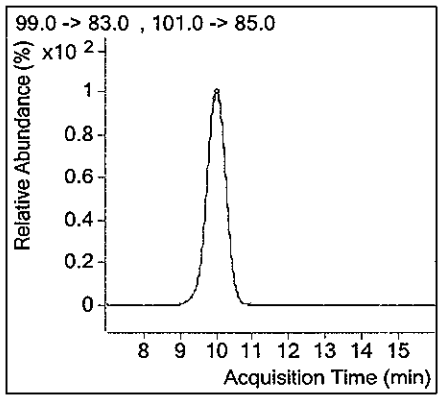
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	32552	101	85	2 97	2 30	3.80	In Control
Perchlorate-(35Cl18O4)	6016	109	91	3.12	2.30	3.80	In Control

Compound Graphics

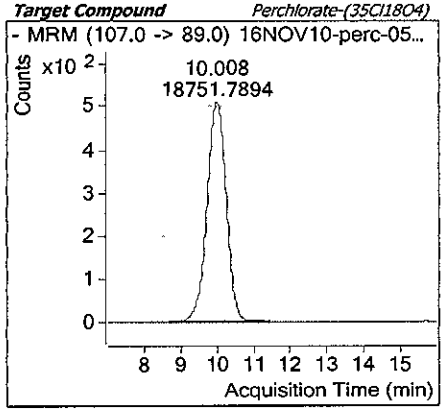
m 11/17/10

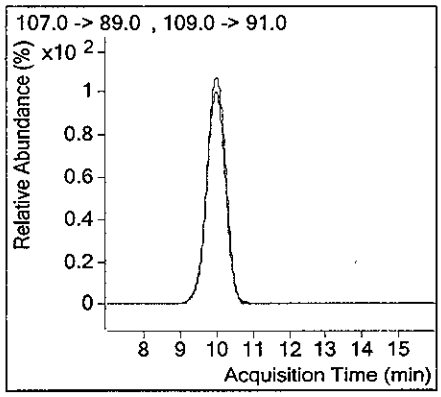
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 06:19
Analyst	lores
Data File	16NOV10-perc-055.d
Acquisition Method	PercMRM_2.m
Sample Name	CCV_5 E100720H Perchlorate Std 2.0ng/mL
Sample Identification	CCV_5
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C6
Exp. Concentration	2.00
Injection Volume	50

Quantitation Results

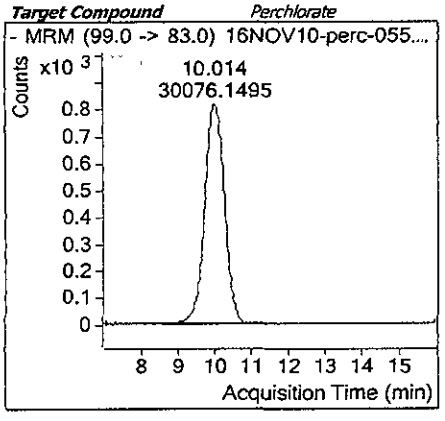
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.014	30076	99	83	1.73765	1.73765	1
Perchlorate-(35Cl18O4)	ISTD	10.005	198745	107	89			1
							-13.1 % Deviation	

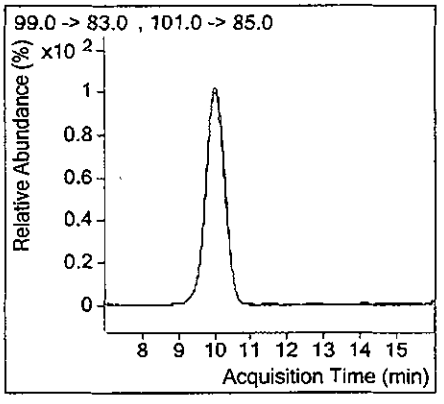
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	10148	101	85	2.96	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	61246	109	91	3.25	2.30	3.80	In Control

Compound Graphics

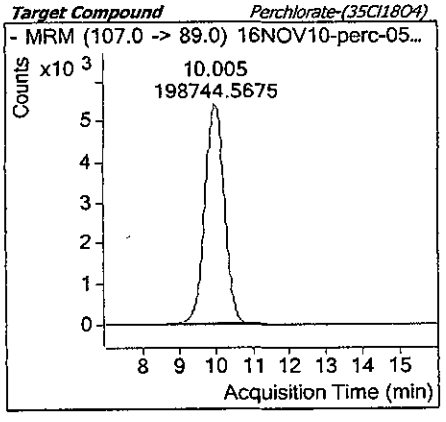
m 11/17/10

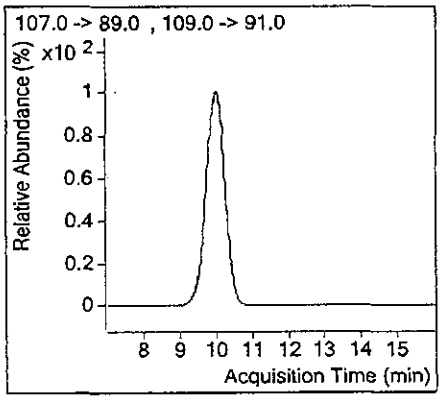
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 06:36
Analyst	lores
Data File	16NOV10-perc-056.d
Acquisition Method	PercMRM_2.m
Sample Name	LODV E100924A Perchlorate Std 0 15ng/mL
Sample Identification	LODV
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C3
Exp. Concentration	0.15
Injection Volume	50

Quantitation Results

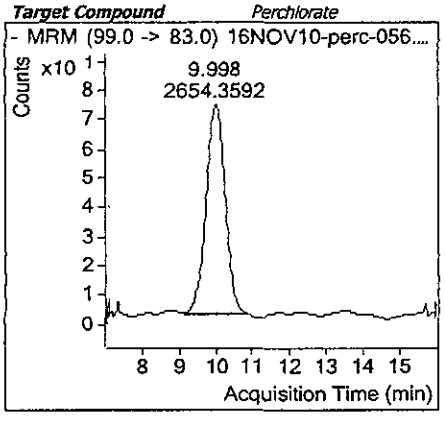
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	9.998	2654	99	83	0.15913	0.15913	1
Perchlorate-(35Cl18O4)	ISTD	10.007	196302	107	89			1

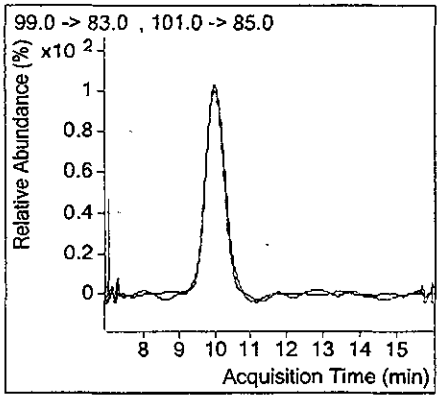
6.1 % Deviation

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	914	101	85	2.90	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	61683	109	91	3.18	2.30	3.80	In Control

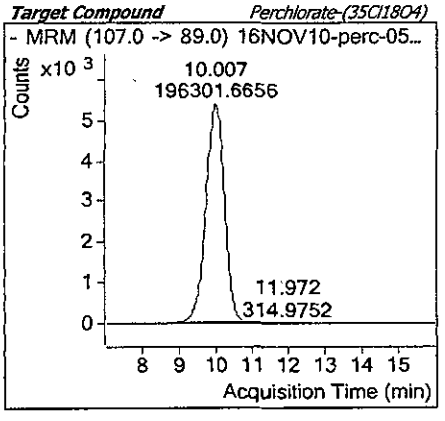
Compound Graphics

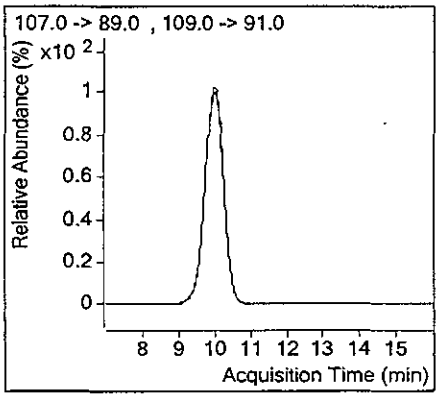
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





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TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/17/2010 06:54
Analyst	lores
Data File	16NOV10-perc-057.d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

Quantitation Results

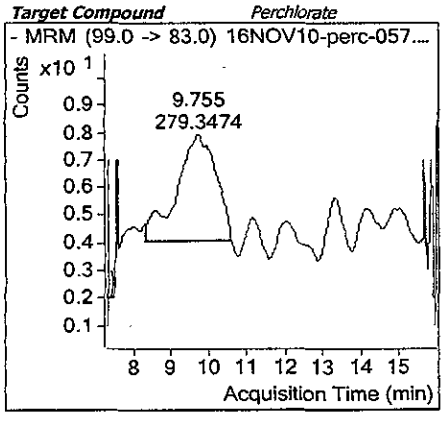
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	9.755	279	99	83	0.02019	0.02019	1
Perchlorate-(35Cl18O4)	ISTD	10 004	200694	107	89			1

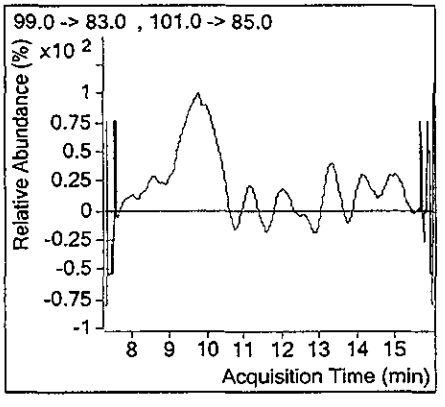
Result is < MDL => ND

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	61817	109	91	3.25	2.30	3.80	In Control

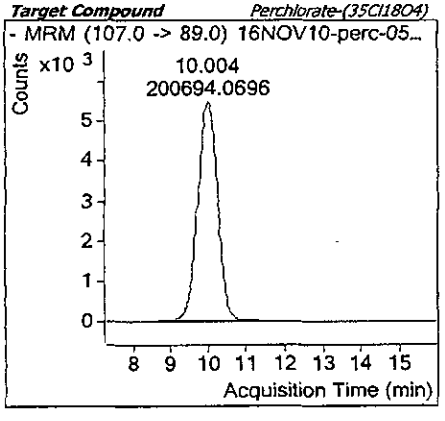
Compound Graphics

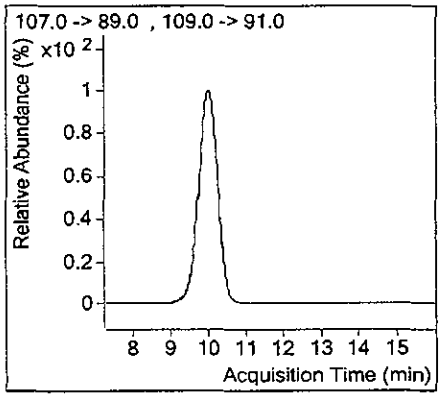
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





m 11/17/10

Initial Calibration

Includes (as applicable):

runlog

standard raw data

statistical summary

ms tune data

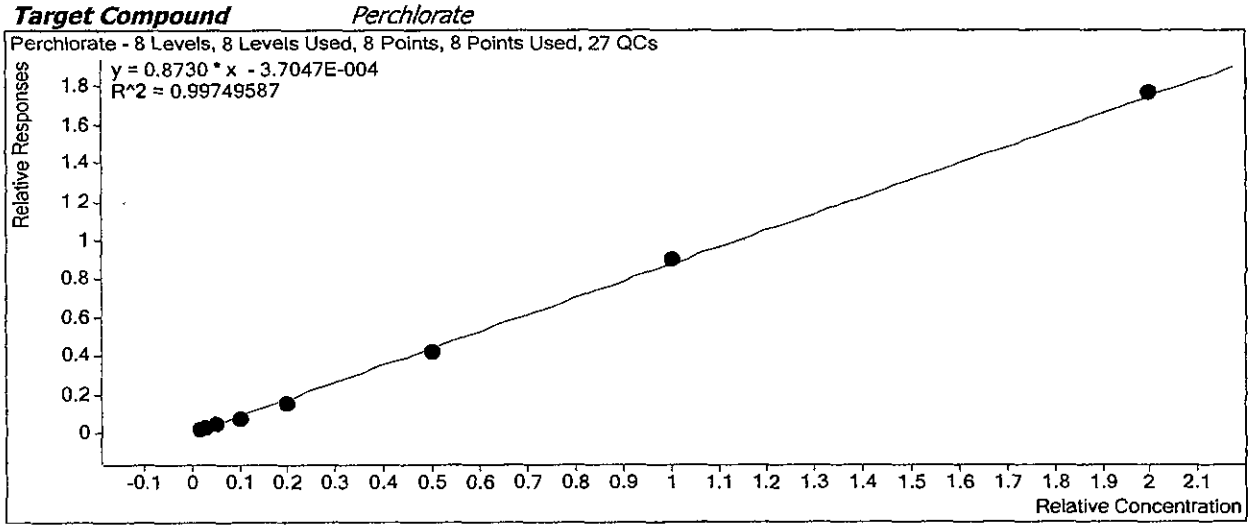
TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Info

Batch Data Path	D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml		
Analysis Time	11/17/2010 2:18 PM	**Analyst Name**	lores
Report Time	11/17/2010 2:21 PM	**Reporter Name**	lores
Last Calib Update	11/17/2010 2:18 PM	**Batch State**	Processed

Calibration Info

Target Compound *Perchlorate*



Weight: 1/x mr 11/17/10

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Sequence Table

Data File	Sample Name	Position	Level	Sample Type	Acq. Date & Time
16NOV10-perc-009.d	Blank, no IS	P2-A9		Sample	11/16/2010 16:56
16NOV10-perc-010.d	Blank + IS	P2-C1		Sample	11/16/2010 17:13
16NOV10-perc-011.d	ICAL-1 E100702D Perchlorate Std 0.15ng/mL	P2-B2	1	Calibration	11/16/2010 17:31
16NOV10-perc-012.d	ICAL-2 E100720E Perchlorate Std 0.30ng/mL	P2-B3	2	Calibration	11/16/2010 17:48
16NOV10-perc-013.d	ICAL-3 E100720F Perchlorate Std 0.50ng/mL	P2-B4	3	Calibration	11/16/2010 18:05
16NOV10-perc-014.d	ICAL-4 E100720G Perchlorate Std 1.0ng/mL	P2-B5	4	Calibration	11/16/2010 18:23
16NOV10-perc-015.d	ICAL-5 E100720H Perchlorate Std 2.0ng/mL	P2-B6	5	Calibration	11/16/2010 18:40
16NOV10-perc-016.d	ICAL-6 E100720I Perchlorate Std 5.0ng/mL	P2-B7	6	Calibration	11/16/2010 18:58
16NOV10-perc-017.d	ICAL-7 E100720J Perchlorate Std 10ng/mL	P2-B8	7	Calibration	11/16/2010 19:15
16NOV10-perc-018.d	ICAL-8 E100720K Perchlorate Std 20ng/mL	P2-B9	8	Calibration	11/16/2010 19:33
16NOV10-perc-019.d	STD_6 Perchlorate Std 5.0ng/mL	P2-A2		Sample	11/16/2010 19:50
16NOV10-perc-020.d	STD_6 Perchlorate Std 5.0ng/mL	P2-A2		Sample	11/16/2010 20:08
16NOV10-perc-021.d	Blank + IS	P2-C1		Sample	11/16/2010 20:25
16NOV10-perc-022.d	ICV E100720C Perchlorate Std 5.0ng/mL	P2-C2	ICV	QC	11/16/2010 20:43
16NOV10-perc-023.d	LODV E100720D Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/16/2010 21:00
16NOV10-perc-024.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/16/2010 21:18
16NOV10-perc-025.d	G0K100000-MB, 0314148, 20mL/20mL, 6850-DOD-L	P1-A1		Sample	11/16/2010 21:35
16NOV10-perc-026.d	G0K100000-LCS, 0314148, 20mL/20mL	P1-A2	LCS_0.5	QC	11/16/2010 21:52
16NOV10-perc-027.d	G0K100000-5MCS, 0314148, 20mL/20mL	P1-A3	LCS_0.5	QC	11/16/2010 22:10
16NOV10-perc-028.d	G0K020530-1, 0314148, 20mL/20mL	P1-A4		Sample	11/16/2010 22:27
16NOV10-perc-029.d	G0K020530-1MS, 0314148, 20mL/20mL	P1-A5	MS_0.5	QC	11/16/2010 22:45
16NOV10-perc-030.d	G0K020530-1MSD, 0314148, 20mL/20mL	P1-A6	MS_0.5	QC	11/16/2010 23:02
16NOV10-perc-031.d	G0K020530-2, 0314148, 20mL/20mL	P1-A7		Sample	11/16/2010 23:20
16NOV10-perc-032.d	G0K020530-3, 0314148, 20mL/20mL	P1-A8		Sample	11/16/2010 23:37
16NOV10-perc-033.d	Q4 LOQ 6850-L, 0314148, 20mL/20mL	P1-A9		Sample	11/16/2010 23:55
16NOV10-perc-034.d	Q4 LOD 6850-L, 0314148, 20mL/20mL	P2-F3		Sample	11/17/2010 00:12

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

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Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

16NOV10-perc-035.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 00:30
16NOV10-perc-036.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 00:47
16NOV10-perc-037.d	Blank + IS	P2-C1		Sample	11/17/2010 01:05
16NOV10-perc-038.d	G0K040000-MB, 0308373, 3.00g/10mL, 6850-DOD-S	P1-B1		Sample	11/17/2010 01:22
16NOV10-perc-039.d	G0K040000-LCS, 0308373, 3.00g/10mL,	P1-B2	LCS_5	QC	11/17/2010 01:39
16NOV10-perc-040.d	G0K040000-SMCS, 0308373, 3.00g/10mL,	P1-B3	LCS_5	QC	11/17/2010 01:57
16NOV10-perc-041.d	G0K020530-4, 0308373, 3.09g/10mL,	P1-B4		Sample	11/17/2010 02:14
16NOV10-perc-042.d	G0K020530-5, 0308373, 3.15g/10mL, 1000X + IS	P1-B5		Sample	11/17/2010 02:32
16NOV10-perc-043.d	G0K020530-6, 0308373, 3.25g/10mL, 5X	P1-B6		Sample	11/17/2010 02:49
16NOV10-perc-044.d	G0K020530-7, 0308373, 3.03g/10mL,	P1-B7		Sample	11/17/2010 03:07
16NOV10-perc-045.d	G0K020530-8, 0308373, 3.19g/10mL,	P1-B8		Sample	11/17/2010 03:24
16NOV10-perc-046.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 03:42
16NOV10-perc-047.d	G0K020530-9, 0308373, 3.00g/10mL,	P1-B9		Sample	11/17/2010 03:59
16NOV10-perc-048.d	G0K020530-10, 0308373, 3.07g/10mL,	P1-C1		Sample	11/17/2010 04:16
16NOV10-perc-049.d	G0K020530-11, 0308373, 3.15g/10mL,	P1-C2		Sample	11/17/2010 04:34
16NOV10-perc-050.d	G0K020530-12, 0308373, 3.00g/10mL, 1000X + IS	P1-C3		Sample	11/17/2010 04:51
16NOV10-perc-051.d	G0K020530-12MS, 0308373, 3.11g/10mL, 1000X + IS	P1-C4	MS_5	QC	11/17/2010 05:09
16NOV10-perc-052.d	G0K020530-12MSD, 0308373, 3.18g/10mL, 1000X + IS	P1-C5	MS_5	QC	11/17/2010 05:26
16NOV10-perc-053.d	G0K020530-13, 0308373, 3.10g/10mL,	P1-C6		Sample	11/17/2010 05:44
16NOV10-perc-054.d	G0K020530-14, 0308373, 3.05g/10mL, 10X	P1-C7		Sample	11/17/2010 06:01
16NOV10-perc-055.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 06:19
16NOV10-perc-056.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 06:36
16NOV10-perc-057.d	Blank + IS	P2-C1		Sample	11/17/2010 06:54
16NOV10-perc-058.d	G0J260000-MB, 0299273, 3.00g/10mL, 6850-DOD-S	P1-C8		Sample	11/17/2010 07:11
16NOV10-perc-059.d	G0J260000-LCS, 0299273, 3.00g/10mL,	P1-C9	LCS_5	QC	11/17/2010 07:29
16NOV10-perc-060.d	G0J260000-SMCS, 0299273, 3.00g/10mL,	P1-D1	LCS_5	QC	11/17/2010 07:46
16NOV10-perc-061.d	A0J210551-1, 0299273, 2.98g/10mL,	P1-D2		Sample	11/17/2010 08:04
16NOV10-perc-062.d	A0J210551-2, 0299273, 3.08g/10mL,	P1-D3		Sample	11/17/2010 08:21
16NOV10-perc-063.d	A0J210551-3, 0299273, 3.01g/10mL,	P1-D4		Sample	11/17/2010 08:38

Instrument A5; Agilent 6410 Mass Spectrometer with Agilent 1200 series Binary SL HPLC.

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Hanbook

16NOV10-perc-064.d	A0J210551-3MS, 0299273, 2.98g/10mL,	P1-D5	MS_5	QC	11/17/2010 08:56
16NOV10-perc-065.d	A0J210551-3MSD, 0299273, 3.02g/10mL,	P1-D6	MS_5	QC	11/17/2010 09:13
16NOV10-perc-066.d	A0J210S51-4, 0299273, 3.06g/10mL,	P1-D7		Sample	11/17/2010 09:31
16NOV10-perc-067.d	A0J210551-5, 0299273, 3.07g/10mL,	P1-D8		Sample	11/17/2010 09:48
16NOV10-perc-068.d	CCV_5 E100720H Perchlorate Std 2.0ng/mL	P2-C6	CCV5	QC	11/17/2010 10:06
16NOV10-perc-069.d	Blank + IS	P2-C1		Sample	11/17/2010 10:23
16NOV10-perc-070.d	A0J210551-6, 0299273, 3.02g/10mL,	P1-D9		Sample	11/17/2010 10:41
16NOV10-perc-071.d	A0J210551-7, 0299273, 2.96g/10mL,	P1-E1		Sample	11/17/2010 10:58
16NOV10-perc-072.d	G0K150000-MB, 0319363, 20mL/20mL, 6850-DOD-L	P1-B1		Sample	11/17/2010 11:16
16NOV10-perc-073.d	G0K150000-LCS, 0319363, 20mL/20mL	P1-B2	LCS_0.5	QC	11/17/2010 11:33
16NOV10-perc-074.d	G0K150000-SMCS, 0319363, 20mL/20mL	P1-B3	LCS_0.5	QC	11/17/2010 11:50
16NOV10-perc-075.d	G0K120447-1, 0319363, 20mL/20mL	P1-B4		Sample	11/17/2010 12:08
16NOV10-perc-076.d	G0K120447-1MS, 0319363, 20mL/20mL	P1-B5	MS_0.5	QC	11/17/2010 12:25
16NOV10-perc-077.d	G0K120447-1MSD, 0319363, 20mL/20mL	P1-B6	MS_0.5	QC	11/17/2010 12:43
16NOV10-perc-078.d	G0K130463-1, 0319363, 20mL/20mL	P1-B7		Sample	11/17/2010 13:00
16NOV10-perc-079.d	CCV_6 E100720I Perchlorate Std 5.0ng/mL	P2-C7	CCV6	QC	11/17/2010 13:18
16NOV10-perc-080.d	LODV E100924A Perchlorate Std 0.15ng/mL	P2-C3	LODV	QC	11/17/2010 13:35
16NOV10-perc-081.d	Blank + IS	P2-C1		Sample	11/17/2010 13:53

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Target Compound *Perchlorate*

Calibration STD	Level	Enabled	Response	RF	Exp Conc
16NOV10-perc-011.d	1	☑	3104	1.1149	0.1500
16NOV10-perc-012.d	2	☑	4877	0.8210	0.3000
16NOV10-perc-013.d	3	☑	8532	0.8836	0.5000
16NOV10-perc-014.d	4	☑	15105	0.7193	1.0000
16NOV10-perc-015.d	5	☑	29560	0.7741	2.0000
16NOV10-perc-016.d	6	☑	78435	0.8401	5.0000
16NOV10-perc-017.d	7	☑	157503	0.8944	10.0000
16NOV10-perc-018.d	8	☑	300401	0.8853	20.0000
16NOV10-perc-035.d	CCV5	☑	29789	0.7644	2.0000
16NOV10-perc-055.d	CCV5	☑	30076	0.7567	2.0000
16NOV10-perc-068.d	CCV5	☑	31405	0.7692	2.0000
16NOV10-perc-024.d	CCV6	☑	76957	0.8234	5.0000
16NOV10-perc-046.d	CCV6	☑	74546	0.7982	5.0000
16NOV10-perc-079.d	CCV6	☑	81120	0.8039	5.0000
16NOV10-perc-022.d	ICV	☑	76334	0.7625	5.0000
16NOV10-perc-026.d	LCS_0.5	☑	6947	0.7477	0.5000
16NOV10-perc-027.d	LC5_0.5	☑	8166	0.8406	0.5000
16NOV10-perc-073.d	LC5_0.5	☑	8178	0.8133	0.5000
16NOV10-perc-074.d	LCS_0.5	☑	8058	0.7573	0.5000
16NOV10-perc-039.d	LC5_5	☑	21940	0.2368	5.0000
16NOV10-perc-040.d	LCS_5	☑	21856	0.2375	5.0000
16NOV10-perc-059.d	LCS_5	☑	22047	0.2388	5.0000
16NOV10-perc-060.d	LCS_5	☑	22942	0.2443	5.0000
16NOV10-perc-023.d	LODV	☑	2620	0.9151	0.1500
16NOV10-perc-036.d	LODV	☑	2800	0.9816	0.1500
16NOV10-perc-056.d	LODV	☑	2654	0.9015	0.1500
16NOV10-perc-080.d	LODV	☑	2763	0.8768	0.1500
16NOV10-perc-029.d	M5_0.5	☑	3873506	1359.0119	0.5000
16NOV10-perc-030.d	MS_0.5	☑	3861931	1370.1296	0.5000
16NOV10-perc-076.d	MS_0.5	☑	S3198	5.1592	0.5000
16NOV10-perc-077.d	MS_0.5	☑	53492	5.1718	0.5000
16NOV10-perc-051.d	MS_5	☑	68655	565.7531	5.0000
16NOV10-perc-052.d	MS_5	☑	61961	551.9805	5.0000
16NOV10-perc-064.d	MS_5	☑	25833	0.2734	5.0000
16NOV10-perc-065.d	MS_5	☑	25985	0.2850	5.0000

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Target Compound *Perchlorate-(35Cl18O4)*

Calibration STD	Level	Enabled	Response	RF	Exp Conc
16NOV10-perc-011.d	1	☑	185574	18557.4453	10.0000
16NOV10-perc-012.d	2	☑	198021	19802.0565	10.0000
16NOV10-perc-013.d	3	☑	193127	19312.6671	10.0000
16NOV10-perc-014.d	4	☑	209981	20998.0725	10.0000
16NOV10-perc-015.d	5	☑	190942	19094.1577	10.0000
16NOV10-perc-016.d	6	☑	186717	18671.7272	10.0000
16NOV10-perc-017.d	7	☑	176091	17609.0962	10.0000
16NOV10-perc-018.d	8	☑	169654	16965.4387	10.0000
16NOV10-perc-035.d	CCV5	☑	194852	19485.1680	10.0000
16NOV10-perc-055.d	CCV5	☑	198745	19874.4567	10.0000
16NOV10-perc-068.d	CCV5	☑	204132	20413.2175	10.0000
16NOV10-perc-024.d	CCV6	☑	186919	18691.8894	10.0000
16NOV10-perc-046.d	CCV6	☑	186789	18678.9350	10.0000
16NOV10-perc-079.d	CCV6	☑	201806	20180.5889	10.0000
16NOV10-perc-022.d	ICV	☑	200224	20022.3787	10.0000
16NOV10-perc-026.d	LCS_0.5	☑	185831	18583.1393	10.0000
16NOV10-perc-027.d	LCS_0.5	☑	194296	19429.5936	10.0000
16NOV10-perc-073.d	LCS_0.5	☑	201092	20109.1544	10.0000
16NOV10-perc-074.d	LCS_0.5	☑	212801	21280.1128	10.0000
16NOV10-perc-039.d	LCS_5	☑	185333	18533.2631	10.0000
16NOV10-perc-040.d	LCS_5	☑	184079	18407.9438	10.0000
16NOV10-perc-059.d	LCS_5	☑	184685	18468.4518	10.0000
16NOV10-perc-060.d	LCS_5	☑	187799	18779.8515	10.0000
16NOV10-perc-023.d	LODV	☑	190832	19083.2110	10.0000
16NOV10-perc-036.d	LODV	☑	190185	19018.4521	10.0000
16NOV10-perc-056.d	LODV	☑	196302	19630.1666	10.0000
16NOV10-perc-080.d	LODV	☑	210100	21009.9926	10.0000
16NOV10-perc-029.d	MS_0.5	☑	57005	5700.4733	10.0000
16NOV10-perc-030.d	MS_0.5	☑	56373	5637.3229	10.0000
16NOV10-perc-076.d	MS_0.5	☑	206224	20622.4143	10.0000
16NOV10-perc-077.d	MS_0.5	☑	206864	20686.3682	10.0000
16NOV10-perc-051.d	MS_5	☑	242703	24.2703	10000.0000
16NOV10-perc-052.d	MS_5	☑	224505	22.4505	10000.0000
16NOV10-perc-064.d	MS_5	☑	188960	18896.0367	10.0000
16NOV10-perc-065.d	MS_5	☑	182363	18236.2596	10.0000

TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path	D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

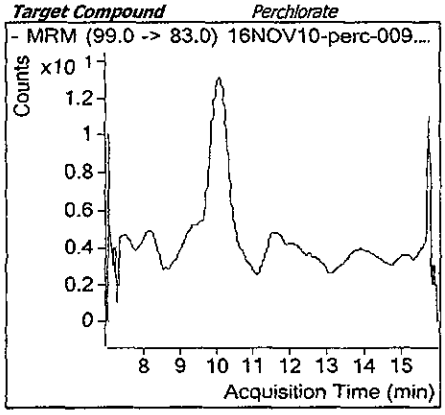
Analysis Information

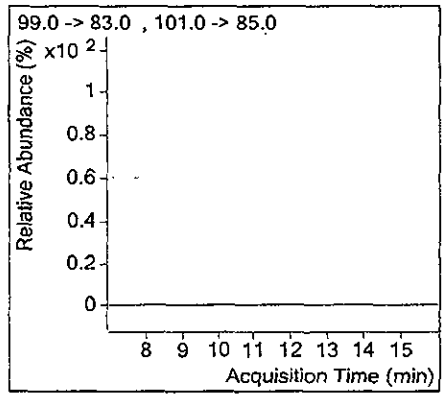
Acquisition Date - Time	11/16/2010 16:56
Analyst	lores
Data File	16NOV10-perc-009 d
Acquisition Method	PercMRM_2.m
Sample Name	Blank, no IS
Sample Identification	Blank
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-A9
Exp. Concentration	
Injection Volume	50

Perchlorate = ND

Compound Graphics

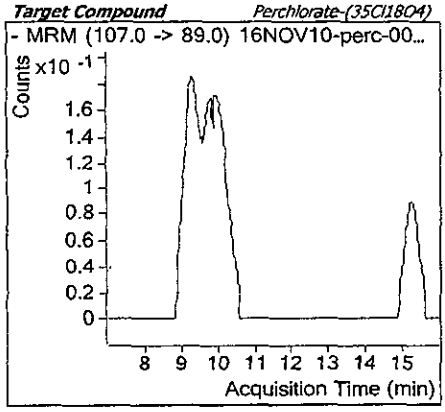
Target Compound *Perchlorate*

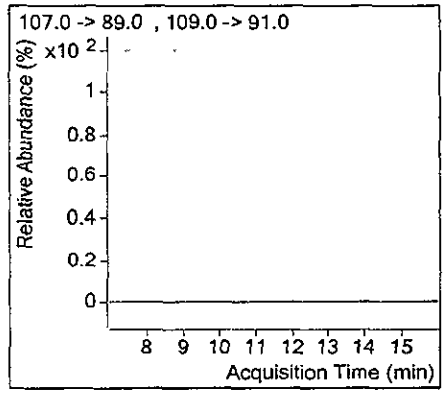




m 11/17/10

Target Compound *Perchlorate-(35Cl,18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 17:13
Analyst	lores
Data File	16NOV10-perc-010.d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

Quantitation Results

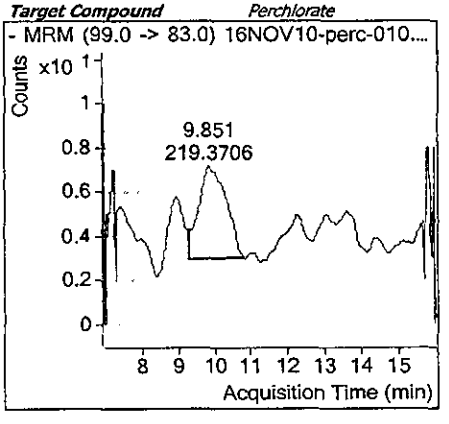
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	9.851	219	99	83	**0.01743**	**0.01743**	1
Perchlorate-(35Cl18O4)	ISTD	10.039	190515	107	89			1

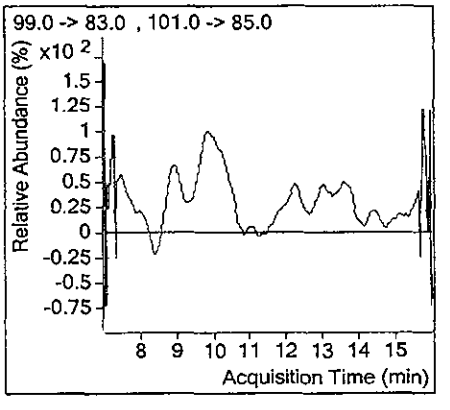
<MDL. = ND

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	59204	109	91	3.22	2.30	3.80	In Control

Compound Graphics

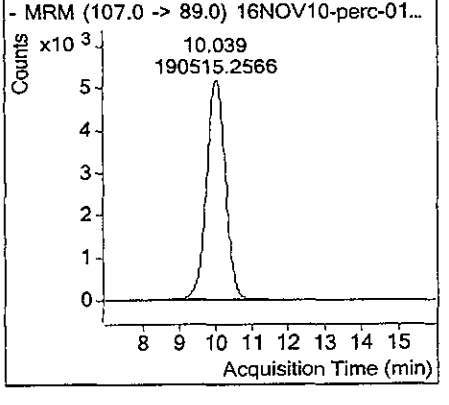
Target Compound *Perchlorate*

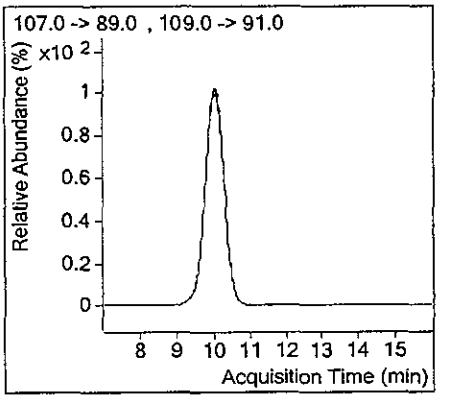




m 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





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Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 17:31
Analyst	lores
Data File	16NOV10-perc-011.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-1 E100702D Perchlorate Std 0.15ng/mL
Sample Identification	ICAL-1
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45.55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B2
Exp. Concentration	0.15
Injection Volume	50

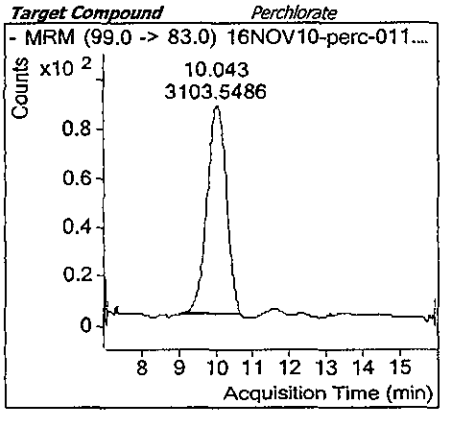
Quantitation Results

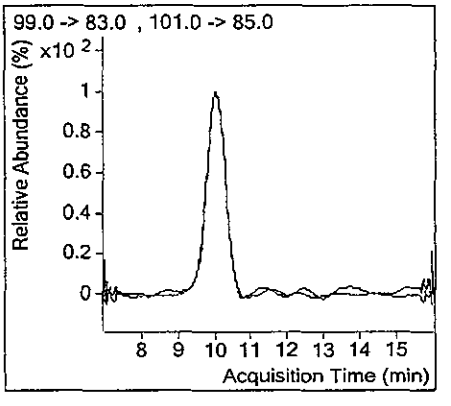
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.043	3104	99	83	**0.19581**	**0.19581**	1
Perchlorate-(35Cl18O4)	ISTD	10.042	185574	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	998	101	85	3.11	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	58941	109	91	3.15	2.30	3.80	In Control

Compound Graphics

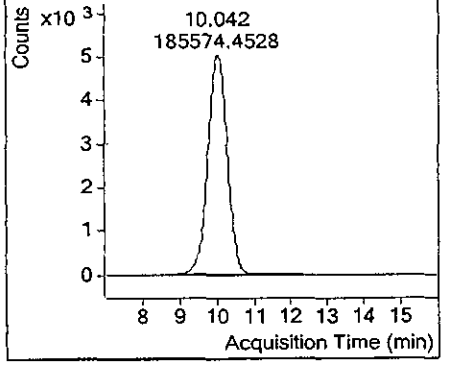
Target Compound *Perchlorate*

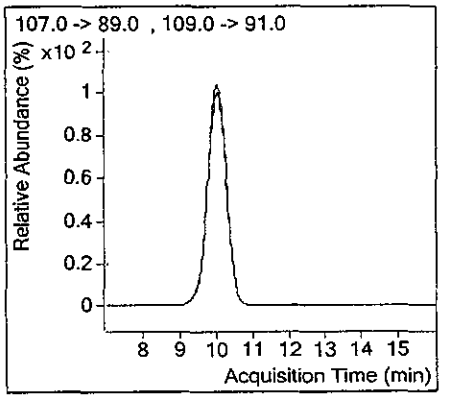




mr 11/17/10

Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 17:48
Analyst	lores
Data File	16NOV10-perc-012.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-2 E100720E Perchlorate Std 0.30ng/mL
Sample Identification	ICAL-2
Sample Information	IC-Pak Anion HR 75x4 6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B3
Exp. Concentration	0.30
Injection Volume	50

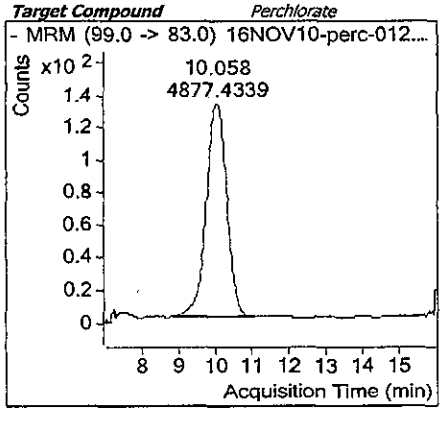
Quantitation Results

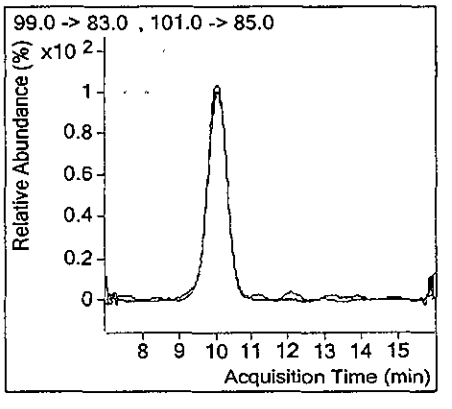
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.058	4877	99	83	0.28638	0.28638	1
Perchlorate-(35Cl18O4)	ISTD	10.040	198021	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	1685	101	85	2.89	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	61219	109	91	3.23	2.30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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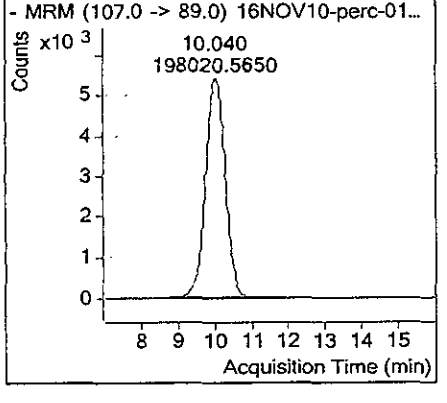
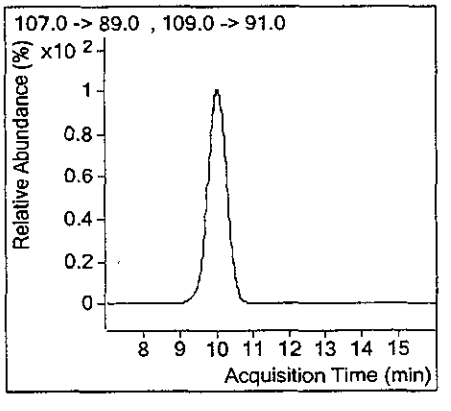
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 18:05
Analyst	lores
Data File	16NOV10-perc-013.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-3 E100720F Perchlorate Std 0.50ng/mL
Sample Identification	ICAL-3
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B4
Exp. Concentration	0.50
Injection Volume	50

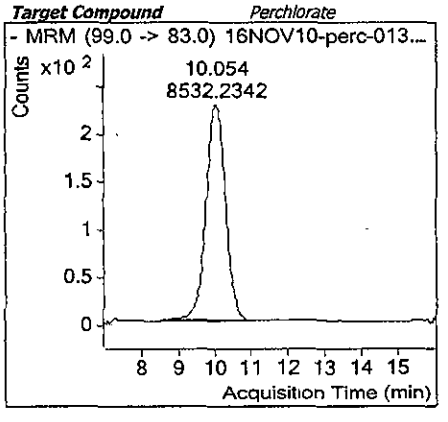
Quantitation Results

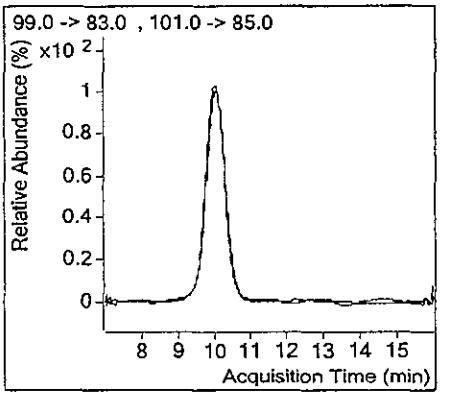
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.054	8532	99	83	**0.51030**	**0.51030**	1
Perchlorate-(35Cl18O4)	ISTD	10.042	193127	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	2853	101	85	2.99	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	59243	109	91	3.26	2.30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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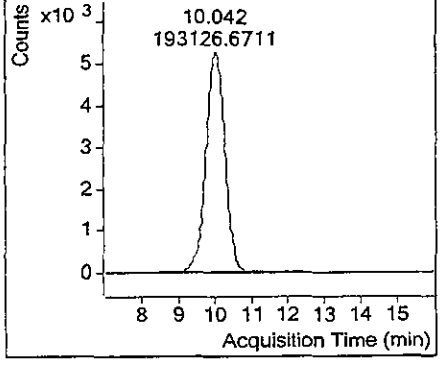
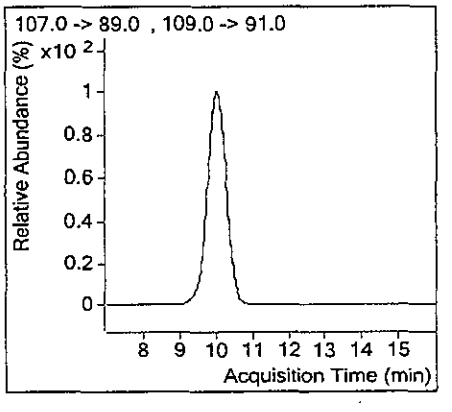
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 18:23
Analyst	lores
Data File	16NOV10-perc-014.d
Acquisition Method	PercMRM_2 m
Sample Name	ICAL-4 E100720G Perchlorate Std 1.0ng/mL
Sample Identification	ICAL-4
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B5
Exp. Concentration	1.00
Injection Volume	50

Quantitation Results

Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.053	15105	99	83	**0.82821**	**0.82821**	1
Perchlorate-(35Cl18O4)	ISTD	10.044	209981	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	5016	101	85	3.01	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	62942	109	91	3.34	2.30	3.80	In Control

Compound Graphics

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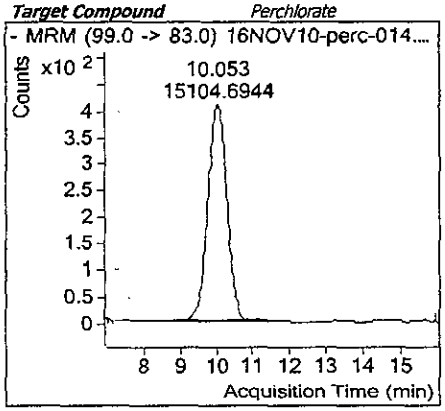
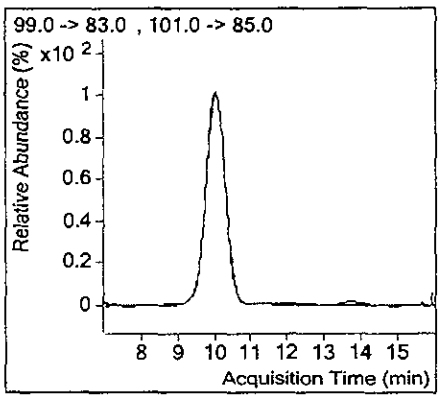
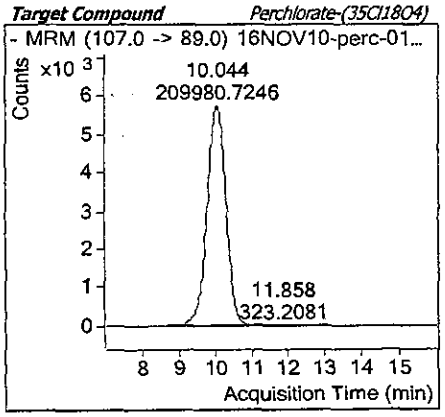
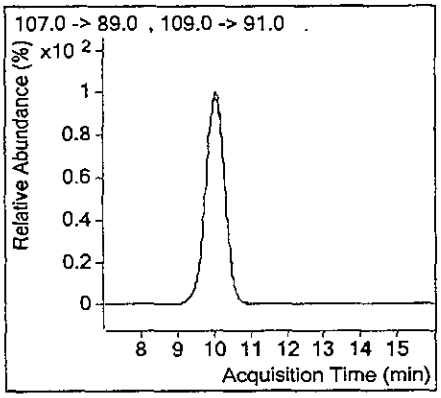
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 18:40
Analyst	lores
Data File	16NOV10-perc-015.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-5 E100720H Perchlorate Std 2.0ng/mL
Sample Identification	ICAL-5
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B6
Exp. Concentration	2.00
Injection Volume	50

Quantitation Results

Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.053	29560	99	83	1.77752	1.77752	1
Perchlorate-(35Cl18O4)	ISTD	10.046	190942	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	10065	101	85	2.94	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	59034	109	91	3.23	2.30	3.80	In Control

Compound Graphics

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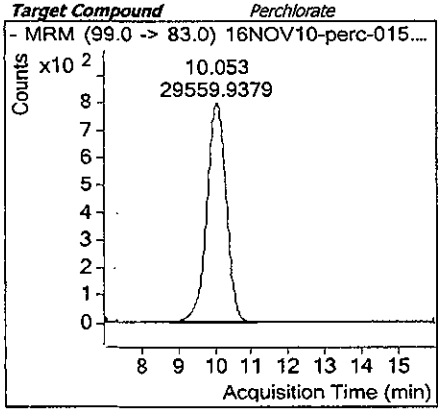
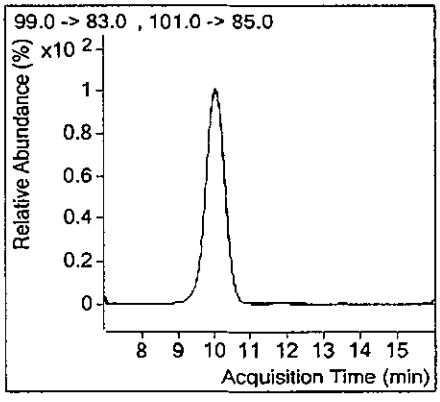
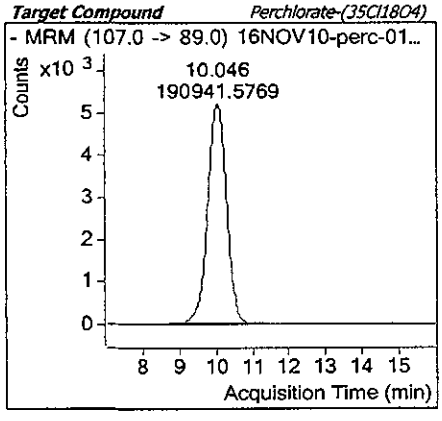
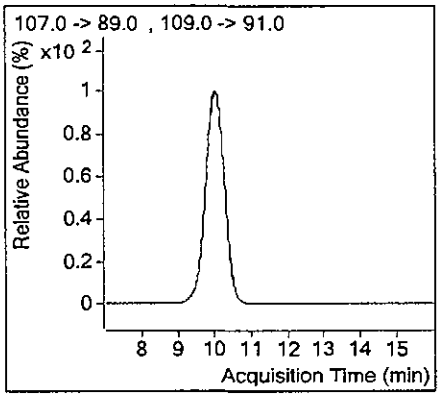
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 18:58
Analyst	lores
Data File	16NOV10-perc-016.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-6 E100720I Perchlorate Std 5.0ng/mL
Sample Identification	ICAL-6
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B7
Exp. Concentration	5.00
Injection Volume	50

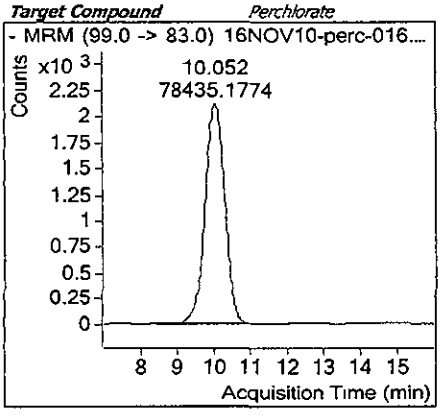
Quantitation Results

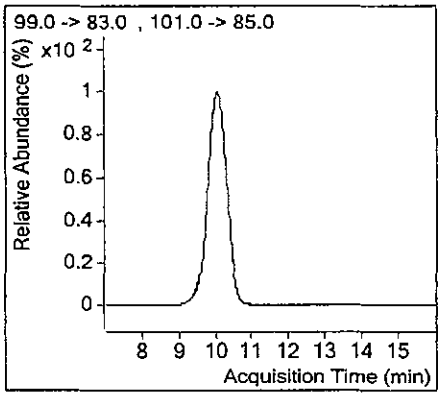
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.052	78435	99	83	4.81597	4.81597	1
Perchlorate-(35Cl18O4)	ISTD	10.045	186717	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	25872	101	85	3.03	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	58056	109	91	3.22	2.30	3.80	In Control

Compound Graphics

Target Compound *Perchlorate*





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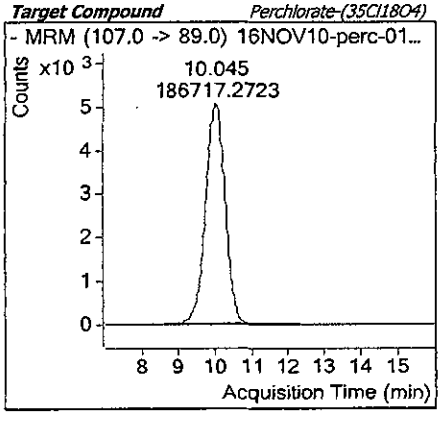
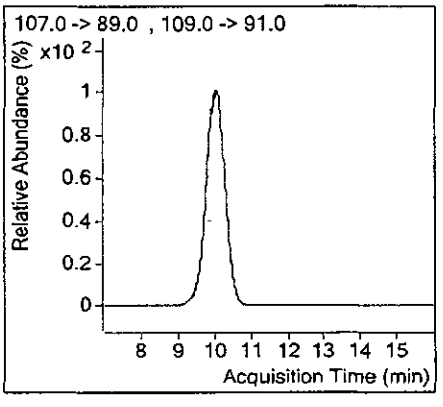
Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 19:15
Analyst	lores
Data File	16NOV10-perc-017.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-7 E100720J Perchlorate Std 10ng/mL
Sample Identification	ICAL-7
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B8
Exp. Concentration	10.00
Injection Volume	50

Quantitation Results

Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.056	157503	99	83	10.24958	10.24958	1
Perchlorate-(35Cl18O4)	ISTD	10.047	176091	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	50595	101	85	3.11	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	54786	109	91	3.21	2.30	3.80	In Control

Compound Graphics

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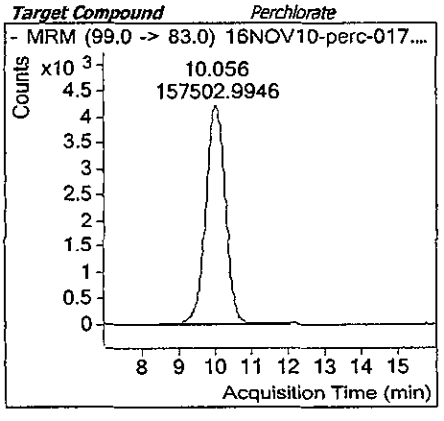
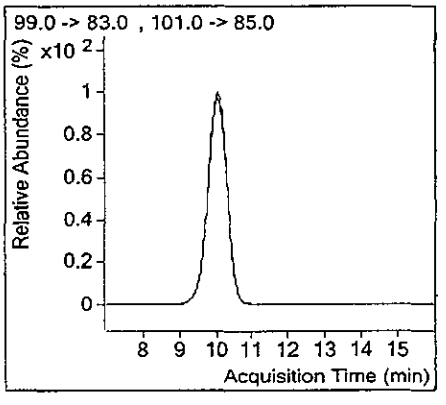
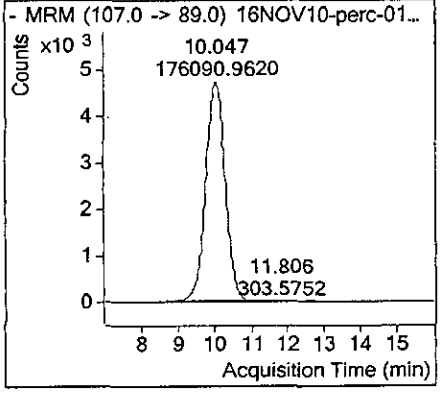
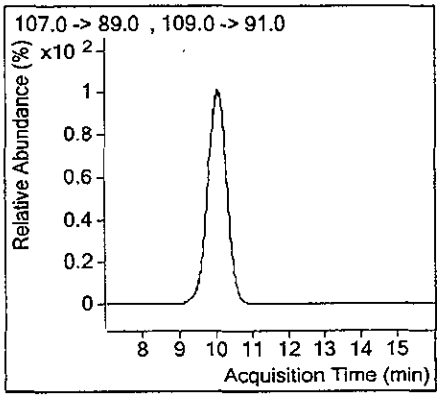
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 19:33
Analyst	lores
Data File	16NOV10-perc-018.d
Acquisition Method	PercMRM_2.m
Sample Name	ICAL-8 E100720K Perchlorate Std 20ng/mL
Sample Identification	ICAL-8
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Calibration
Sample Position	P2-B9
Exp. Concentration	20.00
Injection Volume	50

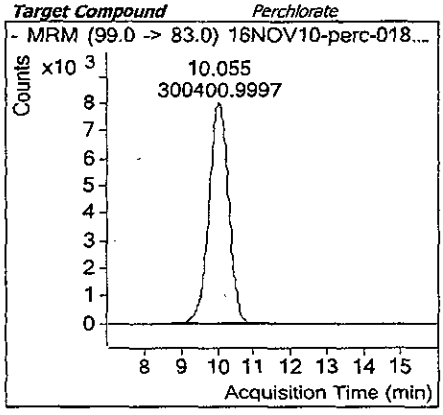
Quantitation Results

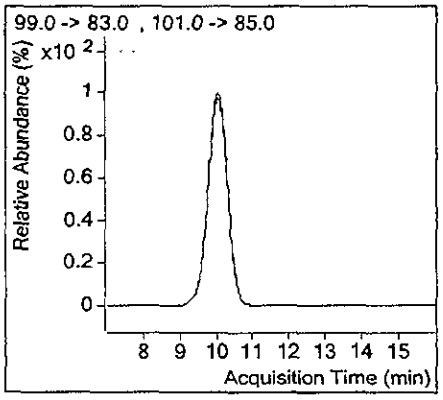
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.055	300401	99	83	20.28624	20.28624	1
Perchlorate-(35Cl18O4)	ISTD	10.046	169654	107	89			1

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	96494	101	85	3.11	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	52242	109	91	3.25	2.30	3.80	In Control

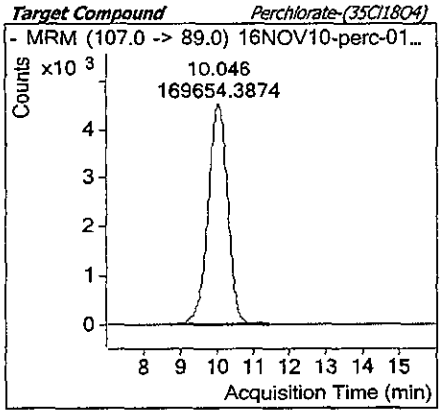
Compound Graphics

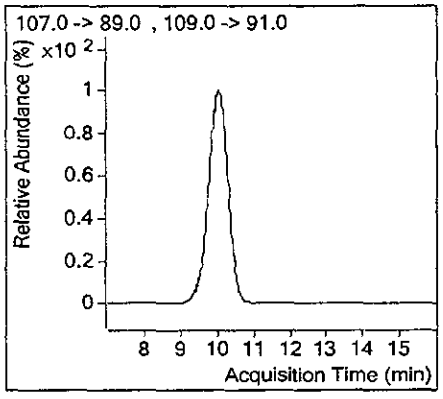
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

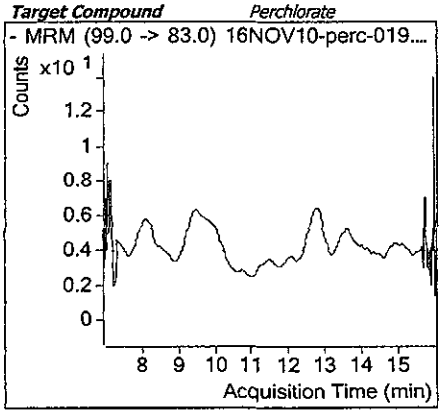
Analysis Information

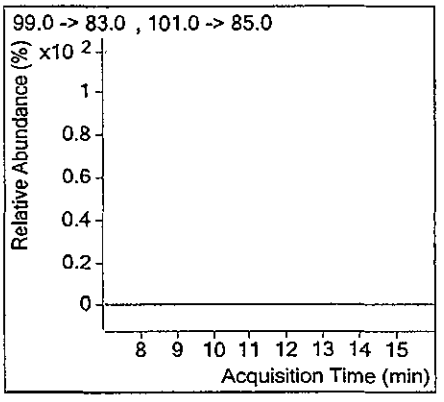
Acquisition Date - Time	11/16/2010 19:50
Analyst	lores
Data File	16NOV10-perc-019.d
Acquisition Method	PercMRM_2.m
Sample Name	STD_6 Perchlorate Std 5.0ng/mL
Sample Identification	STD_6
Sample Information	IC-Pak Anion HR 75x4.6mm T=40°C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-A2
Exp. Concentration	
Injection Volume	50

Not needed.

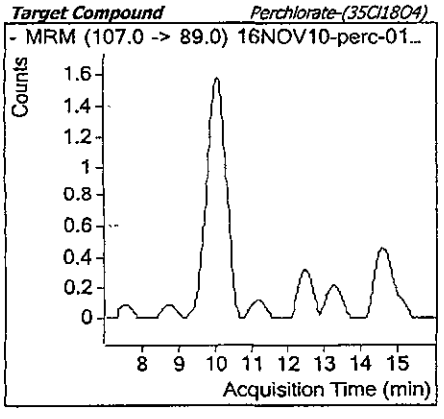
Compound Graphics

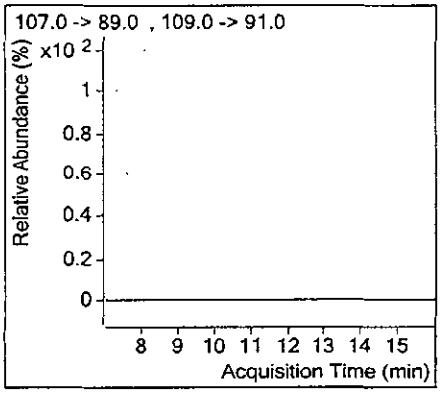
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path	D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

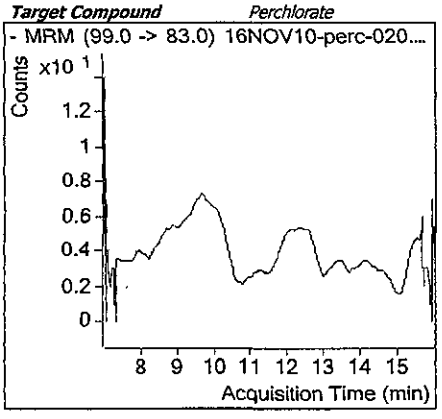
Analysis Information

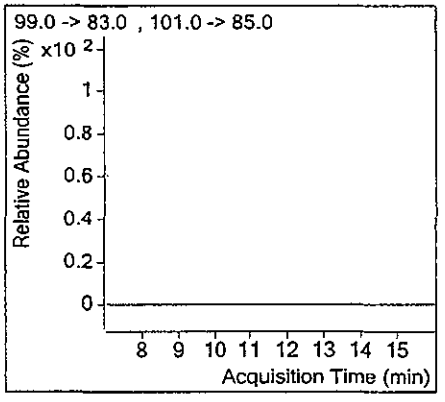
Acquisition Date - Time	11/16/2010 20:08
Analyst	lores
Data File	16NOV10-perc-020.d
Acquisition Method	PercMRM_2 m
Sample Name	STD_6 Perchlorate Std 5.0ng/mL
Sample Identification	STD_6
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-A2
Exp. Concentration	
Injection Volume	50

Not needed.

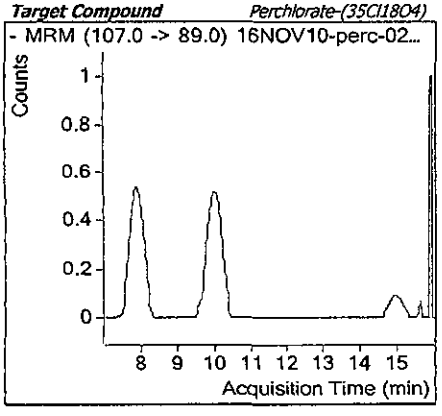
Compound Graphics

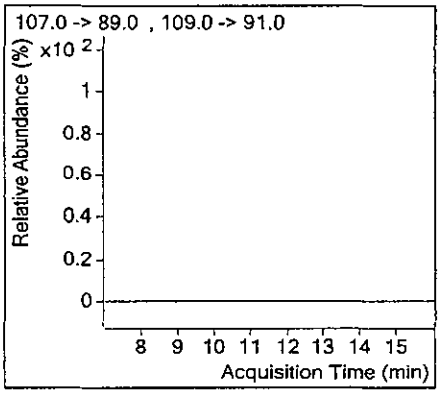
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 20:25
Analyst	lores
Data File	16NOV10-perc-021.d
Acquisition Method	PercMRM_2.m
Sample Name	Blank + IS
Sample Identification	Blank + IS
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	Sample
Sample Position	P2-C1
Exp. Concentration	
Injection Volume	50

Quantitation Results

Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	9.998	330	99	83	0.02379	0.02379	1
Perchlorate-(35Cl18O4)	ISTD	10.050	193688	107	89			1

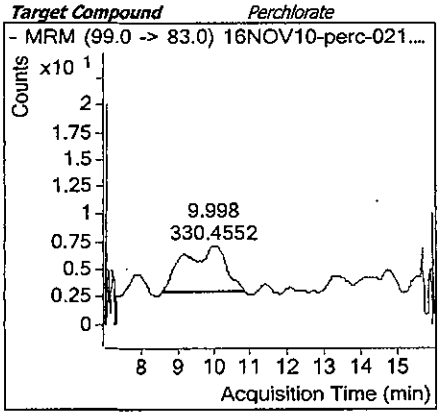
Result is < MDL => ND

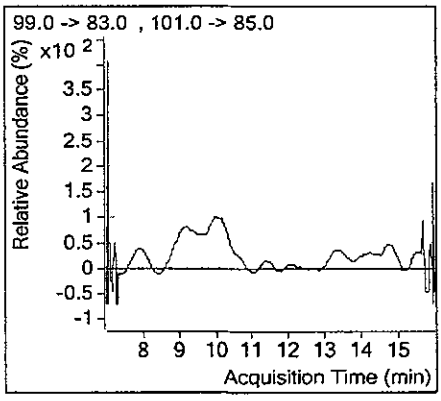
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate-(35Cl18O4)	59131	109	91	3.28	2.30	3.80	In Control

Compound Graphics

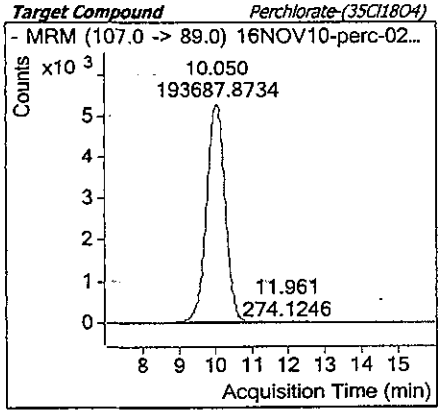
m 11/17/10

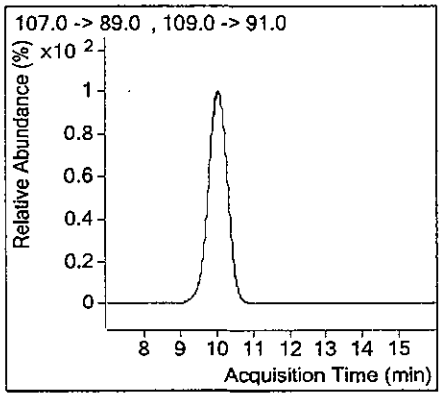
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 20:43
Analyst	lores
Data File	16NOV10-perc-022 d
Acquisition Method	PercMRM_2.m
Sample Name	ICV E100720C Perchlorate Std 5 0ng/mL
Sample Identification	ICV
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C2
Exp. Concentration	5.00
Injection Volume	50

Quantitation Results

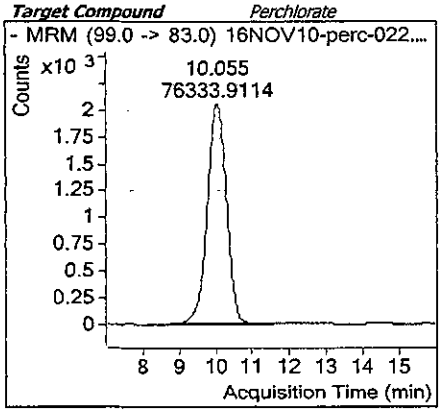
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.055	76334	99	83	4.37117	4.37117	1
Perchlorate-(35Cl18O4)	ISTD	10.047	200224	107	89			1
							-12.6 % Deviation	

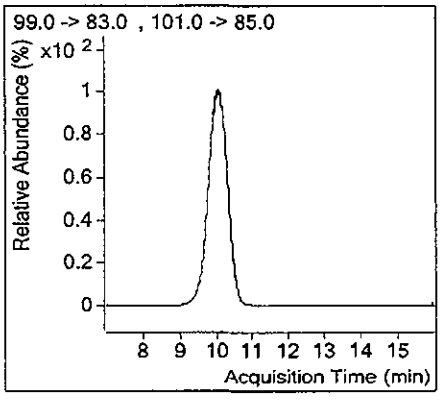
Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	25309	101	85	3 02	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	62773	109	91	3.19	2.30	3 80	In Control

Compound Graphics

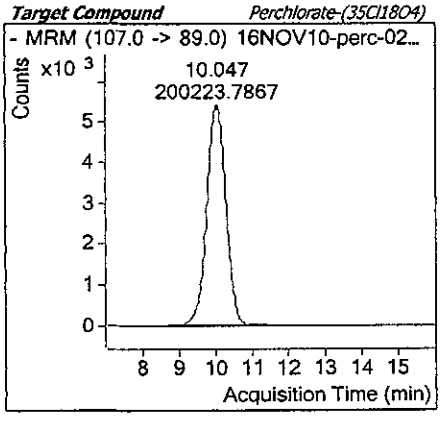
mr 11/17/10

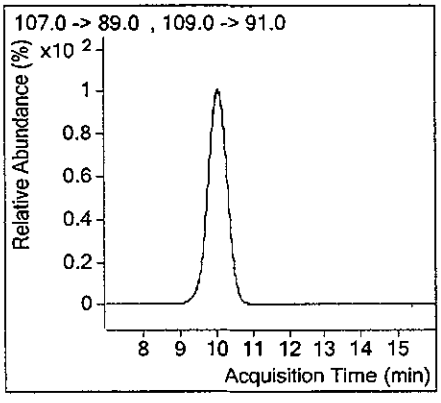
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





TestAmerica Inc.
Perchlorate Analysis by LC/MS/MS; Method 8321 / 6850 / 331 / DOD Handbook

Batch Data Path D:\Masshunter\A5-data\Perc_84NM101161VE 02\16NOV2010\QuantResults\16October2010-Perchlorate.batch.xml

Analysis Information

Acquisition Date - Time	11/16/2010 21:00
Analyst	lores
Data File	16NOV10-perc-023.d
Acquisition Method	PercMRM_2.m
Sample Name	LODV E100720D Perchlorate Std 0.15ng/mL
Sample Identification	LODV
Sample Information	IC-Pak Anion HR 75x4.6mm T=40*C iso 45:55 Coll=30 frag=130 src=1750v neb=45 gas T=350 fl=12
Sample Type	QC
Sample Position	P2-C3
Exp. Concentration	0.15
Injection Volume	50

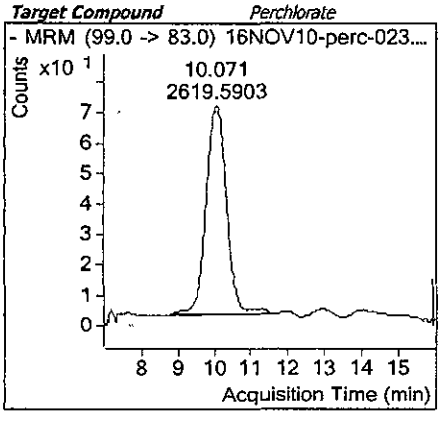
Quantitation Results

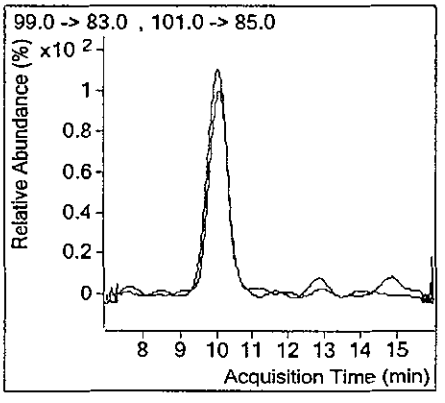
Name	Type	RT	Area	Precursor	Product	Final Conc.	Injection Conc.	Dilution
Perchlorate	Target	10.071	2620	99	83	**0.16148**	**0.16148**	1
Perchlorate-(35Cl18O4)	ISTD	10.046	190832	107	89			1
							7.7 % Deviation	

Qualifier Ion	Area	Precursor	Product	Ratio	Min	Max	
Perchlorate	958	101	85	2.74	2.30	3.80	In Control
Perchlorate-(35Cl18O4)	58252	109	91	3.28	2.30	3.80	In Control

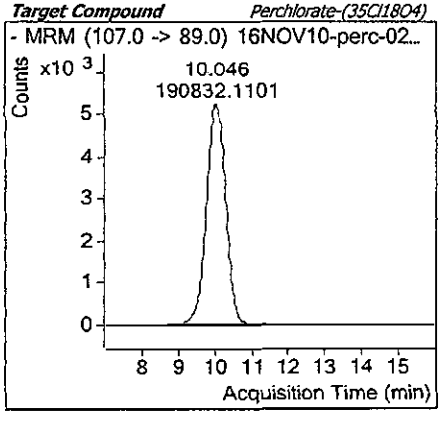
Compound Graphics

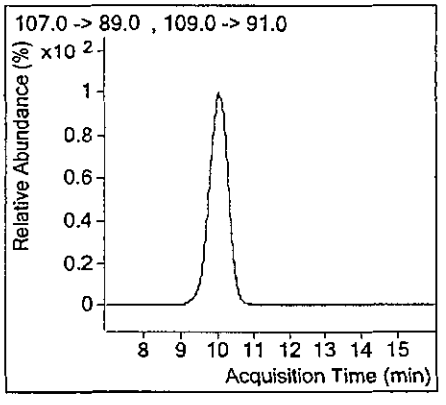
Target Compound *Perchlorate*





Target Compound *Perchlorate-(35Cl18O4)*





MM 11/17/10

QQQ Checktune Report

Instrument Name	Instrument 1	**MS Model**	G6410A
Tune Date & Time	2010-11-16 15:26		
Data Path	D:\MassHunter\Tune\QQQ\atunes.tune.xml		
Ion Source	ESI		
Ionization Mode	ESI		

Negative Results

Analyzer: MS1 ***Polarity: Negative*** ***Width: Unit***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.00	112.99	0.10	0.01		0.70	0.70	0.10	0.00		24534	0	
302.00	302.00	0.10	0.00		0.68	0.70	0.10	-0.02		90979	0	
601.96	601.98	0.10	-0.02		0.68	0.70	0.10	-0.02		1173582	0	
1033.98	1033.99	0.10	-0.01		0.68	0.70	0.10	-0.02		493112	0	
1333.95	1333.97	0.10	-0.02		0.67	0.70	0.10	-0.03		442738	0	
1633.92	1633.95	0.10	-0.03		0.73	0.70	0.10	0.03		516689	0	

Analyzer: MS2 ***Polarity: Negative*** ***Width: Unit***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.01	112.99	0.10	0.02		0.72	0.70	0.10	0.02		75167	0	
301.98	302.00	0.10	-0.02		0.70	0.70	0.10	0.00		87263	0	
601.98	601.98	0.10	0.00		0.71	0.70	0.10	0.01		604513	0	
1034.00	1033.99	0.10	0.01		0.69	0.70	0.10	-0.01		204177	0	
1333.99	1333.97	0.10	0.02		0.69	0.70	0.10	-0.01		320234	0	
1633.94	1633.95	0.10	-0.01		0.75	0.70	0.10	0.05		342000	0	

Analyzer: MS1 ***Polarity: Negative*** ***Width: Wide***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.01	112.99	0.30	0.02		1.17	1.20	0.60	-0.03		28392	0	
301.98	302.00	0.30	-0.02		1.22	1.20	0.60	0.02		120554	0	
601.94	601.98	0.30	-0.04		1.25	1.20	0.60	0.05		1549390	0	
1033.85	1033.99	0.30	-0.14		1.29	1.20	0.60	0.09		815748	0	
1333.85	1333.97	0.30	-0.12		1.28	1.20	0.60	0.08		869811	0	
1633.89	1633.95	0.30	-0.06		1.23	1.20	0.60	0.03		985279	0	

Test America West Sacramento (916) 373 - 5600

G0K020530

QQQ Checktune Report

Analyzer: MS2 ***Polarity: Negative*** ***Width: Wide***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
113.03	112.99	0.30	0.04	Pass	1.21	1.20	0.60	0.01		102240	0	
301.96	302.00	0.30	-0.04	Pass	1.28	1.20	0.60	0.08		126343	0	
601.93	601.98	0.30	-0.05	Pass	1.26	1.20	0.60	0.06		985562	0	
1033.95	1033.99	0.30	-0.04	Pass	1.23	1.20	0.60	0.03		413611	0	
1333.94	1333.97	0.30	-0.03	Pass	1.22	1.20	0.60	0.02		597631	0	
1633.95	1633.95	0.30	0.00	Pass	1.20	1.20	0.60	0.00		564396	0	

Analyzer: MS1 ***Polarity: Negative*** ***Width: Widest***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
112.92	112.99	0.50	-0.07		2.73	2.50	1.25	0.23		31875	0	
301.94	302.00	0.50	-0.06		2.75	2.50	1.25	0.25		159882	0	
601.91	601.98	0.50	-0.07		2.83	2.50	1.25	0.33		1894569	0	
1033.86	1033.99	0.50	-0.13		2.83	2.50	1.25	0.33		1097771	0	
1333.89	1333.97	0.50	-0.08		2.77	2.50	1.25	0.27		1232745	0	
1633.99	1633.95	0.50	0.04		2.65	2.50	1.25	0.15		1564595	0	

Analyzer: MS2 ***Polarity: Negative*** ***Width: Widest***

m/z	m/z Exp	Tolerance	Delta	Result	FWHM	FWHM Exp	Tolerance	Delta	Result	Abundance	Minimum1	Result
112.90	112.99	0.50	-0.09		2.60	2.50	1.25	0.10		132707	0	
301.89	302.00	0.50	-0.11		2.64	2.50	1.25	0.14		182496	0	
601.90	601.98	0.50	-0.08		2.61	2.50	1.25	0.11		1587823	0	
1033.98	1033.99	0.50	-0.01		2.46	2.50	1.25	-0.04		849840	0	
1333.94	1333.97	0.50	-0.03		2.50	2.50	1.25	0.00		1236220	0	
1634.01	1633.95	0.50	0.06		2.39	2.50	1.25	-0.11		1434707	0	

[1] *NOTE:* *1) Actual abundances depend on many factors and are instrument specific.*
To change the minimum abundance, edit the values on the "Options" sheet.

Test America West Sacramento (916) 373 - 5600

G0K020530

Sample Extraction/Preparation Log Copies and Checklists

RQC058

TestAmerica Laboratories, Inc.
EXTRACTION BENCH WORKSHEET

Run Date: 11/04/10
Time: 18:56:19

LEV 1	LEV 2		LEV 1	LEV 2	
Y	_	Blank	Y	_	Weights/Volumes
Y	_	Check	Y	_	Spike & Surrogate Worksheet
Y	_	MS/MSD	Y	_	Vial contains correct volume
			Y	_	Labels, greenbars, worksheets
					computer batch: correct & all match
			_	_	Anomalies to Extraction Method

_ Expanded Deliverable
_ COC Completed
Y Bench Sheet Copied
_ Package Submitted to AnalyticalGr
_ Bench Sheet Copied per COC

Extractionist: 000915 Horacio J. Arauz

Concentrationist: 000915 Horacio J. Arauz

QC BATCH: 0308373

PREP DATE: 11/04/10 13:55
COMP DATE: 11/04/10 17:30

Reviewer/Date: ARAUZH / 11/04/10

Perchlorate by LC/MS/MS
EXTRACTION, SOLID/SOLVENT (Manual)

EXTR EXPR	ANL DUE	LOT#,MSRUN#/ WORK ORDER	TEST FLGS	EXT	MTH	MATRIX	INIT/FIN WT/VOL	INIT	PH"S ADJI	ADJ2	EXTRACTION	SOLVENTS VOL	EXCHANGE	VOL	SPIKE STANDARD/ SURROGATE ID
11/24/10	11/18/10	G0K020530-004 **L9FXD-1-AC**	0308180 D	76	71	SOLID	**3.09g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-005 **L9FXE-1-AC**	0308180 D	76	71	SOLID	**3.15g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-006 **L9FXF-1-AC**	0308180 D	76	71	SOLID	**3.25g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-007 **L9FXG-1-AC**	0308180 D	76	71	SOLID	**3.03g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-008 **L9FXH-1-AC**	0308180 D	76	71	SOLID	**3.19g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-009 **L9FXJ-1-AC**	0308180 D	76	71	SOLID	**3.00g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-010 **L9FXL-1-AC**	0308180 D	76	71	SOLID	**3.07g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															

RQC058

TestAmerica Laboratories, Inc.
EXTRACTION BENCH WORKSHEET

Run Date: 11/04/10
Time: 18:56:19

QC BATCH: 0308373

PREP DATE: 11/04/10 13:55
COMP DATE: 11/04/10 17:30

EXTR EXPR	ANL DUE	LOT#,MSRUN#/ WORK ORDER	TEST FLGS	EXT	MTH	MATRIX	INIT/FIN WT/VOL	INIT	PH"S ADJ1	ADJ2	SOLVENTS EXTRACTION	VOL	EXCHANGE	VOL	SPIKE STANDARD/ SURROGATE ID
11/24/10	11/18/10	G0K020530-011 **L9FXM-1-AC**	0308180 D	76	71	SOLID	**3.15g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-012 **L9FXN-1-AC**	0308180 D	76	71	SOLID	**3.00g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-012 **L9FXN-1-AMS**	0308180 D	76	71	SOLID	**3.11g** 10.00mL	NA	NA	NA	H2O	10.0		.0	150UL-E100805C 100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-012 **L9FXN-1-AND**	0308180 D	76	71	SOLID	**3.18g** 10.00mL	NA	NA	NA	H2O	10.0		.0	150UL-E100805C 100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-013 **L9FXQ-1-AC**	0308180 D	76	71	SOLID	**3.10g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	11/18/10	G0K020530-014 **L9FXW-1-AC**	0308180 D	76	71	SOLID	**3.05g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	0/00/00	G0K040000-373 **L9J9K-1-AAB**		76	71	SOLID	**3.00g** 10.00mL	NA	NA	NA	H2O	10.0		.0	100UL-10LCMS0313-01
COMMENTS:															
11/24/10	0/00/00	G0K040000-373 **L9J9K-1-ACC**		76	71	SOLID	**3.00g** 10.00mL	NA	NA	NA	H2O	10.0		.0	150UL-E100805C 100UL-10LCMS0313-01
COMMENTS:															
11/24/10	0/00/00	G0K040000-373 **L9J9K-1-ADC**		76	71	SOLID	**3.00g** 10.00mL	NA	NA	NA	H2O	10.0		.0	150UL-E100805C 100UL-10LCMS0313-01
COMMENTS:	SMCS														

R = RUSH C = CLP
E = EPA 600 D = EXP.DEL)
M = CLIENT REQ MS/MSD
‡

NUMBER OF WORK ORDERS IN BATCH: 16

G0K020530

TestAmerica West Sacramento
ESC-Extraction Master Sheet

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Holding Time Due: 11-24-10 Project Due: 11-18-10
BATCH #: 0308373 Initiated By: HA Date: 11-4-10
Test #: Perchlorate-S (6850-DOD) Extn Comp'd By: HA Date: 11-4-10

QC Code	Lot ID	Sample #	Sample Size g / Initial Mass	Final Volume ml / Final Mass	Chlorine checked
B	MB		3.00	10	NA
C	LCS		3.00	10	
	EOF 020530	04	3.09	10	
		05	3.15	10	
		06	3.25	10	
		07	3.03	10	
		08	3.19	10	
		09	3.00	10	
		10	3.07	10	
		11	3.15	10	
		12	3.00	10	
S		12MS	3.11	10	
D		12MSD	3.18	10	
		13	3.10	10	
		14	3.05	10	
C	SMCS		3.00	10	

HA 11-4-10

SOP No.: WS-LC-0012
EXTRACTION COMMENTS:
Multi-incremental Sampling/Date: NA
Dried/Date NA Ground//Date NA
Sonicated - Start: 14:45 / 11-4-10 End: 15:15 Date: 11-4-10
Cleanup by/Date 11-4-10 Dilution by/Date NA
Final Vialling /Date NA 11-4-10
Millipore Water Dispensed / Date 11-1-10
SPE Cartridge: Waters Lot # ND
* SMCS 3844-035A
* .45 Filter millipore R0EA63609
* Ba/Ag/H cartridge Dionex 101004
* .20 Filter millex R0EA35631

QC Codes	Standard Information				
	Volume	STD ID	Exp. Date	STD Name/Conc.	ppm/ppb
All	100ul	10LCMS0313-01	5-4-11	Perchl. IStd 1.0mg/L	10
LCS,D,C	150ul	E100805C	1-20-11	Perchl. spike 0.1mg/ml	5.0

Spiked By / Date: NA 11-4-10 Witnessed By / Date: 11/4/10

QC Codes: B = MB, C = LCS, L = LCSD, S = MS, D = SD, FB = Filter Blank

Q:\FORMS\QA-413 ESC EXTRACTION.DOC QA-413 RE 1/29/10

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento

Preparation Data Review Checklist

Prep Batch(es) 0308373 **Test:** Perchlorate- S (6850-DOD)

Prep Date: 11-4-10 **Holding Times:** 11-24-10 **NCM:** Y N

A. Spike Witness/Batch setup	Spike Witness	Reviewer
1. **Holding times checked?** NCMs filed as appropriate	✓	
2. QAS checked for QC instructions (LCS, LCSD, MS,MSD, etc)	✓	
3. Amount of samples in hood match amount of samples on bench sheet. Sample IDS match.	✓	NA
4. Worksheets have been checked for required spiking compounds	✓	
5. Spiking volumes are correctly documented	✓	
6. Std ID numbers on spike labels match numbers on bench sheet	✓	NA
7. Expiration dates have been checked	✓	
8. Calibration expiration dates on pipettors have been checked	✓	NA
9. Spiker and spike witness have signed and dated bench sheet	✓	
B. Weights and Volumes		
1. Recorded weights are in anticipated range	NA	
2. Balance upload or raw data for weights is included	NA	
3. Weights and volumes have been transcribed correctly to LIMS.	NA	
4. Weights are not targeted to meet exact weights.	NA	
5. Each weight or volume measurement is a unique record (no dittos or line downs)	NA	
C. Standards and Reagents		
1. Lot numbers for all reagents, including clean up stages, are recorded.	NA	
2. Are dates and analysts for cleanups recorded?	NA	
3. Are correct IDs used for standards? Are expiration dates to day/month/year, when listed?	NA	
D. Documentation		
1. Are all nonconformances documented appropriately?	NA	
2. QuantIMs entry correct, including dates and times.	NA	
3. Are all fields completed?	NA	

Spike witness: [signature] Date: 11/04/10

2nd Level Reviewer: _____ Date: _____

Comments:

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica West Sacramento

LCMS Data Review Checklist

Lot ID: G0K020530 **Test:** 6850-000-S **PM:** KMD

Prep Batch(es) 0308373

A. Calibration/Instrument Run QC	Analyst	Reviewer	N/A
1. ICAL or ICAL Summary and CCV included.	✓	✓	
2. ICAL, CCV Frequency & Criteria met.	✓	✓	
3. Peaks correctly ID'd by data system.	✓	✓	
4. Copy of logbook for ICAL included	✓	✓	
5. Tune check frequency & criteria met and copy included.	✓	✓	
6. Method Number is identified on data.	✓	✓	
B. QA/QC			
1. Method blank, LCS/LCSD and MS/SD frequencies met.	✓	✓	
2. LCS/LCSD and MB data is included.	✓	✓	
3. LCS/LCSD and MB data are within control limits. If not, NCM is present in Clouseau.	✓	✓	
4. MS/MSD data complete.	✓	✓	
5. Holding Times were met. E: 11/24/10	✓	✓	
6. IS/Surrogate recoveries meet criteria or properly noted.	✓	✓	
C. Sample Analysis			
1. Logbook copies for all injections made, including ICV standards and ICAL.	✓	✓	
2. Logbooks/prep sheets properly filled out.	✓	✓	
3. Manual Integrations reviewed and appropriate.			✓
4. All raw data for samples is included (applies to unused data as well)	✓	✓	
5. All analytes correctly reported.	✓	✓	
6. Correct reporting limits used. (based on client request, prep factors, and dilutions)	✓	✓	
D. Documentation			
1. Are all nonconformances documented appropriately?	✓	✓	
2. Quantims entry correct, including dates and times.	✓	✓	
3. Appropriate footnotes used.	✓	✓	
4. Report sheets included and error-free.	✓	✓	

Analyst: [signature] Date: 11/19/10

2nd Level Reviewer: [signature] Date: 11-19-2010

Comments:

Metals - Various Methods

Raw Data Package

ICPMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ICP-MS Data Review Checklist
Level I and Level II

Instrument ID (Circle one): M01 M02		Method 6020 SOP SAC-MT-0001	
File Number 10 11 10 A1	Batch Numbers 313206, 314158, 312407, 314155, 313205, 267217, 267220, 295783	Date 11-10-10	Analyst SH

Lot Numbers: G0K020530, G0K040545, G0J120540, G0J30447, G0K030490, G0K050462, G0I200468	YES	NO	NA
1. Copy of analysis protocol used included?	✓		
2. ICVs & CCVs within 10% of true value or recal and rerun?	✓		
3. ICB & CCBs < reporting limit or recal and rerun?	✓		
4. 10 samples or less analyzed between calibration checks?	✓		
5. All parameters within linear range?	✓		
6. LCS/LCSD within limits?	✓		
7. Prep blank value < reporting limit or all samples >20x blank?	✓		
8. Internal standard intensities for samples (unless followed by dilution) are > 30% and <120% of the Calibration Blank intensities?	✓		
9. Appropriate dilution factors applied to data?	✓		
10. Matrix spike and spike dup within customer defined limits?			✓
11. Each batch checked for presence of internal standard in samples?	✓		
12. Anomalies entered using Clouseau?			✓

COMMENTS: _____

REVIEWED BY:	DATA ENTERED BY: SH
DATE:	DATE: 11-11-10

Dataset Report

Perkin Elmer ICPMS M01
SOP No. SAC-MT-0001
Method 6020,200.8
User Name: metal
Computer Name: SACP317BFB
Dataset File Path: C:\elandata\Dataset\101110a1\
Report Date/Time: Thursday, November 11, 2010 08:39:46

The Dataset

Batch ID	Sample ID	Date and Time	Read Type	Description
	TUNE SHARGRAVE	11:59:59 Wed 10-Nov-10	Sample	
	AUTOLENS SHARGF	12:02:53 Wed 10-Nov-10	Sample	Auto Lens Calib
	DAILY SHARGRAVE	12:05:33 Wed 10-Nov-10	Sample	
	Rinse 2X	12:36:37 Wed 10-Nov-10	Sample	
	Blank	12:40:45 Wed 10-Nov-10	Blank	
	Standard 1	12:44:48 Wed 10-Nov-10	Standard #1	
	ICV	12:48:36 Wed 10-Nov-10	Sample	
	ICB	12:52:28 Wed 10-Nov-10	Sample	
	LLSTD1	13:14:41 Wed 10-Nov-10	Sample	LLSTD@10X
	LLSTD2	13:18:29 Wed 10-Nov-10	Sample	LLSTD@5X
	ICSA	13:24:44 Wed 10-Nov-10	Sample	
	ICSAB	13:28:33 Wed 10-Nov-10	Sample	
	LRSTD1	13:36:02 Wed 10-Nov-10	Sample	LRSTD@10ppmPbZnCR100pPbAg
	LRSTD2	13:39:51 Wed 10-Nov-10	Sample	LRSTD@5X
313206	L9FXN N.I.	14:21:33 Wed 10-Nov-10	Sample	G0K020530-12 N.I.
314158	L9J2N N.I.	14:24:22 Wed 10-Nov-10	Sample	G0K040545-1 N.I.
314155	L9C2M N.I.	14:27:13 Wed 10-Nov-10	Sample	G0J300447-1 N.I.
314155	L9G2Q N.I.	14:30:03 Wed 10-Nov-10	Sample	G0K030490-1 N.I.
313205	L9LGE N.I.	14:32:50 Wed 10-Nov-10	Sample	G0K050462-1 N.I.
	Rinse	14:44:35 Wed 10-Nov-10	Sample	
	CCV 1	14:48:28 Wed 10-Nov-10	Sample	
	CCB 1	14:52:21 Wed 10-Nov-10	Sample	
	CCV 2	15:11:36 Wed 10-Nov-10	Sample	
	CCB 2	15:15:29 Wed 10-Nov-10	Sample	
	LLSTD3	15:19:21 Wed 10-Nov-10	Sample	LLSTD@3ppbSe
313206	L9QF0B	15:31:05 Wed 10-Nov-10	Sample	G0K090000-206 BLK
313206	L9QF0C	15:34:52 Wed 10-Nov-10	Sample	G0K090000-206 LCS
313206	L9FXNS	15:38:36 Wed 10-Nov-10	Sample	G0K020530-12 MS
313206	L9FXND	15:42:20 Wed 10-Nov-10	Sample	G0K020530-12 SD
313206	L9FXN	15:46:04 Wed 10-Nov-10	Sample	G0K020530-12
313206	L9FXNP5	15:49:47 Wed 10-Nov-10	Sample	G0K020530-12 5X
313206	L9FXNZ	15:53:31 Wed 10-Nov-10	Sample	G0K020530-12 PS
313206	L9FXD	15:57:15 Wed 10-Nov-10	Sample	G0K020530-4
313206	L9FXE	16:01:00 Wed 10-Nov-10	Sample	G0K020530-5
	CCV 3	16:04:51 Wed 10-Nov-10	Sample	
	CCB 3	16:08:44 Wed 10-Nov-10	Sample	
	CCV 4	16:12:36 Wed 10-Nov-10	Sample	
	CCB 4	16:16:29 Wed 10-Nov-10	Sample	
313206	L9FXF	16:20:16 Wed 10-Nov-10	Sample	G0K020530-6
313206	L9FXG	16:24:01 Wed 10-Nov-10	Sample	G0K020530-7
313206	L9FXH	16:27:47 Wed 10-Nov-10	Sample	G0K020530-8
313206	L9FXJ	16:31:33 Wed 10-Nov-10	Sample	G0K020530-9
313206	L9FXL	16:35:20 Wed 10-Nov-10	Sample	G0K020530-10
313206	L9FXM	16:39:07 Wed 10-Nov-10	Sample	G0K020530-11
313206	L9FXQ	16:42:54 Wed 10-Nov-10	Sample	G0K020530-13
313206	L9FXW	16:46:42 Wed 10-Nov-10	Sample	G0K020530-14
	CCV 5	16:50:35 Wed 10-Nov-10	Sample	
	CCB 5	16:54:28 Wed 10-Nov-10	Sample	
	CCV 6	16:58:20 Wed 10-Nov-10	Sample	

	CCB 6	17:02:13 Wed 10-Nov-10	Sample		
314158	L9RP7B	17:06:02 Wed 10-Nov-10	Sample	G0K100000-158 BLK	
314158	L9RP7C	17:09:49 Wed 10-Nov-10	Sample	G0K100000-158 LCS	
314158	L9J2NS	17:13:34 Wed 10-Nov-10	Sample	G0K040545-1 MS	
314158	L9J2ND	17:17:20 Wed 10-Nov-10	Sample	G0K040545-1 SD	
314158	L9J2N	17:21:07 Wed 10-Nov-10	Sample	G0K040545-1	
314158	L9J2NP5	17:24:55 Wed 10-Nov-10	Sample	G0K040545-1 5X	
314158	L9J2NZ	17:28:44 Wed 10-Nov-10	Sample	G0K040545-1 PS	
	CCV 7	17:32:38 Wed 10-Nov-10	Sample		
	CCB 7	17:36:30 Wed 10-Nov-10	Sample		
	CCV 8	17:40:23 Wed 10-Nov-10	Sample		
	CCB 8 >Recal	17:43:38 Wed 10-Nov-10	Sample	> out down method	
	CCV 9	17:46:52 Wed 10-Nov-10	Sample		
	CCB 9	17:50:07 Wed 10-Nov-10	Sample		
312407	L9PX2B	17:53:17 Wed 10-Nov-10	Sample	G0K080000-407 BLK	
312407	L9PX2C	17:56:24 Wed 10-Nov-10	Sample	G0K080000-407 LCS	
312407	L8CN7S	17:59:28 Wed 10-Nov-10	Sample	G0J120540-4 MS	
312407	L8CN7D	18:02:33 Wed 10-Nov-10	Sample	G0J120540-4 SD	
312407	L8CN7	18:05:38 Wed 10-Nov-10	Sample	G0J120540-4	report Zn
312407	L8CN7P5	18:08:44 Wed 10-Nov-10	Sample	G0J120540-4 5X	
312407	L8CN7Z	18:11:49 Wed 10-Nov-10	Sample	G0J120540-4 PS	
312407	L8CN3	18:14:56 Wed 10-Nov-10	Sample	G0J120540-1	
312407	L8CN5	18:18:02 Wed 10-Nov-10	Sample	G0J120540-2	
	CCV 10	18:21:15 Wed 10-Nov-10	Sample		
	CCB 10	18:24:29 Wed 10-Nov-10	Sample		
	CCV 11	18:27:44 Wed 10-Nov-10	Sample		
	CCB 11	18:30:58 Wed 10-Nov-10	Sample		
312407	L8CN6	18:34:07 Wed 10-Nov-10	Sample	G0J120540-3	
312407	L8CN8	18:37:14 Wed 10-Nov-10	Sample	G0J120540-5	
312407	L8CN9	18:40:22 Wed 10-Nov-10	Sample	G0J120540-6	
312407	L8CPD	18:43:30 Wed 10-Nov-10	Sample	G0J120540-7	report Zn
312407	L8CPF	18:46:39 Wed 10-Nov-10	Sample	G0J120540-8	
312407	L8CPG	18:49:48 Wed 10-Nov-10	Sample	G0J120540-9	
312407	L8CPL	18:52:57 Wed 10-Nov-10	Sample	G0J120540-10	
	CCV 12	18:56:11 Wed 10-Nov-10	Sample		
	CCB 12	18:59:25 Wed 10-Nov-10	Sample		
	CCV 13	19:02:40 Wed 10-Nov-10	Sample		
	CCB 13	19:05:54 Wed 10-Nov-10	Sample		
312407	L8CPN	19:09:04 Wed 10-Nov-10	Sample	G0J120540-11	
312407	L8CPQ	19:12:14 Wed 10-Nov-10	Sample	G0J120540-12	
312407	L8CPR	19:15:24 Wed 10-Nov-10	Sample	G0J120540-13	
312407	L8CPT	19:18:35 Wed 10-Nov-10	Sample	G0J120540-14	report Zn
312407	L8CPV	19:21:47 Wed 10-Nov-10	Sample	G0J120540-15	
312407	L8CPX	19:24:58 Wed 10-Nov-10	Sample	G0J120540-16	
312407	L8CP1	19:28:10 Wed 10-Nov-10	Sample	G0J120540-17	
	CCV 14	19:31:26 Wed 10-Nov-10	Sample		
	CCB 14	19:34:40 Wed 10-Nov-10	Sample		
	CCV 15	19:37:54 Wed 10-Nov-10	Sample		
	CCB 15	19:41:09 Wed 10-Nov-10	Sample		
314155	L9RP1B	19:44:19 Wed 10-Nov-10	Sample	G0K100000-155 BLK	
314155	L9RP1C	19:47:29 Wed 10-Nov-10	Sample	G0K100000-155 LCS	
314155	L9C2MS	19:50:37 Wed 10-Nov-10	Sample	G0J300447-1 MS	
314155	L9C2MD	19:53:45 Wed 10-Nov-10	Sample	G0J300447-1 SD	report Pb
314155	L9C2M	19:56:55 Wed 10-Nov-10	Sample	G0J300447-1	
314155	L9C2MP5	20:00:06 Wed 10-Nov-10	Sample	G0J300447-1 5X	
314155	L9C2MZ	20:03:15 Wed 10-Nov-10	Sample	G0J300447-1 PS	
314155	L9C2Q	20:06:19 Wed 10-Nov-10	Sample	G0J300447-2	
314155	L9C2T	20:09:24 Wed 10-Nov-10	Sample	G0J300447-3	
	CCV 16	20:12:36 Wed 10-Nov-10	Sample		
	CCB 16	20:15:52 Wed 10-Nov-10	Sample		

	CCV 17	20:19:08 Wed 10-Nov-10	Sample		
	CCB 17	20:22:22 Wed 10-Nov-10	Sample		
314155	L9G2Q	20:25:30 Wed 10-Nov-10	Sample	G0K030490-1	report Pb
314155	L9G23	20:28:36 Wed 10-Nov-10	Sample	G0K030490-2	
314155	L9G23S	20:31:43 Wed 10-Nov-10	Sample	G0K030490-2 MS	
314155	L9G23D	20:34:53 Wed 10-Nov-10	Sample	G0K030490-2 SD	
	CCV 18	20:38:07 Wed 10-Nov-10	Sample		
	CCB 18	20:41:22 Wed 10-Nov-10	Sample		
	CCV 19	20:44:38 Wed 10-Nov-10	Sample		
	CCB 19	20:47:55 Wed 10-Nov-10	Sample		
313205	L9QFLB	20:51:08 Wed 10-Nov-10	Sample	G0K090000-205 BLK	report Pb
313205	L9QFLC	20:54:18 Wed 10-Nov-10	Sample	G0K090000-205 LCS	
313205	L9LGES	20:57:28 Wed 10-Nov-10	Sample	G0K050462-1 MS	
313205	L9LGED	21:00:39 Wed 10-Nov-10	Sample	G0K050462-1 SD	
313205	L9LGE	21:03:47 Wed 10-Nov-10	Sample	G0K050462-1	
313205	L9LGEP5	21:06:54 Wed 10-Nov-10	Sample	G0K050462-1 5X	
313205	L9LGEZ	21:10:01 Wed 10-Nov-10	Sample	G0K050462-1 PS	
313205	L9LGF	21:13:08 Wed 10-Nov-10	Sample	G0K050462-2	
	CCV 20	21:16:23 Wed 10-Nov-10	Sample		
	CCB 20	21:19:40 Wed 10-Nov-10	Sample		
	CCV 21	21:22:57 Wed 10-Nov-10	Sample		
	CCB 21	21:26:14 Wed 10-Nov-10	Sample		
313205	L9LGG	21:29:25 Wed 10-Nov-10	Sample	G0K050462-3	report Pb
313205	L9LGH	21:32:33 Wed 10-Nov-10	Sample	G0K050462-4	
313205	L9LGJ	21:35:41 Wed 10-Nov-10	Sample	G0K050462-5	
313205	L9LGK	21:38:50 Wed 10-Nov-10	Sample	G0K050462-6	
313205	L9LGL	21:42:00 Wed 10-Nov-10	Sample	G0K050462-7	
313205	L9LGM	21:45:09 Wed 10-Nov-10	Sample	G0K050462-8	
313205	L9LGN	21:48:19 Wed 10-Nov-10	Sample	G0K050462-9	
	CCV 22	21:51:35 Wed 10-Nov-10	Sample		
	CCB 22 ?Recal	21:54:53 Wed 10-Nov-10	Sample		
	CCV 23	21:58:10 Wed 10-Nov-10	Sample		
	CCB 23	22:01:27 Wed 10-Nov-10	Sample		
267217	L7FK8B	22:04:40 Wed 10-Nov-10	Sample	G0I240000-217 BLK	report Ag, Se
267217	L7FK8C	22:07:48 Wed 10-Nov-10	Sample	G0I240000-217 LCS	
267217	L676JS	22:10:53 Wed 10-Nov-10	Sample	G0I200468-10 MS	
267217	L676JD	22:13:58 Wed 10-Nov-10	Sample	G0I200468-10 SD	
267217	L676J	22:17:06 Wed 10-Nov-10	Sample	G0I200468-10	
267217	L676JP5	22:20:17 Wed 10-Nov-10	Sample	G0I200468-10 5X	
267217	L676JZ	22:23:29 Wed 10-Nov-10	Sample	G0I200468-10 PS	
267217	L6754	22:26:37 Wed 10-Nov-10	Sample	G0I200468-1	
	CCV 24	22:29:50 Wed 10-Nov-10	Sample		
	CCB 24	22:33:07 Wed 10-Nov-10	Sample		
	CCV 25	22:36:24 Wed 10-Nov-10	Sample		
	CCB 25	22:39:42 Wed 10-Nov-10	Sample		
267217	L6758	22:42:51 Wed 10-Nov-10	Sample	G0I200468-2	report Ag, Se
267217	L6759	22:45:57 Wed 10-Nov-10	Sample	G0I200468-3	
267217	L676A	22:49:02 Wed 10-Nov-10	Sample	G0I200468-4	
267217	L676C	22:52:08 Wed 10-Nov-10	Sample	G0I200468-5	
267217	L676E	22:55:14 Wed 10-Nov-10	Sample	G0I200468-6	
267217	L676F	22:58:21 Wed 10-Nov-10	Sample	G0I200468-7	
267217	L676G	23:01:28 Wed 10-Nov-10	Sample	G0I200468-8	
	CCV 26	23:04:43 Wed 10-Nov-10	Sample		
	CCB 26	23:08:00 Wed 10-Nov-10	Sample		
	CCV 27	23:11:17 Wed 10-Nov-10	Sample		
	CCB 27	23:14:35 Wed 10-Nov-10	Sample		
267217	L676H	23:17:45 Wed 10-Nov-10	Sample	G0I200468-9	report Ag, Se
267217	L676L	23:20:53 Wed 10-Nov-10	Sample	G0I200468-12	
267217	L676M	23:24:01 Wed 10-Nov-10	Sample	G0I200468-13	
267217	L676N	23:27:10 Wed 10-Nov-10	Sample	G0I200468-14	

267217	L676P	23:30:19 Wed 10-Nov-10	Sample	G0I200468-15	report Ag, Se
267217	L676Q	23:33:28 Wed 10-Nov-10	Sample	G0I200468-16	
267217	L676R	23:36:38 Wed 10-Nov-10	Sample	G0I200468-17	
	CCV 28	23:39:54 Wed 10-Nov-10	Sample		
	CCB 28	23:43:11 Wed 10-Nov-10	Sample		
	CCV 29	23:46:29 Wed 10-Nov-10	Sample		
	CCB 29	23:49:46 Wed 10-Nov-10	Sample		
267220	L7FLJB	23:52:59 Wed 10-Nov-10	Sample	G0I240000-220 BLK	report Ag, Se
267220	L7FLJC	23:56:08 Wed 10-Nov-10	Sample	G0I240000-220 LCS	
267220	L676W	23:59:14 Wed 10-Nov-10	Sample	G0I200468-19	
267220	L676WP5	00:02:20 Thu 11-Nov-10	Sample	G0I200468-19 5X	
267220	L676WZ	00:05:26 Thu 11-Nov-10	Sample	G0I200468-19 PS	
267220	L676X	00:08:33 Thu 11-Nov-10	Sample	G0I200468-20	
267220	L6760	00:11:40 Thu 11-Nov-10	Sample	G0I200468-21	
267220	L6761	00:14:47 Thu 11-Nov-10	Sample	G0I200468-22	
267220	L6763	00:17:55 Thu 11-Nov-10	Sample	G0I200468-24	
	CCV 30	00:21:10 Thu 11-Nov-10	Sample		
	CCB 30	00:24:27 Thu 11-Nov-10	Sample		
	CCV 31	00:27:45 Thu 11-Nov-10	Sample		
	CCB 31	00:31:02 Thu 11-Nov-10	Sample		
295183	L8XA5B	00:34:13 Thu 11-Nov-10	Sample	G0J220000-183 BLK	report Ag, Se
295183	L8XA5C	00:37:21 Thu 11-Nov-10	Sample	G0J220000-183 LCS	
295183	L676TS	00:40:30 Thu 11-Nov-10	Sample	G0I200468-18 MS	
295183	L676TD	00:43:41 Thu 11-Nov-10	Sample	G0I200468-18 SD	
295183	L676T	00:46:49 Thu 11-Nov-10	Sample	G0I200468-18	
295183	L676TP5	00:49:55 Thu 11-Nov-10	Sample	G0I200468-18 5X	
295183	L676TZ	00:53:02 Thu 11-Nov-10	Sample	G0I200468-18 PS	
	CCV 32	00:56:17 Thu 11-Nov-10	Sample		
	CCB 32	00:59:34 Thu 11-Nov-10	Sample		

TAL West Sac

RUN SUMMARY

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
1	Rinse 2X				2.0	11/10/10 12:36		☐
2	Blank				1.0	11/10/10 12:40		☐
3	Standard1				1.0	11/10/10 12:44		☐
4	ICV				1.0	11/10/10 12:48		☐
5	ICB				1.0	11/10/10 12:52		☐
6	LLSTD1				1.0	11/10/10 13:14		☐
7	LLSTD2				1.0	11/10/10 13:18		☐
8	ICSA				1.0	11/10/10 13:24		☐
9	ICSAB				1.0	11/10/10 13:28		☐
10	LRSTD1				1.0	11/10/10 13:36		☐
11	LRSTD2				1.0	11/10/10 13:39		☐
12	L9FXN N.I.	G0K020530-12	0313206	46	1.0	11/10/10 14:21		☐
13	L9J2N N.I.	G0K040545-1	0314158	46	1.0	11/10/10 14:24		☐
14	L9C2M N.I.	G0J300447-1	0314155	46	1.0	11/10/10 14:27		☐
15	L9G2Q N.I.	G0K030490-1	0314155	46	1.0	11/10/10 14:30		☐
16	L9LGE N.I.	G0K050462-1	0313205	46	1.0	11/10/10 14:32		☐
17	Rinse				1.0	11/10/10 14:44		☐
18	CCV 1				1.0	11/10/10 14:48		☐
19	CCB 1				1.0	11/10/10 14:52		☐
20	CCV 2				1.0	11/10/10 15:11		☐
21	CCB 2				1.0	11/10/10 15:15		☐
22	LLSTD3				1.0	11/10/10 15:19		☐
23	L9QF0B	G0K090000	0313206	46	1.0	11/10/10 15:31		☐
24	L9QF0C	G0K090000	0313206	46	1.0	11/10/10 15:34		☐
25	L9FXNS	G0K020530-12	0313206	46	1.0	11/10/10 15:38		☐
26	L9FXND	G0K020530-12	0313206	46	1.0	11/10/10 15:42		☐
27	L9FXN	G0K020530-12	0313206	46	1.0	11/10/10 15:46		☐
28	L9FXNP5	G0K020530	0313206		5.0	11/10/10 15:49		☐
29	L9FXNZ	G0K020530-12	0313206		1.0	11/10/10 15:53		☐
30	L9FXD	G0K020530-4	0313206	46	1.0	11/10/10 15:57		☐
31	L9FXE	G0K020530-5	0313206	46	1.0	11/10/10 16:01		☐
32	CCV 3				1.0	11/10/10 16:04		☐
33	CCB 3				1.0	11/10/10 16:08		☐
34	CCV 4				1.0	11/10/10 16:12		☐
35	CCB 4				1.0	11/10/10 16:16		☐
36	L9FXF	G0K020530-6	0313206	46	1.0	11/10/10 16:20		☐
37	L9FXG	G0K020530-7	0313206	46	1.0	11/10/10 16:24		☐
38	L9FXH	G0K020530-8	0313206	46	1.0	11/10/10 16:27		☐
39	L9FXJ	G0K020530-9	0313206	46	1.0	11/10/10 16:31		☐
40	L9FXL	G0K020530-10	0313206	46	1.0	11/10/10 16:35		☐
41	L9FXM	G0K020530-11	0313206	46	1.0	11/10/10 16:39		☐
42	L9FXQ	G0K020530-13	0313206	46	1.0	11/10/10 16:42		☐
43	L9FXW	G0K020530-14	0313206	46	1.0	11/10/10 16:46		☐
44	CCV 5				1.0	11/10/10 16:50		☐
45	CCB 5				1.0	11/10/10 16:54		☐
46	CCV 6				1.0	11/10/10 16:58		☐

TAL West Sac RUN SUMMARY

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
47	CCB 6				1.0	11/10/10 17:02		☐
48	L9RP7B	G0K100000	0314158	46	1.0	11/10/10 17:06		☐
49	L9RP7C	G0K100000	0314158	46	1.0	11/10/10 17:09		☐
50	L9J2NS	G0K040545-1	0314158	46	1.0	11/10/10 17:13		☐
51	L9J2ND	G0K040545-1	0314158	46	1.0	11/10/10 17:17		☐
52	L9J2N	G0K040545-1	0314158	46	1.0	11/10/10 17:21		☐
53	L9J2NP5	G0K040545	0314158		5.0	11/10/10 17:24		☐
54	L9J2NZ	G0K040545-1	0314158		1.0	11/10/10 17:28		☐
55	CCV 7				1.0	11/10/10 17:32		☐
56	CCB 7				1.0	11/10/10 17:36		☐
57	CCV 8				1.0	11/10/10 17:40		☐
58	CCB 8				1.0	11/10/10 17:43		☐
61	CCV 9				1.0	11/10/10 17:46		☐
62	CCB 9				1.0	11/10/10 17:50		☐
63	L9PX2B	G0K080000	0312407	46	1.0	11/10/10 17:53		☐
64	L9PX2C	G0K080000	0312407	46	1.0	11/10/10 17:56		☐
65	L8CN7S	G0J120540-4	0307225	46	1.0	11/10/10 17:59		☐
66	L8CN7D	G0J120540-4	0307225	46	1.0	11/10/10 18:02		☐
67	L8CN7	G0J120540-4	0307225	46	1.0	11/10/10 18:05		☐
68	L8CN7P5	G0J120540	0307225		5.0	11/10/10 18:08		☐
69	L8CN7Z	G0J120540-4	0307225		1.0	11/10/10 18:11		☐
70	L8CN3	G0J120540-1	0307225	46	1.0	11/10/10 18:14		☐
71	L8CN5	G0J120540-2	0307225	46	1.0	11/10/10 18:18		☐
72	CCV 10				1.0	11/10/10 18:21		☐
73	CCB 10				1.0	11/10/10 18:24		☐
74	CCV 11				1.0	11/10/10 18:27		☐
75	CCB 11				1.0	11/10/10 18:30		☐
76	L8CN6	G0J120540-3	0307225	46	1.0	11/10/10 18:34		☐
77	L8CN8	G0J120540-5	0307225	46	1.0	11/10/10 18:37		☐
78	L8CN9	G0J120540-6	0307225	46	1.0	11/10/10 18:40		☐
79	L8CPD	G0J120540-7	0307225	46	1.0	11/10/10 18:43		☐
80	L8CPF	G0J120540-8	0307225	46	1.0	11/10/10 18:46		☐
81	L8CPG	G0J120540-9	0307225	46	1.0	11/10/10 18:49		☐
82	L8CPL	G0J120540-10	0307225	46	1.0	11/10/10 18:52		☐
83	CCV 12				1.0	11/10/10 18:56		☐
84	CCB 12				1.0	11/10/10 18:59		☐
85	CCV 13				1.0	11/10/10 19:02		☐
86	CCB 13				1.0	11/10/10 19:05		☐
87	L8CPN	G0J120540-11	0307225	46	1.0	11/10/10 19:09		☐
88	L8CPQ	G0J120540-12	0307225	46	1.0	11/10/10 19:12		☐
89	L8CPR	G0J120540-13	0307225	46	1.0	11/10/10 19:15		☐
90	L8CPT	G0J120540-14	0307225	46	1.0	11/10/10 19:18		☐
91	L8CPV	G0J120540-15	0307225	46	1.0	11/10/10 19:21		☐
92	L8CPX	G0J120540-16	0307225	46	1.0	11/10/10 19:24		☐
93	L8CP1	G0J120540-17	0307225	46	1.0	11/10/10 19:28		☐
94	CCV 14				1.0	11/10/10 19:31		☐

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst: hargraves**

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
95	CCB 14				1.0	11/10/10 19:34		☐
96	CCV 15				1.0	11/10/10 19:37		☐
97	CCB 15				1.0	11/10/10 19:41		☐
98	L9RP1B	G0K100000	0314155	46	1.0	11/10/10 19:44		☐
99	L9RP1C	G0K100000	0314155	46	1.0	11/10/10 19:47		☐
100	L9C2MS	G0J300447-1	0314155	46	1.0	11/10/10 19:50		☐
101	L9C2MD	G0J300447-1	0314155	46	1.0	11/10/10 19:53		☐
102	L9C2M	G0J300447-1	0314155	46	1.0	11/10/10 19:56		☐
103	L9C2MP5	G0J300447	0314155		5.0	11/10/10 20:00		☐
104	L9C2MZ	G0J300447-1	0314155		1.0	11/10/10 20:03		☐
105	L9C2Q	G0J300447-2	0314155	46	1.0	11/10/10 20:06		☐
106	L9C2T	G0J300447-3	0314155	46	1.0	11/10/10 20:09		☐
107	CCV 16				1.0	11/10/10 20:12		☐
108	CCB 16				1.0	11/10/10 20:15		☐
109	CCV 17				1.0	11/10/10 20:19		☐
110	CCB 17				1.0	11/10/10 20:22		☐
111	L9G2Q	G0K030490-1	0314155	46	1.0	11/10/10 20:25		☐
112	L9G23	G0K030490-2	0314155	46	1.0	11/10/10 20:28		☐
113	L9G23S	G0K030490-2	0314155	46	1.0	11/10/10 20:31		☐
114	L9G23D	G0K030490-2	0314155	46	1.0	11/10/10 20:34		☐
115	CCV 18				1.0	11/10/10 20:38		☐
116	CCB 18				1.0	11/10/10 20:41		☐
117	CCV 19				1.0	11/10/10 20:44		☐
118	CCB 19				1.0	11/10/10 20:47		☐
119	L9QFLB	G0K090000	0313205	46	1.0	11/10/10 20:51		☐
120	L9QFLC	G0K090000	0313205	46	1.0	11/10/10 20:54		☐
121	L9LGES	G0K050462-1	0313205	46	1.0	11/10/10 20:57		☐
122	L9LGED	G0K050462-1	0313205	46	1.0	11/10/10 21:00		☐
123	L9LGE	G0K050462-1	0313205	46	1.0	11/10/10 21:03		☐
124	L9LGEP5	G0K050462	0313205		5.0	11/10/10 21:06		☐
125	L9LGEZ	G0K050462-1	0313205		1.0	11/10/10 21:10		☐
126	L9LGF	G0K050462-2	0313205	46	1.0	11/10/10 21:13		☐
127	CCV 20				1.0	11/10/10 21:16		☐
128	CCB 20				1.0	11/10/10 21:19		☐
129	CCV 21				1.0	11/10/10 21:22		☐
130	CCB 21				1.0	11/10/10 21:26		☐
131	L9LGG	G0K050462-3	0313205	46	1.0	11/10/10 21:29		☐
132	L9LGH	G0K050462-4	0313205	46	1.0	11/10/10 21:32		☐
133	L9LGJ	G0K050462-5	0313205	46	1.0	11/10/10 21:35		☐
134	L9LGK	G0K050462-6	0313205	46	1.0	11/10/10 21:38		☐
135	L9LGL	G0K050462-7	0313205	46	1.0	11/10/10 21:42		☐
136	L9LGM	G0K050462-8	0313205	46	1.0	11/10/10 21:45		☐
137	L9LGN	G0K050462-9	0313205	46	1.0	11/10/10 21:48		☐
138	CCV 22				1.0	11/10/10 21:51		☐
139	CCB 22				1.0	11/10/10 21:54		☐
142	CCV 23				1.0	11/10/10 21:58		☐

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 Analyst: hargraves

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
143	CCB 23				1.0	11/10/10 22:01		☐
144	L7FK8B	G0I240000	0267217	46	1.0	11/10/10 22:04		☐
145	L7FK8C	G0I240000	0267217	46	1.0	11/10/10 22:07		☐
146	L676JS	G0I200468-10	0267217	46	1.0	11/10/10 22:10		☐
147	L676JD	G0I200468-10	0267217	46	1.0	11/10/10 22:13		☐
148	L676J	G0I200468-10	0267217	46	1.0	11/10/10 22:17		☐
149	L676JP5	G0I200468	0267217		5.0	11/10/10 22:20		☐
150	L676JZ	G0I200468-10	0267217		1.0	11/10/10 22:23		☐
151	L6754	G0I200468-1	0267217	46	1.0	11/10/10 22:26		☐
152	CCV 24				1.0	11/10/10 22:29		☐
153	CCB 24				1.0	11/10/10 22:33		☐
154	CCV 25				1.0	11/10/10 22:36		☐
155	CCB 25				1.0	11/10/10 22:39		☐
156	L6758	G0I200468-2	0267217	46	1.0	11/10/10 22:42		☐
157	L6759	G0I200468-3	0267217	46	1.0	11/10/10 22:45		☐
158	L676A	G0I200468-4	0267217	46	1.0	11/10/10 22:49		☐
159	L676C	G0I200468-5	0267217	46	1.0	11/10/10 22:52		☐
160	L676E	G0I200468-6	0267217	46	1.0	11/10/10 22:55		☐
161	L676F	G0I200468-7	0267217	46	1.0	11/10/10 22:58		☐
162	L676G	G0I200468-8	0267217	46	1.0	11/10/10 23:01		☐
163	CCV 26				1.0	11/10/10 23:04		☐
164	CCB 26				1.0	11/10/10 23:08		☐
165	CCV 27				1.0	11/10/10 23:11		☐
166	CCB 27				1.0	11/10/10 23:14		☐
167	L676H	G0I200468-9	0267217	46	1.0	11/10/10 23:17		☐
168	L676L	G0I200468-12	0267217	46	1.0	11/10/10 23:20		☐
169	L676M	G0I200468-13	0267217	46	1.0	11/10/10 23:24		☐
170	L676N	G0I200468-14	0267217	46	1.0	11/10/10 23:27		☐
171	L676P	G0I200468-15	0267217	46	1.0	11/10/10 23:30		☐
172	L676Q	G0I200468-16	0267217	46	1.0	11/10/10 23:33		☐
173	L676R	G0I200468-17	0267217	46	1.0	11/10/10 23:36		☐
174	CCV 28				1.0	11/10/10 23:39		☐
175	CCB 28				1.0	11/10/10 23:43		☐
176	CCV 29				1.0	11/10/10 23:46		☐
177	CCB 29				1.0	11/10/10 23:49		☐
178	L7FLJB	G0I240000	0267220	46	1.0	11/10/10 23:52		☐
179	L7FLJC	G0I240000	0267220	46	1.0	11/10/10 23:56		☐
180	L676W	G0I200468-19	0267220	46	1.0	11/10/10 23:59		☐
181	L676WP5	G0I200468	0267220		5.0	11/11/10 00:02		☐
182	L676WZ	G0I200468-19	0267220		1.0	11/11/10 00:05		☐
183	L676X	G0I200468-20	0267220	46	1.0	11/11/10 00:08		☐
184	L6760	G0I200468-21	0267220	46	1.0	11/11/10 00:11		☐
185	L6761	G0I200468-22	0267220	46	1.0	11/11/10 00:14		☐
186	L6763	G0I200468-24	0267220	46	1.0	11/11/10 00:17		☐
187	CCV 30				1.0	11/11/10 00:21		☐
188	CCB 30				1.0	11/11/10 00:24		☐

TAL West Sac

RUN SUMMARY

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst: hargraves**

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
189	CCV 31				1.0	11/11/10 00:27		☐
190	CCB 31				1.0	11/11/10 00:31		☐
191	L8XA5B	G0J220000	0295183	46	1.0	11/11/10 00:34		☐
192	L8XA5C	G0J220000	0295183	46	1.0	11/11/10 00:37		☐
193	L676TS	G0I200468-18	0295183	46	1.0	11/11/10 00:40		☐
194	L676TD	G0I200468-18	0295183	46	1.0	11/11/10 00:43		☐
195	L676T	G0I200468-18	0295183	46	1.0	11/11/10 00:46		☐
196	L676TP5	G0I200468	0295183		5.0	11/11/10 00:49		☐
197	L676TZ	G0I200468-18	0295183		1.0	11/11/10 00:53		☐
198	CCV 32				1.0	11/11/10 00:56		☐
199	CCB 32				1.0	11/11/10 00:59		☐

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
1	Rinse 2X	11/10/10 12:36	84.0	82.7	81.6	☐
2	Blank	11/10/10 12:40	100.0	100.0	100.0	☑
3	Standard1	11/10/10 12:44	97.6	97.1	99.0	☑
4	ICV	11/10/10 12:48	102.0	97.6	98.4	☑
5	ICB	11/10/10 12:52	99.5	98.1	99.3	☑
6	LLSTD1	11/10/10 13:14	102.5	100.5	100.5	☑
7	LLSTD2	11/10/10 13:18	103.8	102.4	101.5	☑
8	ICSA	11/10/10 13:24	86.0	85.7	86.9	☑
9	ICSAB	11/10/10 13:28	86.1	86.9	88.4	☑
10	LRSTD1	11/10/10 13:36	89.4	90.0	99.0	☑
11	LRSTD2	11/10/10 13:39	88.7	86.4	96.1	☑
12	L9FXN N.I.	11/10/10 14:21	4.9	0.4	4.0	☐
13	L9J2N N.I.	11/10/10 14:24	6.4	0.6	2.5	☐
14	L9C2M N.I.	11/10/10 14:27	18.5	0.6	4.0	☐
15	L9G2Q N.I.	11/10/10 14:30	18.1	0.6	3.5	☐
16	L9LGE N.I.	11/10/10 14:32	4.2	0.3	3.2	☐
17	Rinse	11/10/10 14:44	97.2	89.3	96.6	☑
18	CCV 1	11/10/10 14:48	94.8	88.5	96.8	☑
19	CCB 1	11/10/10 14:52	94.2	87.3	95.4	☑
20	CCV 2	11/10/10 15:11	94.8	88.4	95.7	☑
21	CCB 2	11/10/10 15:15	95.7	89.2	96.2	☑
22	LLSTD3	11/10/10 15:19	95.6	89.6	96.2	☑
23	L9QF0B	11/10/10 15:31	99.5	91.0	98.8	☑
24	L9QF0C	11/10/10 15:34	96.2	87.5	96.9	☑
25	L9FXNS	11/10/10 15:38	91.3	81.3	87.8	☑
26	L9FXND	11/10/10 15:42	99.3	85.5	89.7	☑
27	L9FXN	11/10/10 15:46	93.8	84.8	87.4	☑
28	L9FXNP5	11/10/10 15:49	95.7	89.8	92.0	☐
29	L9FXNZ	11/10/10 15:53	93.5	85.4	86.7	☑
30	L9FXD	11/10/10 15:57	93.1	86.3	86.8	☑
31	L9FXE	11/10/10 16:01	95.8	84.7	83.0	☑
32	CCV 3	11/10/10 16:04	89.8	87.6	92.9	☑
33	CCB 3	11/10/10 16:08	94.0	90.5	92.4	☑
34	CCV 4	11/10/10 16:12	92.5	90.1	93.9	☑
35	CCB 4	11/10/10 16:16	94.9	90.8	92.7	☑
36	L9FXF	11/10/10 16:20	92.8	82.9	81.1	☑
37	L9FXG	11/10/10 16:24	96.7	86.6	86.4	☑
36	L9FXH	11/10/10 16:27	94.5	84.4	85.4	☑
39	L9FXJ	11/10/10 16:31	92.4	85.3	86.4	☑
40	L9FXL	11/10/10 16:35	93.7	85.5	87.3	☑
41	L9FXM	11/10/10 16:39	88.9	82.5	84.9	☑
42	L9FXQ	11/10/10 16:42	93.1	83.8	85.2	☑
43	L9FXW	11/10/10 16:46	91.5	82.8	83.4	☑
44	CCV 5	11/10/10 16:50	86.4	84.1	89.9	☑
45	CCB 5	11/10/10 16:54	92.3	89.1	92.2	☑
46	CCV 8	11/10/10 16:58	89.7	86.6	90.1	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: **101110A1** **Analyst: hargraves**

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
47	CCB 6	11/10/10 17:02	92.4	89.2	92.1	☑
48	L9RP7B	11/10/10 17:06	93.7	88.5	91.0	☑
49	L9RP7C	11/10/10 17:09	93.0	86.9	90.9	☑
50	L9J2NS	11/10/10 17:13	91.1	79.3	80.0	☑
51	L9J2ND	11/10/10 17:17	89.9	79.9	80.9	☑
52	L9J2N	11/10/10 17:21	89.3	78.4	80.4	☑
53	L9J2NP5	11/10/10 17:24	90.1	82.8	86.7	☐
54	L9J2NZ	11/10/10 17:28	88.1	78.0	80.6	☑
55	CCV 7	11/10/10 17:32	90.5	84.4	89.8	☑
56	CCB 7	11/10/10 17:36	91.5	85.9	89.6	☑
57	CCV 8	11/10/10 17:40	82.6	84.9	91.0	☑
58	CCB 8	11/10/10 17:43	82.9	85.2	91.2	☑
61	CCV 9	11/10/10 17:46	98.6	99.6	99.4	☑
62	CCB 9	11/10/10 17:50	100.5	99.5	99.1	☑
63	L9PX2B	11/10/10 17:53	101.8	100.3	100.4	☑
64	L9PX2C	11/10/10 17:56	101.8	99.9	100.5	☑
65	L8CN7S	11/10/10 17:59	99.2	90.3	84.7	☑
66	L8CN7D	11/10/10 18:02	101.5	94.7	86.8	☑
67	L8CN7	11/10/10 18:05	99.6	92.8	84.9	☑
68	L8CN7P5	11/10/10 18:08	97.0	94.3	92.4	☐
69	L8CN7Z	11/10/10 18:11	99.5	92.2	84.4	☑
70	L8CN3	11/10/10 18:14	98.4	91.5	85.0	☑
71	L8CN5	11/10/10 18:18	98.3	90.5	82.6	☑
72	CCV 10	11/10/10 18:21	94.3	93.6	96.8	☑
73	CCB 10	11/10/10 18:24	97.2	98.3	99.6	☑
74	CCV 11	11/10/10 18:27	97.6	96.5	97.5	☑
75	CCB 11	11/10/10 18:30	98.6	97.9	98.8	☑
76	L8CN6	11/10/10 18:34	100.2	92.0	86.9	☑
77	L8CN8	11/10/10 18:37	98.4	90.7	84.4	☑
78	L8CN9	11/10/10 18:40	96.3	91.6	86.8	☑
79	L8CPD	11/10/10 18:43	96.3	87.6	81.0	☑
80	L8CPF	11/10/10 18:46	96.3	87.8	80.8	☑
81	L8CPG	11/10/10 18:49	96.1	86.5	78.5	☑
82	L8CPL	11/10/10 18:52	96.3	85.3	77.4	☑
83	CCV 12	11/10/10 18:56	90.5	91.1	94.1	☑
84	CCB 12	11/10/10 18:59	93.2	92.5	94.4	☑
85	CCV 13	11/10/10 19:02	93.3	92.6	95.2	☑
86	CCB 13	11/10/10 19:05	94.7	93.1	95.5	☑
87	L8CPN	11/10/10 19:09	96.0	87.4	83.5	☑
88	L8CPQ	11/10/10 19:12	95.2	87.3	79.4	☑
89	L8CPR	11/10/10 19:15	95.0	87.5	81.4	☑
90	L8CPT	11/10/10 19:18	96.8	85.9	77.7	☑
91	L8CPV	11/10/10 19:21	94.5	86.8	85.7	☑
92	L8CPX	11/10/10 19:24	93.6	83.6	79.6	☑
93	L8CP1	11/10/10 19:28	93.1	83.8	76.0	☑
94	CCV 14	11/10/10 19:31	88.5	87.3	91.0	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
95	CCB 14	11/10/10 19:34	92.6	91.9	92.8	☑
96	CCV 15	11/10/10 19:37	91.9	90.1	92.1	☑
97	CCB 15	11/10/10 19:41	93.7	92.4	92.7	☑
98	L9RP1B	11/10/10 19:44	94.6	91.2	92.7	☑
99	L9RP1C	11/10/10 19:47	94.4	90.8	91.7	☑
100	L9C2MS	11/10/10 19:50	91.2	70.5	68.6	☑
101	L9C2MD	11/10/10 19:53	88.3	68.6	66.8	☑
102	L9C2M	11/10/10 19:56	88.6	70.1	68.6	☑
103	L9C2MP5	11/10/10 20:00	89.4	83.1	82.9	☐
104	L9C2MZ	11/10/10 20:03	86.9	69.5	68.0	☑
105	L9C2Q	11/10/10 20:06	85.5	66.7	65.4	☑
106	L9C2T	11/10/10 20:09	78.3	65.1	61.7	☑
107	CCV 16	11/10/10 20:12	91.2	86.0	89.4	☑
108	CCB 16	11/10/10 20:15	91.3	87.0	90.9	☑
109	CCV 17	11/10/10 20:19	91.4	86.6	90.3	☑
110	CCB 17	11/10/10 20:22	92.3	89.0	91.9	☑
111	L9G2Q	11/10/10 20:25	85.8	67.9	67.0	☑
112	L9G23	11/10/10 20:28	85.6	68.0	66.5	☑
113	L9G23S	11/10/10 20:31	83.2	64.2	63.0	☑
114	L9G23D	11/10/10 20:34	81.2	63.9	63.1	☑
115	CCV 18	11/10/10 20:38	85.2	87.1	87.6	☑
116	CCB 18	11/10/10 20:41	86.4	86.4	86.3	☑
117	CCV 19	11/10/10 20:44	84.5	85.7	86.2	☑
118	CCB 19	11/10/10 20:47	86.4	86.7	87.2	☑
119	L9QFLB	11/10/10 20:51	90.1	88.7	90.4	☑
120	L9QFLC	11/10/10 20:54	89.0	88.5	89.3	☑
121	L9LGES	11/10/10 20:57	81.0	76.5	74.1	☑
122	L9LGED	11/10/10 21:00	82.3	77.7	76.3	☑
123	L9LGE	11/10/10 21:03	81.4	77.9	76.4	☑
124	L9LGEP5	11/10/10 21:06	84.2	81.7	82.6	☐
125	L9LGEZ	11/10/10 21:10	79.4	76.0	74.3	☑
126	L9LGF	11/10/10 21:13	80.1	76.0	73.6	☑
127	CCV 20	11/10/10 21:16	84.9	84.6	85.7	☑
128	CCB 20	11/10/10 21:19	85.4	85.2	86.6	☑
129	CCV 21	11/10/10 21:22	84.2	85.3	86.8	☑
130	CCB 21	11/10/10 21:26	84.4	85.6	86.8	☑
131	L9LGG	11/10/10 21:29	78.1	76.7	76.0	☑
132	L9LGH	11/10/10 21:32	80.3	78.0	75.2	☑
133	L9LGJ	11/10/10 21:35	78.4	77.6	75.7	☑
134	L9LGK	11/10/10 21:38	77.8	77.1	74.7	☑
135	L9LGL	11/10/10 21:42	77.9	78.4	76.8	☑
136	L9LGM	11/10/10 21:45	78.9	76.5	73.9	☑
137	L9LGN	11/10/10 21:48	78.7	75.3	72.5	☑
138	CCV 22	11/10/10 21:51	83.5	83.6	83.8	☑
139	CCB 22	11/10/10 21:54	85.1	86.1	87.4	☑
142	CCV 23	11/10/10 21:58	96.3	98.5	98.7	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst: hargraves**

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
143	CCB 23	11/10/10 22:01	98.7	99.4	98.7	☑
144	L7FK8B	11/10/10 22:04	102.0	99.1	99.6	☑
145	L7FK8C	11/10/10 22:07	104.4	97.3	98.0	☑
146	L676JS	11/10/10 22:10	97.2	90.4	86.0	☑
147	L676JD	11/10/10 22:13	99.3	91.3	91.5	☑
148	L676J	11/10/10 22:17	97.6	88.3	82.7	☑
149	L676JP5	11/10/10 22:20	98.9	96.3	94.3	☐
150	L676JZ	11/10/10 22:23	96.5	88.1	82.7	☑
151	L6754	11/10/10 22:26	92.0	86.5	81.3	☑
152	CCV 24	11/10/10 22:29	95.5	98.6	96.7	☑
153	CCB 24	11/10/10 22:33	98.5	101.1	97.3	☑
154	CCV 25	11/10/10 22:36	95.8	101.0	98.0	☑
155	CCB 25	11/10/10 22:39	99.5	101.5	97.2	☑
156	L6758	11/10/10 22:42	95.9	88.4	83.2	☑
157	L6759	11/10/10 22:45	95.3	89.3	84.3	☑
158	L676A	11/10/10 22:49	102.0	95.1	93.5	☑
159	L676C	11/10/10 22:52	95.7	87.4	81.3	☑
160	L676E	11/10/10 22:55	97.2	90.8	85.0	☑
161	L676F	11/10/10 22:58	96.0	87.0	80.2	☑
162	L676G	11/10/10 23:01	93.9	84.8	78.6	☑
163	CCV 26	11/10/10 23:04	93.7	98.8	96.4	☑
164	CCB 26	11/10/10 23:08	97.7	100.5	96.8	☑
165	CCV 27	11/10/10 23:11	94.5	100.8	97.1	☑
166	CCB 27	11/10/10 23:14	96.9	98.3	94.7	☑
167	L676H	11/10/10 23:17	94.1	85.2	79.8	☑
168	L676L	11/10/10 23:20	98.2	90.0	87.8	☑
169	L676M	11/10/10 23:24	94.0	85.7	79.3	☑
170	L676N	11/10/10 23:27	94.8	85.7	80.0	☑
171	L676P	11/10/10 23:30	94.6	86.1	80.4	☑
172	L676Q	11/10/10 23:33	94.4	83.9	78.6	☑
173	L676R	11/10/10 23:36	93.4	83.6	77.7	☑
174	CCV 28	11/10/10 23:39	95.4	97.1	95.1	☑
175	CCB 28	11/10/10 23:43	96.6	99.6	96.5	☑
176	CCV 29	11/10/10 23:46	94.9	99.5	96.1	☑
177	CCB 29	11/10/10 23:49	98.6	100.7	96.9	☑
178	L7FLJB	11/10/10 23:52	103.1	100.8	97.0	☑
179	L7FLJC	11/10/10 23:56	101.8	99.2	95.4	☑
180	L676W	11/10/10 23:59	95.5	85.9	80.1	☑
181	L676WP5	11/11/10 00:02	97.1	94.7	93.1	☐
182	L676WZ	11/11/10 00:05	93.3	85.0	79.8	☑
183	L676X	11/11/10 00:08	92.7	83.7	78.1	☑
184	L6760	11/11/10 00:11	93.3	83.3	77.8	☑
185	L6761	11/11/10 00:14	93.9	83.5	78.2	☑
186	L6763	11/11/10 00:17	93.8	81.7	76.6	☑
187	CCV 30	11/11/10 00:21	94.0	95.2	94.0	☑
188	CCB 30	11/11/10 00:24	95.9	96.8	94.2	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
189	CCV 31	11/11/10 00:27	93.2	97.4	93.6	☑
190	CCB 31	11/11/10 00:31	97.3	98.0	94.5	☑
191	L8XA5B	11/11/10 00:34	100.3	99.6	97.6	☑
192	L8XA5C	11/11/10 00:37	99.7	96.7	95.5	☑
193	L676TS	11/11/10 00:40	90.7	83.0	78.5	☑
194	L676TD	11/11/10 00:43	89.9	82.7	78.3	☑
195	L676T	11/11/10 00:46	90.1	84.9	80.3	☑
196	L676TP5	11/11/10 00:49	94.1	91.4	89.6	☐
197	L676TZ	11/11/10 00:53	89.6	84.2	80.1	☑
198	CCV 32	11/11/10 00:56	92.6	94.5	93.9	☑
199	CCB 32	11/11/10 00:59	96.3	98.2	96.2	☑

TAL-W.SACRAMENTO - Elan 6000 ICPMS Perkin Elmer M01 Quantitative Method Report

File Name: 0314158.mth
File Path: C:\elandata\Method\0314158.mth

Timing Parameters

Sweeps/Reading: 50
Readings/Replicate: 1
Number of Replicates: 3
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: c:\elandata\Optimize\default.dac
QC Enabled: Yes
Settling Time: Normal

Analyte	Mass	Scan Mode	MCA Channels	Dwell Time	Integration Time
Ca	43.956	Peak Hopping	1	14.0 ms	700 ms
V	50.944	Peak Hopping	1	14.0 ms	700 ms
Cr	51.941	Peak Hopping	1	14.0 ms	700 ms
Fe	53.940	Peak Hopping	1	14.0 ms	700 ms
Fe	56.935	Peak Hopping	1	14.0 ms	700 ms
Zn	67.925	Peak Hopping	1	14.0 ms	700 ms
As	74.922	Peak Hopping	1	20.0 ms	1000 ms
Se	81.917	Peak Hopping	1	20.0 ms	1000 ms
Ge-1	71.922	Peak Hopping	1	14.0 ms	700 ms
Ag	106.905	Peak Hopping	1	14.0 ms	700 ms
Cd	110.904	Peak Hopping	1	14.0 ms	700 ms
Ba	134.906	Peak Hopping	1	14.0 ms	700 ms
In-1	114.904	Peak Hopping	1	14.0 ms	700 ms
Tl	204.975	Peak Hopping	1	14.0 ms	700 ms
Pb	207.977	Peak Hopping	1	14.0 ms	700 ms
Tm-1	168.934	Peak Hopping	1	14.0 ms	700 ms
Cr	49.946	Peak Hopping	1	5.0 ms	250 ms
Cr	52.941	Peak Hopping	1	5.0 ms	250 ms
Zn	66.927	Peak Hopping	1	5.0 ms	250 ms
Zn	65.926	Peak Hopping	1	5.0 ms	250 ms
Se	75.919	Peak Hopping	1	5.0 ms	250 ms
Se	76.920	Peak Hopping	1	20.0 ms	1000 ms
Se	77.917	Peak Hopping	1	20.0 ms	1000 ms
Br	78.918	Peak Hopping	1	20.0 ms	1000 ms
Ge	71.922	Peak Hopping	1	14.0 ms	700 ms
Cd	107.904	Peak Hopping	1	5.0 ms	250 ms
Cd	113.904	Peak Hopping	1	14.0 ms	700 ms
Ag	108.905	Peak Hopping	1	5.0 ms	250 ms
In	114.904	Peak Hopping	1	14.0 ms	700 ms
207.977	207.977	Peak Hopping	1	14.0 ms	700 ms
Pb	206.976	Peak Hopping	1	14.0 ms	700 ms
Pb	205.975	Peak Hopping	1	14.0 ms	700 ms
Tm	168.934	Peak Hopping	1	14.0 ms	700 ms

Signal Processing

Detector Mode: Dual
Measurement Units: Counts
AutoLens: On
Spectral Peak Processing: Average

Report Date/Time: Thursday, November 11, 2010 08:43:17
Page 1

Signal Profile Processing:	Average
Blank Subtraction:	After Internal Standard
Baseline Readings:	0
Smoothing:	Yes, Factor 5

Equations

Analyte	Mass	Corrections
V	50.944	-3.108 * Cr 53 + 0.3524 * Cr 52
Fe	53.940	- 0.028226 * Cr 52
Fe	56.935	-0.074 * Ca 43
Zn	67.925	-0.03 * Ba 136
As	74.922	-3.1278 * Se 77 + 1.0177 * Se 78
Se	81.917	- 0.00205 * Br 79
Cd	110.904	-1.073 * Pd 108 + 0.712 * Pd 106
In-1	114.904	- 0.014032 * Sn 118
Pb	207.977	+ 1.0 * Pb 207 + 1.0 * Pb 206
Cr	49.946	- 0.739726 * Ti 47 - 0.002506 * V 51
Se	75.919	- 0.268980 * Ge 72
Se	77.917	- 0.030435 * Kr 83
Cd	107.904	- 1.184953 * Pd 105
Cd	113.904	- 0.026826 * Sn 118
In	114.904	- 0.014032 * Sn 118

Calibration Information

Analyte	Mass	Curve Type	Sample Units	Std Units	Std 1	Std 2	Std 3	Std 4
Ca	43.956	Linear Thru Zero	ug/L	ug/L	5.1e+003			
V	50.944	Linear Thru Zero	ug/L	ug/L	100			
Cr	51.941	Linear Thru Zero	ug/L	ug/L	100			
Fe	53.940	Linear Thru Zero	ug/L	ug/L	5.1e+003			
Fe	56.935	Linear Thru Zero	ug/L	ug/L	5.1e+003			
Zn	67.925	Linear Thru Zero	ug/L	ug/L	100			
As	74.922	Linear Thru Zero	ug/L	ug/L	100			
Se	81.917	Linear Thru Zero	ug/L	ug/L	100			
Ge-1	71.922	Linear Thru Zero	ug/L	ug/L				
Ag	106.905	Linear Thru Zero	ug/L	ug/L	50			
Cd	110.904	Linear Thru Zero	ug/L	ug/L	100			
Ba	134.906	Linear Thru Zero	ug/L	ug/L	100			
In-1	114.904	Linear Thru Zero	ug/L	ug/L				
Tl	204.975	Linear Thru Zero	ug/L	ug/L	50			
Pb	207.977	Linear Thru Zero	ug/L	ug/L	100			
Tm-1	168.934	Linear Thru Zero	ug/L	ug/L				
Cr	49.946	Linear Thru Zero	ug/L	ug/L	100			
Cr	52.941	Linear Thru Zero	ug/L	ug/L	100			
Zn	66.927	Linear Thru Zero	ug/L	ug/L	100			
Zn	65.926	Linear Thru Zero	ug/L	ug/L	100			
Se	75.919	Linear Thru Zero	ug/L	ug/L	100			
Se	76.920	Linear Thru Zero	ug/L	ug/L	100			
Se	77.917	Linear Thru Zero	ug/L	ug/L	100			
Br	78.918	Linear Thru Zero	ug/L	ug/L	100			
Ge	71.922	Linear Thru Zero	ug/L	ug/L				
Cd	107.904	Linear Thru Zero	ug/L	ug/L	100			
Cd	113.904	Linear Thru Zero	ug/L	ug/L	100			
Ag	108.905	Linear Thru Zero	ug/L	ug/L	50			
In	114.904	Linear Thru Zero	ug/L	ug/L				
207.97	207.977	Linear Thru Zero	ug/L	ug/L	100			

Pb	206.976	Linear Thru Zero	ug/L	ug/L	100
Pb	205.975	Linear Thru Zero	ug/L	ug/L	100
Tm	168.934	Linear Thru Zero	ug/L	ug/L	

TAL-W. SACRAMENTO - Perkin Elmer Elan 6000 ICPMS, M01 – Methods 6020, 200.8

SOIL STANDARDS - 4% HNO3 / 1% HCl / 1% H2O2

Standards for run:

Tuning standard: 4075-6A

Internal standard: 4075-14A

Blank, CCBs: 3185-41F

Standard 1, CCVs: 4075-23A

ICV: 4075-20B

ICSA: 4075-23D

ICSAB: 4075-23E

File Number: 101110A1

Instrument Tuning Report - Elan 6000

File Name: default.tun

Sample Information

Sample Date/Time: Wednesday, November 10, 2010 11:59:59

Sample ID: TUNE SHARGRAVE

Analyte	Exact Mass	Meas. Mass	Mass DAC	Meas. Pk. Width	Res. DAC	Custom Res.
Li	7.016	7.027	1552	0.732	2030	
Be	9.012	9.029	2056	0.730	2015	
Mg	23.985	23.979	5719	0.693	1977	
Co	58.933	58.929	14289	0.709	1885	
In	114.904	114.879	27956	0.721	1839	
Ce	139.905	139.878	34030	0.719	1880	
Tl	204.975	204.979	49758	0.725	2091	
Pb	207.977	207.979	50484	0.710	2111	
U	238.050	238.077	57712	0.715	2270	

Report Date/Time: Wednesday, November 10, 2010 12:01:49

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Elan 6000 Instrument Optomization Report

File Name c:\elandata\Optimize\default.dac
Path c:\elandata\Optimize

Sample Information

Sample Date/Time: Wednesday, November 10, 2010 11:59:59
Sample ID: TUNE SHARGRAVE

Parameter Settings

Nebulizer Gas Flow	0.8
Lens Voltage	6.8
ICP RF Power	1050.0
Analog Stage Voltage	-1725.0
Pulse Stage Voltage	1300.0
Discriminator Threshold	70.0
AC Rod Offset	-7.0
Service DAC 1	60.0
Quadrupole Rod Offset	0.0
Exit Lens	0.0
Makeup Gas Flow [MGAS]	0.9
DRC Mode MGAS	0.9

AutoLens Calibration

Date:	12:02:53 Wed 10-Nov-10
Sample Filename:	AUTOLENS SHARGRAVE.002
Dataset Pathname:	101110a1\
Lens Voltage Start:	4.00 V
Lens Voltage End:	8.00 V
Lens Voltage Step:	0.25 V
Slope:	0.0166
Intercept:	4.8244

Analyte	Mass	Optimum Voltage	Maximum Intensity	# Points
Be	9.012	5.0 V	6559 cps	17
Co	58.933	5.8 V	233151 cps	17
In	114.904	6.8 V	483407 cps	17

Dual Detector Calibration

Date:	11:01:51 Mon 01-Nov-10
Sample Filename:	DUAL BJONES.1147
Dataset Pathname:	dual detector calibration\
Points Acquired:	37
Lens Voltage Start:	-3.00 V
Lens Voltage End:	15.00 V
Lens Voltage Step:	0.50 V

Analyte	Mass	Gain	N(max)
Li	6.015	6677	1.87e+009 cps
Li	7.016	6329	1.98e+009 cps

Report Date/Time: Wednesday, November 10, 2010 12:05:21
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Be	9.012	5802	2.16e+009 cps
B	11.009	5983	2.09e+009 cps
Na	22.990	5762	2.17e+009 cps
Mg	23.985	5303	2.36e+009 cps
Mg	24.986	5212	2.40e+009 cps
Al	26.982	4890	2.56e+009 cps
P	30.994	4691	2.67e+009 cps
K	38.964	4445	2.82e+009 cps
Ca	42.959		cps
Ca	43.956	4460	2.81e+009 cps
Sc	44.956	4463	2.81e+009 cps
V	50.944	4449	2.81e+009 cps
Cr	51.941	4175	3.00e+009 cps
Fe	53.940	4126	3.03e+009 cps
Mn	54.938	4113	3.04e+009 cps
Fe	56.935	4042	3.10e+009 cps
Co	58.933	3951	3.17e+009 cps
Ni	59.933	3853	3.25e+009 cps
Cu	62.930	3756	3.33e+009 cps
Cu	64.928	3718	3.37e+009 cps
Zn	67.925	3744	3.34e+009 cps
Ge	71.922	3828	3.27e+009 cps
As	74.922	3788	3.31e+009 cps
Se	77.917	3852	3.25e+009 cps
Br	78.918		cps
Se	81.917	3757	3.33e+009 cps
Sr	87.906		cps
Mo	96.906	3803	3.29e+009 cps
Ag	106.905	3410	3.67e+009 cps
Ag	108.905	3445	3.63e+009 cps
Cd	110.904	3441	3.64e+009 cps
Cd	113.904	3479	3.60e+009 cps
In	114.904	3466	3.61e+009 cps
Sn	117.902	3496	3.58e+009 cps
Sb	120.904	3494	3.58e+009 cps
Ba	134.906	3377	3.71e+009 cps
Tm	168.934	3257	3.84e+009 cps
Tl	204.975	3068	4.08e+009 cps
Pb	207.977	3056	4.10e+009 cps
Bi	208.980		cps
U	238.050	3095	4.04e+009 cps

Daily Performance Report - Elan 6000

Sample ID: DAILY SHARGRAVE
Sample Date/Time: Wednesday, November 10, 2010 12:05:33
Sample Description:
Sample File: C:\elandata\Sample\0312172X.sam
Method File: C:\elandata\Method\000-DAILY_EPA.mth
Dataset File: C:\elandata\Dataset\101110a1\DAILY SHARGRAVE.003
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Number of Replicates: 5
Dual Detector Mode: Dual

Summary

	Analyte	Mass	Net Intens. Mean	Net Intens. SD	Net Intens. RSD
	Mg	24	71749.190	734.354	1.024
	Rh	103	314365.216	2161.557	0.688
	Pb	208	183425.430	581.557	0.317
⌈>	Ba	138	362703.034	1769.870	0.488
⌊	Ba++	69	0.030	0.001	1.991
⌈>	Ce	140	458481.108	2219.906	0.484
⌊	CeO	156	0.027	0.001	3.399
	Bkgd	220	10.571	3.860	36.512
	Li	7	12203.332	317.090	2.598
	Be	9	4617.458	98.702	2.138
	Co	59	165470.458	1631.582	0.986
	In	115	437300.045	2310.165	0.528
	Tl	205	263628.804	1302.640	0.494

Sample ID: L9FXN N.I.
Sample Description: G0K020530-12 N.I.
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 14:21:33
Method File: C:\elandata\Method\000-LISCGEIN....mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXN N.I..015
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 46
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
6	Li			55432.885	ug/L	0.000
45	Sc			620236.203	ug/L	0.000
69	Ga			668359.468	ug/L	0.000
72	Ge			125176.632	ug/L	1771793.376
89	Y			3831701.851	ug/L	0.000
103	Rh			245.241	ug/L	0.000
115	In			11148.989	ug/L	1764755.884
133	Cs			827147.456	ug/L	0.000
165	Ho			176851.263	ug/L	0.000
169	Tm			60158.397	ug/L	1042947.447
209	Bi			37668.834	ug/L	0.000

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Li	6	
Sc	45	
Ga	69	
Ge	72	
Y	89	
Rh	103	
In	115	
Cs	133	
Ho	165	88.669
Tm	169	
Bi	209	

Sample ID: L9J2N N.I.
Sample Description: G0K040545-1 N.I.
Batch ID: 314158
Sample Date/Time: Wednesday, November 10, 2010 14:24:22
Method File: C:\elandata\Method\000-LISCGEIN....mth
Dataset File: C:\elandata\Dataset\101110a1\L9J2N N.I..016
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 59
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
6	Li			11063.873	ug/L	0.000
45	Sc			555067.495	ug/L	0.000
69	Ga			942352.005	ug/L	0.000
72	Ge			161443.894	ug/L	1771793.376
89	Y			1952130.922	ug/L	0.000
103	Rh			969.099	ug/L	0.000
115	In			14785.117	ug/L	1764755.884
133	Cs			304237.184	ug/L	0.000
165	Ho			88888.652	ug/L	0.000
169	Tm			36946.355	ug/L	1042947.447
209	Bi			26574.984	ug/L	0.000

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Li	6	
Sc	45	
Ga	69	
Ge	72	
Y	89	
Rh	103	
In	115	
Cs	133	
Ho	165	88.669
Tm	169	
Bi	209	

Sample ID: L9C2M N.I.
Sample Description: G0J300447-1 N.I.
Batch ID: 314155
Sample Date/Time: Wednesday, November 10, 2010 14:27:13
Method File: C:\elandata\Method\000-LISCGEIN....mth
Dataset File: C:\elandata\Dataset\101110a1\L9C2M N.I..017
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 62
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
6	Li			15626.283	ug/L	0.000
45	Sc			1735779.024	ug/L	0.000
69	Ga			3403186.773	ug/L	0.000
72	Ge			467955.136	ug/L	1771793.376
89	Y			4425449.435	ug/L	0.000
103	Rh			17227.261	ug/L	0.000
115	In			16026.135	ug/L	1764755.884
133	Cs			115385.750	ug/L	0.000
165	Ho			217315.327	ug/L	0.000
169	Tm			59869.831	ug/L	1042947.447
209	Bi			5676.534	ug/L	0.000

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Li	6	
Sc	45	
Ga	69	
Ge	72	
Y	89	
Rh	103	
In	115	
Cs	133	
Ho	165	88.669
Tm	169	
Bi	209	

Sample ID: L9G2Q N.I.
Sample Description: G0K030490-1 N.I.
Batch ID: 314155
Sample Date/Time: Wednesday, November 10, 2010 14:30:03
Method File: C:\elandata\Method\000-LISCGEIN....mth
Dataset File: C:\elandata\Dataset\101110a1\L9G2Q N.I..018
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 67
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
6	Li			13489.049	ug/L	0.000
45	Sc			1412379.355	ug/L	0.000
69	Ga			3012146.965	ug/L	0.000
72	Ge			457450.303	ug/L	1771793.376
89	Y			4142687.840	ug/L	0.000
103	Rh			6037.243	ug/L	0.000
115	In			14959.886	ug/L	1764755.884
133	Cs			132064.727	ug/L	0.000
165	Ho			208741.238	ug/L	0.000
169	Tm			52888.638	ug/L	1042947.447
209	Bi			4182.391	ug/L	0.000

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Li	6	
Sc	45	
Ga	69	
Ge	72	
Y	89	
Rh	103	
In	115	
Cs	133	
Ho	165	88.669
Tm	169	
Bi	209	

Sample ID: L9LGE N.I.
Sample Description: G0K050462-1 N.I.
Batch ID: 313205
Sample Date/Time: Wednesday, November 10, 2010 14:32:50
Method File: C:\elandata\Method\000-LISCGEIN....mth
Dataset File: C:\elandata\Dataset\101110a1\L9LGE N.I..019
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 69
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
6	Li			15576.668	ug/L	0.000
45	Sc			407430.363	ug/L	0.000
69	Ga			1189627.110	ug/L	0.000
72	Ge			106996.575	ug/L	1771793.376
89	Y			2963746.267	ug/L	0.000
103	Rh			1242.466	ug/L	0.000
115	In			8058.552	ug/L	1764755.884
133	Cs			653089.362	ug/L	0.000
165	Ho			133803.216	ug/L	0.000
169	Tm			48308.012	ug/L	1042947.447
209	Bi			34545.512	ug/L	0.000

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Li	6	
Sc	45	
Ga	69	
Ge	72	
Y	89	
Rh	103	
In	115	
Cs	133	
Ho	165	88.669
Tm	169	
Bi	209	

Sample ID: Rinse 2X
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 12:36:37
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\Rinse 2X.004
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 6
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca			48304.017	ug/L	0.000
	51	V			-45317.029	ug/L	0.000
	52	Cr			41049.871	ug/L	0.000
	54	Fe			109571.397	ug/L	0.000
	57	Fe			18064.380	ug/L	0.000
	68	Zn			1215.025	ug/L	0.000
	75	As			15330.688	ug/L	0.000
	82	Se			1600.477	ug/L	0.000
>	72	Ge-1			1488906.054	ug/L	0.000
	107	Ag			126.668	ug/L	0.000
	111	Cd			80.979	ug/L	0.000
	135	Ba			156.669	ug/L	0.000
>	115	In-1			1459947.095	ug/L	0.000
	205	Tl			1450.851	ug/L	0.000
	208	Pb			1412.727	ug/L	0.000
>	169	Tm-1			850540.239	ug/L	0.000
	50	Cr			-1079.821	ug/L	0.000
	53	Cr			168567.398	ug/L	0.000
	67	Zn			2477.071	ug/L	0.000
	66	Zn			356.028	ug/L	0.000
	76	Se			-208824.351	ug/L	0.000
	77	Se			21720.623	ug/L	0.000
	78	Se			18234.141	ug/L	0.000
	79	Br			91560.668	ug/L	0.000
>	72	Ge			1488906.054	ug/L	0.000
	108	Cd			65.101	ug/L	0.000
	114	Cd			35.579	ug/L	0.000
	109	Ag			26.667	ug/L	0.000
>	115	In			1459947.095	ug/L	0.000
	208	207.977			725.708	ug/L	0.000
	207	Pb			311.008	ug/L	0.000
	206	Pb			376.011	ug/L	0.000
>	169	Tm			850540.239	ug/L	0.000

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	
Ag	107	
Cd	111	
Ba	135	
In-1	115	
Tl	205	
Pb	208	
Tm-1	169	
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	
Cd	108	
Cd	114	
Ag	109	
In	115	
207.977	208	
Pb	207	
Pb	206	
Tm	169	

Sample ID: Blank
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 12:40:45
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\Blank.005
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca			51319.472	ug/L	
	51	V			-48497.319	ug/L	
	52	Cr			45784.122	ug/L	
	54	Fe			102545.051	ug/L	
	57	Fe			14872.716	ug/L	
	68	Zn			1273.180	ug/L	
	75	As			15968.061	ug/L	
	82	Se			1670.645	ug/L	
>	72	Ge-1			1771793.376	ug/L	
	107	Ag			96.667	ug/L	
	111	Cd			50.657	ug/L	
	135	Ba			113.668	ug/L	
>	115	In-1			1764755.884	ug/L	
	205	Tl			820.053	ug/L	
	208	Pb			1215.711	ug/L	
>	169	Tm-1			1042947.447	ug/L	
	50	Cr			-1325.306	ug/L	
	53	Cr			198138.356	ug/L	
	67	Zn			4133.424	ug/L	
	66	Zn			242.346	ug/L	
	76	Se			-250489.135	ug/L	
	77	Se			22937.902	ug/L	
	78	Se			18196.433	ug/L	
	79	Br			88883.115	ug/L	
>	72	Ge			1771793.376	ug/L	
	108	Cd			18.434	ug/L	
	114	Cd			57.155	ug/L	
	109	Ag			31.000	ug/L	
>	115	In			1764755.884	ug/L	
	208	207.977			613.030	ug/L	
	207	Pb			266.672	ug/L	
	206	Pb			336.009	ug/L	
>	169	Tm			1042947.447	ug/L	

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	
Ag	107	
Cd	111	
Ba	135	
In-1	115	
Tl	205	
Pb	208	
Tm-1	169	
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	
Cd	108	
Cd	114	
Ag	109	
In	115	
207.977	208	
Pb	207	
Pb	206	
Tm	169	

Sample ID: Standard 1
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 12:44:48
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\Standard 1.006
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	5100.000000	0.527	1477859.324	ug/L	51319.472
|	51	V	100.000000	0.172	1090091.910	ug/L	-48497.319
|	52	Cr	100.000000	0.141	1019354.884	ug/L	45784.122
|	54	Fe	5100.000000	0.068	4300393.489	ug/L	102545.051
|	57	Fe	5100.000000	0.719	1757191.174	ug/L	14872.716
|	68	Zn	100.000000	0.332	98438.700	ug/L	1273.180
|	75	As	100.000000	0.224	280024.437	ug/L	15968.061
|	82	Se	100.000000	1.401	26872.546	ug/L	1670.645
⌊>	72	Ge-1			1728930.360	ug/L	1771793.376
⌈	107	Ag	50.000000	1.046	540031.077	ug/L	96.667
|	111	Cd	100.000000	0.665	247696.664	ug/L	50.657
|	135	Ba	100.000000	0.554	239980.524	ug/L	113.668
⌊>	115	In-1			1713882.896	ug/L	1764755.884
⌈	205	Tl	50.000000	1.200	906022.122	ug/L	820.053
|	208	Pb	100.000000	0.725	2382116.576	ug/L	1215.711
⌊>	169	Tm-1			1032679.232	ug/L	1042947.447
⌈	50	Cr	100.000000	3.630	18334.891	ug/L	-1325.306
|	53	Cr	100.000000	12.082	236423.657	ug/L	198138.356
|	67	Zn	100.000000	2.800	11800.573	ug/L	4133.424
|	66	Zn	100.000000	0.437	51328.220	ug/L	242.346
|	76	Se	100.000000	34.809	-239938.755	ug/L	-250489.135
|	77	Se	100.000000	5.287	30492.740	ug/L	22937.902
|	78	Se	100.000000	0.861	79767.101	ug/L	18196.433
|	79	Br	100.000000	22.059	103940.416	ug/L	88883.115
⌊>	72	Ge			1728930.360	ug/L	1771793.376
⌈	108	Cd	100.000000	0.194	17473.818	ug/L	18.434
|	114	Cd	100.000000	0.488	593990.424	ug/L	57.155
|	109	Ag	50.000000	0.225	187372.103	ug/L	31.000
⌊>	115	In			1713882.896	ug/L	1764755.884
⌈	208	207.977	100.000000	0.598	1219304.701	ug/L	613.030
|	207	Pb	100.000000	0.755	495828.496	ug/L	266.672
|	206	Pb	100.000000	0.952	666983.379	ug/L	336.009
⌊>	169	Tm			1032679.232	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	
Ag	107	
Cd	111	
Ba	135	
In-1	115	
Tl	205	
Pb	208	
Tm-1	169	
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	
Cd	108	
Cd	114	
Ag	109	
In	115	
207.977	208	
Pb	207	
Pb	206	
Tm	169	

Sample ID: ICV
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 12:48:36
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\ICV .007
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 3
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	879.530774	1.884	309634.745	ug/L	51319.472
|	51	V	84.067759	1.460	949766.065	ug/L	-48497.319
|	52	Cr	85.189085	1.378	914358.499	ug/L	45784.122
|	54	Fe	811.464504	1.531	802952.096	ug/L	102545.051
|	57	Fe	784.230246	1.228	295201.360	ug/L	14872.716
|	68	Zn	81.429797	2.487	84007.457	ug/L	1273.180
|	75	As	77.440535	1.884	230280.076	ug/L	15968.061
|	82	Se	77.622479	0.812	22181.038	ug/L	1670.645
⌊>	72	Ge-1			1806804.275	ug/L	1771793.376
⌈	107	Ag	40.149943	1.536	435849.422	ug/L	96.667
|	111	Cd	79.257864	1.210	197308.147	ug/L	50.657
|	135	Ba	77.363295	1.929	186590.876	ug/L	113.668
⌊>	115	In-1			1722538.537	ug/L	1764755.884
⌈	205	Tl	39.607549	0.205	713594.942	ug/L	820.053
|	208	Pb	79.959300	0.865	1893487.778	ug/L	1215.711
⌊>	169	Tm-1			1026463.140	ug/L	1042947.447
⌈	50	Cr	68.026948	1.784	12605.049	ug/L	-1325.306
|	53	Cr	445.086288	1.416	402251.171	ug/L	198138.356
|	67	Zn	141.015438	0.688	15659.095	ug/L	4133.424
|	66	Zn	79.514359	0.880	42699.381	ug/L	242.346
|	76	Se	16.076696	111.950	-254682.423	ug/L	-250489.135
|	77	Se	308.365465	1.509	49515.484	ug/L	22937.902
|	78	Se	77.376860	2.567	68693.616	ug/L	18196.433
|	79	Br	-125.004775	5.563	68128.419	ug/L	88883.115
⌊>	72	Ge			1806804.275	ug/L	1771793.376
⌈	108	Cd	76.905164	1.744	13508.727	ug/L	18.434
|	114	Cd	79.063423	1.447	471992.226	ug/L	57.155
|	109	Ag	39.912926	1.311	150315.426	ug/L	31.000
⌊>	115	In			1722538.537	ug/L	1764755.884
⌈	208	207.977	81.770958	1.135	991135.725	ug/L	613.030
|	207	Pb	84.455993	0.720	416277.556	ug/L	266.672
|	206	Pb	73.304832	1.007	486074.497	ug/L	336.009
⌊>	169	Tm			1026463.140	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	101.976
Ag	107	
Cd	111	
Ba	135	
In-1	115	97.608
Tl	205	
Pb	208	
Tm-1	169	98.419
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.976
Cd	108	
Cd	114	
Ag	109	
In	115	97.608
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.419

Sample ID: ICB
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 12:52:28
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\ICB.008
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	10.829594	34.485	54157.555	ug/L	51319.472
	51	V	0.686537	68.685	-40282.743	ug/L	-48497.319
	52	Cr	0.086466	44.829	46414.656	ug/L	45784.122
	54	Fe	-0.547868	329.414	101571.632	ug/L	102545.051
	57	Fe	-3.814924	17.950	13468.894	ug/L	14872.716
	68	Zn	0.335052	18.158	1599.039	ug/L	1273.180
	75	As	-0.107494	169.030	15599.372	ug/L	15968.061
	82	Se	-0.282346	71.494	1589.655	ug/L	1670.645
>	72	Ge-1			1762970.391	ug/L	1771793.376
	107	Ag	0.000655	36.637	102.001	ug/L	96.667
	111	Cd	-0.003587	151.906	40.708	ug/L	50.657
	135	Ba	0.003767	125.264	120.668	ug/L	113.668
>	115	In-1			1731553.547	ug/L	1764755.884
	205	Tl	0.403425	20.068	8135.977	ug/L	820.053
	208	Pb	0.029602	8.178	1913.441	ug/L	1215.711
>	169	Tm-1			1035373.880	ug/L	1042947.447
	50	Cr	-0.433416	50.840	-1405.481	ug/L	-1325.306
	53	Cr	8.114345	77.988	200711.477	ug/L	198138.356
	67	Zn	13.522853	13.134	5183.574	ug/L	4133.424
	66	Zn	0.100134	45.915	293.352	ug/L	242.346
	76	Se	-49.716038	165.537	-251506.453	ug/L	-250489.135
	77	Se	-15.646012	7.345	21530.132	ug/L	22937.902
	78	Se	-0.751084	46.559	17630.663	ug/L	18196.433
	79	Br	-18.838150	8.150	85129.736	ug/L	88883.115
>	72	Ge			1762970.391	ug/L	1771793.376
	108	Cd	-0.047150	22.476	9.767	ug/L	18.434
	114	Cd	0.002398	99.845	70.522	ug/L	57.155
	109	Ag	0.004120	26.871	46.000	ug/L	31.000
>	115	In			1731553.547	ug/L	1764755.884
	208	207.977	0.027346	12.904	942.737	ug/L	613.030
	207	Pb	0.034555	9.062	436.348	ug/L	266.672
	206	Pb	0.030045	3.185	534.356	ug/L	336.009
>	169	Tm			1035373.880	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	99.502
Ag	107	
Cd	111	
Ba	135	
In-1	115	98.119
Tl	205	
Pb	208	
Tm-1	169	99.274
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	99.502
Cd	108	
Cd	114	
Ag	109	
In	115	98.119
207.977	208	
Pb	207	
Pb	206	
Tm	169	99.274

Sample ID: LLSTD1
Sample Description: LLSTD@10X
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 13:14:41
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\LLSTD1.009
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 83
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	66.050832	4.889	71986.563	ug/L	51319.472
	51	V	10.126514	1.050	71241.565	ug/L	-48497.319
	52	Cr	1.333293	2.346	60552.104	ug/L	45784.122
	54	Fe	45.768108	2.898	144637.466	ug/L	102545.051
	57	Fe	45.986749	0.882	31736.459	ug/L	14872.716
	68	Zn	5.462683	1.649	6879.566	ug/L	1273.180
	75	As	0.694546	18.782	18290.147	ug/L	15968.061
	82	Se	0.601170	50.858	1870.993	ug/L	1670.645
>	72	Ge-1			1815209.957	ug/L	1771793.376
	107	Ag	0.498219	1.120	5664.187	ug/L	96.667
	111	Cd	1.007339	2.442	2632.077	ug/L	50.657
	135	Ba	0.970944	0.660	2523.834	ug/L	113.668
>	115	In-1			1773242.133	ug/L	1764755.884
	205	Tl	0.488987	1.134	9812.894	ug/L	820.053
	208	Pb	1.020147	0.321	25885.796	ug/L	1215.711
>	169	Tm-1			1048550.624	ug/L	1042947.447
	50	Cr	-0.148710	153.401	-1388.768	ug/L	-1325.306
	53	Cr	28.929796	16.166	216074.857	ug/L	198138.356
	67	Zn	15.952752	10.893	5535.738	ug/L	4133.424
	66	Zn	5.159409	3.126	3016.336	ug/L	242.346
	76	Se	-8.541151	429.418	-257034.283	ug/L	-250489.135
	77	Se	10.366765	6.075	24382.658	ug/L	22937.902
	78	Se	0.537708	27.544	18992.851	ug/L	18196.433
	79	Br	62.676601	8.055	102396.114	ug/L	88883.115
>	72	Ge			1815209.957	ug/L	1771793.376
	108	Cd	0.852416	10.760	172.461	ug/L	18.434
	114	Cd	1.000118	2.522	6203.573	ug/L	57.155
	109	Ag	0.508815	2.740	2003.550	ug/L	31.000
>	115	In			1773242.133	ug/L	1764755.884
	208	207.977	1.047489	0.834	13577.804	ug/L	613.030
	207	Pb	1.068214	2.410	5644.504	ug/L	266.672
	206	Pb	0.934432	0.434	6663.488	ug/L	336.009
>	169	Tm			1048550.624	ug/L	1042947.447

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
⌈	Ca	44	
|	V	51	
|	Cr	52	
|	Fe	54	
|	Fe	57	
|	Zn	68	
|	As	75	
|	Se	82	
⌊>	Ge-1	72	102.450
⌈	Ag	107	
|	Cd	111	
|	Ba	135	
⌊>	In-1	115	100.481
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	100.537
⌈	Cr	50	
|	Cr	53	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	102.450
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	100.481
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	100.537

Sample ID: LLSTD2
Sample Description: LLSTD@5X
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 13:18:29
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\LLSTD2.010
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 84
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	98.543158	3.365	82609.427	ug/L	51319.472
	51	V	19.555045	0.901	186248.949	ug/L	-48497.319
	52	Cr	1.861210	3.266	66819.689	ug/L	45784.122
	54	Fe	86.751394	2.331	182437.928	ug/L	102545.051
	57	Fe	92.317620	0.880	48991.435	ug/L	14872.716
	68	Zn	10.595625	1.251	12276.501	ug/L	1273.180
	75	As	1.888968	9.953	21888.310	ug/L	15968.061
	82	Se	1.470809	7.450	2128.916	ug/L	1670.645
>	72	Ge-1			1839038.830	ug/L	1771793.376
	107	Ag	0.967791	0.081	11122.044	ug/L	96.667
	111	Cd	1.942498	3.046	5124.826	ug/L	50.657
	135	Ba	1.922513	1.450	4979.614	ug/L	113.668
>	115	In-1			1807515.652	ug/L	1764755.884
	205	Tl	0.956515	1.532	18581.093	ug/L	820.053
	208	Pb	1.994387	1.156	49898.687	ug/L	1215.711
>	169	Tm-1			1058417.475	ug/L	1042947.447
	50	Cr	0.879684	23.815	-1191.820	ug/L	-1325.306
	53	Cr	12.680719	42.817	211468.348	ug/L	198138.356
	67	Zn	20.269805	5.000	5964.819	ug/L	4133.424
	66	Zn	9.991316	0.833	5681.092	ug/L	242.346
	76	Se	-67.461133	17.898	-263214.426	ug/L	-250489.135
	77	Se	-6.239176	83.152	23270.754	ug/L	22937.902
	78	Se	0.909589	16.198	19486.848	ug/L	18196.433
	79	Br	108.042613	6.567	112060.128	ug/L	88883.115
>	72	Ge			1839038.830	ug/L	1771793.376
	108	Cd	1.751263	2.978	341.247	ug/L	18.434
	114	Cd	1.931339	1.014	12156.890	ug/L	57.155
	109	Ag	0.985460	2.579	3925.388	ug/L	31.000
>	115	In			1807515.652	ug/L	1764755.884
	208	207.977	2.048447	1.005	26207.187	ug/L	613.030
	207	Pb	2.095599	0.819	10914.352	ug/L	266.672
	206	Pb	1.820326	1.895	12777.148	ug/L	336.009
>	169	Tm			1058417.475	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	103.795
Ag	107	
Cd	111	
Ba	135	
In-1	115	102.423
Tl	205	
Pb	208	
Tm-1	169	101.483
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	103.795
Cd	108	
Cd	114	
Ag	109	
In	115	102.423
207.977	208	
Pb	207	
Pb	206	
Tm	169	101.483

Sample ID: ICSA
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 13:24:44
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\ICSA .011
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 2
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	94999.602342	2.065	23489290.690	ug/L	51319.472
|	51	V	2.220070	26.870	-19365.451	ug/L	-48497.319
|	52	Cr	-0.169620	61.148	37929.428	ug/L	45784.122
|	54	Fe	95172.622186	1.290	69188334.788	ug/L	102545.051
|	57	Fe	95541.499554	1.527	28792606.796	ug/L	14872.716
|	68	Zn	2.388664	7.102	3140.492	ug/L	1273.180
|	75	As	1.004335	31.976	16070.454	ug/L	15968.061
|	82	Se	-0.523254	169.478	1324.150	ug/L	1670.645
⌊>	72	Ge-1			1524536.883	ug/L	1771793.376
⌈	107	Ag	0.168931	4.472	1693.559	ug/L	96.667
|	111	Cd	0.999473	6.758	2229.194	ug/L	50.657
|	135	Ba	2.884336	1.857	6203.022	ug/L	113.668
⌊>	115	In-1			1512825.175	ug/L	1764755.884
⌈	205	Tl	0.224175	2.703	4274.769	ug/L	820.053
|	208	Pb	0.497255	1.861	11446.322	ug/L	1215.711
⌊>	169	Tm-1			906336.623	ug/L	1042947.447
⌈	50	Cr	174.100383	20.338	28911.817	ug/L	-1325.306
|	53	Cr	-161.603485	2.981	109125.982	ug/L	198138.356
|	67	Zn	8.085885	14.403	4111.387	ug/L	4133.424
|	66	Zn	7.085841	0.773	3400.878	ug/L	242.346
|	76	Se	-151.900686	30.554	-221572.873	ug/L	-250489.135
|	77	Se	-87.118773	6.346	13513.387	ug/L	22937.902
|	78	Se	2.875928	3.136	17229.358	ug/L	18196.433
|	79	Br	38436.965302	3.341	5914044.265	ug/L	88883.115
⌊>	72	Ge			1524536.883	ug/L	1771793.376
⌈	108	Cd	61.669561	1.564	9516.662	ug/L	18.434
|	114	Cd	4.081481	0.508	21446.476	ug/L	57.155
|	109	Ag	0.129983	4.552	456.379	ug/L	31.000
⌊>	115	In			1512825.175	ug/L	1764755.884
⌈	208	207.977	0.507875	1.126	5964.794	ug/L	613.030
|	207	Pb	0.508371	3.313	2442.469	ug/L	266.672
|	206	Pb	0.469579	2.898	3039.059	ug/L	336.009
⌊>	169	Tm			906336.623	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	86.045
Ag	107	
Cd	111	
Ba	135	
In-1	115	85.724
Tl	205	
Pb	208	
Tm-1	169	86.901
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	86.045
Cd	108	
Cd	114	
Ag	109	
In	115	85.724
207.977	208	
Pb	207	
Pb	206	
Tm	169	86.901

Sample ID: ICSAB
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 13:28:33
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\ICSAB.012
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 1
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	90898.045521	4.960	22466642.501	ug/L	51319.472
	51	V	99.090260	4.509	951262.651	ug/L	-48497.319
	52	Cr	98.043639	4.239	881437.502	ug/L	45784.122
	54	Fe	92394.118186	3.651	67150277.583	ug/L	102545.051
	57	Fe	92854.634957	3.342	27979255.032	ug/L	14872.716
	68	Zn	91.663640	2.700	79623.025	ug/L	1273.180
	75	As	101.002020	3.224	249125.704	ug/L	15968.061
	82	Se	108.486551	3.633	25573.034	ug/L	1670.645
>	72	Ge-1			1524766.825	ug/L	1771793.376
	107	Ag	46.357162	3.324	447609.589	ug/L	96.667
	111	Cd	97.893361	2.934	216776.927	ug/L	50.657
	135	Ba	103.188631	2.942	221360.578	ug/L	113.668
>	115	In-1			1533045.788	ug/L	1764755.884
	205	Tl	48.446900	2.638	783733.225	ug/L	820.053
	208	Pb	98.098003	3.998	2085561.767	ug/L	1215.711
>	169	Tm-1			922365.427	ug/L	1042947.447
	50	Cr	265.965593	9.753	44839.901	ug/L	-1325.306
	53	Cr	107.344844	22.857	211099.060	ug/L	198138.356
	67	Zn	109.339762	3.919	11039.754	ug/L	4133.424
	66	Zn	97.248671	3.627	43991.378	ug/L	242.346
	76	Se	-11.493288	344.463	-216044.939	ug/L	-250489.135
	77	Se	154.526937	11.428	30763.648	ug/L	22937.902
	78	Se	109.137407	4.675	75281.414	ug/L	18196.433
	79	Br	1555.363341	4.095	312705.923	ug/L	88883.115
>	72	Ge			1524766.825	ug/L	1771793.376
	108	Cd	153.092481	2.183	23909.808	ug/L	18.434
	114	Cd	99.785430	2.847	529890.861	ug/L	57.155
	109	Ag	46.271015	2.990	155006.427	ug/L	31.000
>	115	In			1533045.788	ug/L	1764755.884
	208	207.977	98.164961	4.178	1068196.322	ug/L	613.030
	207	Pb	98.406819	4.153	435453.499	ug/L	266.672
	206	Pb	97.746041	3.553	581911.946	ug/L	336.009
>	169	Tm			922365.427	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	86.058
Ag	107	
Cd	111	
Ba	135	
In-1	115	86.870
Tl	205	
Pb	208	
Tm-1	169	88.438
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	86.058
Cd	108	
Cd	114	
Ag	109	
In	115	86.870
207.977	208	
Pb	207	
Pb	206	
Tm	169	88.438

Sample ID: LRSTD1
Sample Description: LRSTD@10ppmPbZnCR100pPbAg
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 13:36:02
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\LRSTD1.013
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 85
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	-4.901216	98.080	44635.523	ug/L	51319.472
	51	V	-225.819192	2.308	-2397197.494	ug/L	-48497.319
	52	Cr	9965.969109	1.516	89044728.255	ug/L	45784.122
	54	Fe	500.931952	3.621	469791.106	ug/L	102545.051
	57	Fe	-9.944025	17.348	10188.931	ug/L	14872.716
	68	Zn	10304.867104	0.479	9177759.386	ug/L	1273.180
	75	As	-0.103788	363.946	14017.645	ug/L	15968.061
	82	Se	0.874739	11.355	1695.852	ug/L	1670.645
>	72	Ge-1			1583998.352	ug/L	1771793.376
	107	Ag	101.475428	0.837	1016148.902	ug/L	96.667
	111	Cd	0.056395	24.782	175.434	ug/L	50.657
	135	Ba	0.226066	1.412	605.029	ug/L	113.668
>	115	In-1			1588974.848	ug/L	1764755.884
	205	Tl	0.574165	1.418	11208.864	ug/L	820.053
	208	Pb	10016.749886	0.218	238529525.536	ug/L	1215.711
>	169	Tm-1			1032807.051	ug/L	1042947.447
	50	Cr	7501.527809	1.724	1348319.645	ug/L	-1325.306
	53	Cr	27473.682887	1.562	11012881.701	ug/L	198138.356
	67	Zn	9886.811265	0.885	707181.564	ug/L	4133.424
	66	Zn	9886.950806	1.191	4628529.374	ug/L	242.346
	76	Se	9.777842	281.101	-223539.286	ug/L	-250489.135
	77	Se	-119.707162	4.202	11619.433	ug/L	22937.902
	78	Se	-1.482434	37.928	15422.854	ug/L	18196.433
	79	Br	188.854304	2.315	109276.936	ug/L	88883.115
>	72	Ge			1583998.352	ug/L	1771793.376
	108	Cd	1.054267	3.202	187.277	ug/L	18.434
	114	Cd	0.057703	12.293	368.893	ug/L	57.155
	109	Ag	101.611752	0.164	353002.550	ug/L	31.000
>	115	In			1588974.848	ug/L	1764755.884
	208	207.977	10292.703100	0.579	125457040.519	ug/L	613.030
	207	Pb	10489.411258	0.248	51990291.437	ug/L	266.672
	206	Pb	9160.934560	0.383	61082193.581	ug/L	336.009
>	169	Tm			1032807.051	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	89.401
Ag	107	
Cd	111	
Ba	135	
In-1	115	90.039
Tl	205	
Pb	208	
Tm-1	169	99.028
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	89.401
Cd	108	
Cd	114	
Ag	109	
In	115	90.039
207.977	208	
Pb	207	
Pb	206	
Tm	169	99.028

Sample ID: LRSTD2
Sample Description: LRSTD@5X
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 13:39:51
Method File: C:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\LRSTD2.014
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 86
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	2968.661877	1.886	800667.432	ug/L	51319.472
	51	V	1848.652355	1.662	19062860.053	ug/L	-48497.319
	52	Cr	1983.712966	1.386	17609314.675	ug/L	45784.122
	54	Fe	2078.683461	2.007	1646480.296	ug/L	102545.051
	57	Fe	1984.116133	1.380	629276.186	ug/L	14872.716
	68	Zn	2021.669339	0.752	1786615.514	ug/L	1273.180
	75	As	1856.480747	0.683	4475084.869	ug/L	15968.061
	82	Se	1955.732760	0.668	450093.277	ug/L	1670.645
>	72	Ge-1			1571027.883	ug/L	1771793.376
	107	Ag	931.198764	1.827	8942981.324	ug/L	96.667
	111	Cd	1947.136664	1.115	4288291.979	ug/L	50.657
	135	Ba	1922.294899	0.571	4100483.238	ug/L	113.668
>	115	In-1			1524184.088	ug/L	1764755.884
	205	Tl	1031.214230	0.747	18116022.907	ug/L	820.053
	208	Pb	2039.554761	0.182	47120359.163	ug/L	1215.711
>	169	Tm-1			1002003.052	ug/L	1042947.447
	50	Cr	1648.844575	1.224	292954.956	ug/L	-1325.306
	53	Cr	5427.187680	0.517	2298344.285	ug/L	198138.356
	67	Zn	2299.658715	0.880	165935.796	ug/L	4133.424
	66	Zn	1996.491516	0.827	927028.439	ug/L	242.346
	76	Se	2447.942818	1.504	-122381.328	ug/L	-250489.135
	77	Se	4544.554927	0.491	355112.865	ug/L	22937.902
	78	Se	1959.237602	0.451	1120073.451	ug/L	18196.433
	79	Br	50.577857	11.953	86739.647	ug/L	88883.115
>	72	Ge			1571027.883	ug/L	1771793.376
	108	Cd	1920.481653	0.810	298147.730	ug/L	18.434
	114	Cd	1897.730226	0.767	10023676.967	ug/L	57.155
	109	Ag	920.531386	0.780	3067445.462	ug/L	31.000
>	115	In			1524184.088	ug/L	1764755.884
	208	207.977	2054.376001	0.151	24294292.820	ug/L	613.030
	207	Pb	2035.811828	0.551	9789608.268	ug/L	266.672
	206	Pb	2015.242986	0.505	13036458.075	ug/L	336.009
>	169	Tm			1002003.052	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	88.669
Ag	107	
Cd	111	
Ba	135	
In-1	115	86.368
Tl	205	
Pb	208	
Tm-1	169	96.074
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	88.669
Cd	108	
Cd	114	
Ag	109	
In	115	86.368
207.977	208	
Pb	207	
Pb	206	
Tm	169	96.074

Sample ID: Rinse
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 14:44:35
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\Rinse.020
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 6
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	-65.063197	3.104	31751.707	ug/L	51319.472
|	51	V	1.327750	20.187	-32093.580	ug/L	-48497.319
|	52	Cr	-0.550452	12.288	39170.192	ug/L	45784.122
|	54	Fe	4.017542	60.545	103000.463	ug/L	102545.051
|	57	Fe	-3.823461	23.350	13159.687	ug/L	14872.716
|	68	Zn	0.489720	1.672	1712.306	ug/L	1273.180
|	75	As	-0.505450	50.602	14195.984	ug/L	15968.061
|	82	Se	-0.850679	5.313	1410.544	ug/L	1670.645
⌊>	72	Ge-1			1722849.654	ug/L	1771793.376
⌈	107	Ag	0.027974	1.847	364.010	ug/L	96.667
|	111	Cd	-0.001593	311.345	41.650	ug/L	50.657
|	135	Ba	0.019280	14.463	144.002	ug/L	113.668
⌊>	115	In-1			1575374.187	ug/L	1764755.884
⌈	205	Tl	0.010988	15.163	986.743	ug/L	820.053
|	208	Pb	0.035503	19.311	1998.788	ug/L	1215.711
⌊>	169	Tm-1			1007764.707	ug/L	1042947.447
⌈	50	Cr	-0.125372	250.970	-1312.916	ug/L	-1325.306
|	53	Cr	-12.383379	58.259	187343.290	ug/L	198138.356
|	67	Zn	14.510153	23.589	5142.155	ug/L	4133.424
|	66	Zn	0.228614	5.595	352.027	ug/L	242.346
|	76	Se	-112.939220	17.728	-248615.840	ug/L	-250489.135
|	77	Se	-60.896291	1.635	17384.273	ug/L	22937.902
|	78	Se	-2.974809	19.627	15854.852	ug/L	18196.433
|	79	Br	111.969229	12.140	105659.377	ug/L	88883.115
⌊>	72	Ge			1722849.654	ug/L	1771793.376
⌈	108	Cd	-0.039409	76.734	10.150	ug/L	18.434
|	114	Cd	-0.011320	18.979	-10.724	ug/L	57.155
|	109	Ag	0.029145	14.489	128.004	ug/L	31.000
⌊>	115	In			1575374.187	ug/L	1764755.884
⌈	208	207.977	0.037408	17.656	1036.751	ug/L	613.030
|	207	Pb	0.035129	31.399	427.348	ug/L	266.672
|	206	Pb	0.032298	15.302	534.689	ug/L	336.009
⌊>	169	Tm			1007764.707	ug/L	1042947.447

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
⌈	Ca	44	
|	V	51	
|	Cr	52	
|	Fe	54	
|	Fe	57	
|	Zn	68	
|	As	75	
|	Se	82	
⌊>	Ge-1	72	97.238
⌈	Ag	107	
|	Cd	111	
|	Ba	135	
⌊>	In-1	115	89.269
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	96.627
⌈	Cr	50	
|	Cr	53	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	97.238
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	89.269
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	96.627

Sample ID: CCV 1
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 14:48:28
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCV 1.021
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	5290.572278	4.138	1485679.691	ug/L	51319.472
	51	V	102.489638	3.750	1085171.096	ug/L	-48497.319
	52	Cr	101.467503	3.684	1003042.831	ug/L	45784.122
	54	Fe	5072.142686	3.223	4151044.824	ug/L	102545.051
	57	Fe	5019.426090	2.729	1678733.014	ug/L	14872.716
	68	Zn	100.625904	2.675	96131.855	ug/L	1273.180
	75	As	96.067915	3.048	261670.486	ug/L	15968.061
	82	Se	95.154688	3.896	24890.108	ug/L	1670.645
>	72	Ge-1			1678956.155	ug/L	1771793.376
	107	Ag	49.564342	3.798	487400.281	ug/L	96.667
	111	Cd	99.374212	3.203	224105.214	ug/L	50.657
	135	Ba	98.214963	3.096	214593.582	ug/L	113.668
>	115	In-1			1561569.121	ug/L	1764755.884
	205	Tl	51.591813	3.255	913194.055	ug/L	820.053
	208	Pb	104.069575	3.589	2421354.554	ug/L	1215.711
>	169	Tm-1			1009286.322	ug/L	1042947.447
	50	Cr	107.334793	0.414	19206.866	ug/L	-1325.306
	53	Cr	76.972557	25.286	219796.764	ug/L	198138.356
	67	Zn	101.278981	5.028	11551.308	ug/L	4133.424
	66	Zn	99.589715	2.666	49612.750	ug/L	242.346
	76	Se	40.850575	102.867	-235626.965	ug/L	-250489.135
	77	Se	63.896719	18.616	26747.632	ug/L	22937.902
	78	Se	94.948153	4.226	74365.463	ug/L	18196.433
	79	Br	173.163294	14.690	113117.497	ug/L	88883.115
>	72	Ge			1678956.155	ug/L	1771793.376
	108	Cd	97.353783	4.912	15486.081	ug/L	18.434
	114	Cd	98.941097	3.486	535049.292	ug/L	57.155
	109	Ag	49.155094	3.974	167677.299	ug/L	31.000
>	115	In			1561569.121	ug/L	1764755.884
	208	207.977	104.256701	3.763	1241570.998	ug/L	613.030
	207	Pb	104.544973	3.696	506296.297	ug/L	266.672
	206	Pb	103.374106	3.234	673487.259	ug/L	336.009
>	169	Tm			1009286.322	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	94.760
Ag	107	
Cd	111	
Ba	135	
In-1	115	88.486
Tl	205	
Pb	208	
Tm-1	169	96.773
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	94.760
Cd	108	
Cd	114	
Ag	109	
In	115	88.486
207.977	208	
Pb	207	
Pb	206	
Tm	169	96.773

Sample ID: CCB 1
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 14:52:21
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCB 1.022
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	-69.675651	6.283	29499.590	ug/L	51319.472
	51	V	1.867709	6.614	-25163.541	ug/L	-48497.319
	52	Cr	-0.846016	4.002	35160.535	ug/L	45784.122
	54	Fe	-8.305868	29.893	89965.726	ug/L	102545.051
	57	Fe	-10.671565	7.383	10486.581	ug/L	14872.716
	68	Zn	0.301646	22.541	1481.781	ug/L	1273.180
	75	As	-0.395065	92.825	14024.955	ug/L	15968.061
	82	Se	-0.771117	43.462	1385.294	ug/L	1670.645
>	72	Ge-1			1668753.514	ug/L	1771793.376
	107	Ag	0.029996	10.812	375.344	ug/L	96.667
	111	Cd	-0.002231	107.439	39.260	ug/L	50.657
	135	Ba	0.009168	38.273	119.001	ug/L	113.668
>	115	In-1			1540216.761	ug/L	1764755.884
	205	Tl	0.363216	21.724	7108.392	ug/L	820.053
	208	Pb	0.042802	14.196	2139.139	ug/L	1215.711
>	169	Tm-1			994467.461	ug/L	1042947.447
	50	Cr	0.598265	12.597	-1134.763	ug/L	-1325.306
	53	Cr	-50.508018	14.751	165610.380	ug/L	198138.356
	67	Zn	8.088102	31.265	4498.117	ug/L	4133.424
	66	Zn	0.029954	49.234	243.013	ug/L	242.346
	76	Se	-120.635985	27.135	-241143.898	ug/L	-250489.135
	77	Se	-84.315880	0.462	15006.042	ug/L	22937.902
	78	Se	-3.237067	10.216	15199.393	ug/L	18196.433
	79	Br	18.273571	41.408	86751.690	ug/L	88883.115
>	72	Ge			1668753.514	ug/L	1771793.376
	108	Cd	-0.064137	59.456	5.977	ug/L	18.434
	114	Cd	0.001949	436.441	60.315	ug/L	57.155
	109	Ag	0.032150	14.293	135.337	ug/L	31.000
>	115	In			1540216.761	ug/L	1764755.884
	208	207.977	0.044721	10.238	1109.097	ug/L	613.030
	207	Pb	0.043863	27.681	463.017	ug/L	266.672
	206	Pb	0.038505	18.808	567.025	ug/L	336.009
>	169	Tm			994467.461	ug/L	1042947.447

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	94.184
Ag	107	
Cd	111	
Ba	135	
In-1	115	87.276
Tl	205	
Pb	208	
Tm-1	169	95.352
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	94.184
Cd	108	
Cd	114	
Ag	109	
In	115	87.276
207.977	208	
Pb	207	
Pb	206	
Tm	169	95.352

Sample ID: BLK RECAL
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 14:52:21
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCB 1.022
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca			29499.590	ug/L	
	51	V			-25163.541	ug/L	
	52	Cr			35160.535	ug/L	
	54	Fe			89965.726	ug/L	
	57	Fe			10486.581	ug/L	
	68	Zn			1481.781	ug/L	
	75	As			14024.955	ug/L	
	82	Se			1385.294	ug/L	
>	72	Ge-1			1668753.514	ug/L	
	107	Ag			375.344	ug/L	
	111	Cd			39.260	ug/L	
	135	Ba			119.001	ug/L	
>	115	In-1			1540216.761	ug/L	
	205	Tl			7108.392	ug/L	
	208	Pb			2139.139	ug/L	
>	169	Tm-1			994467.461	ug/L	
	50	Cr			-1134.763	ug/L	
	53	Cr			165610.380	ug/L	
	67	Zn			4498.117	ug/L	
	66	Zn			243.013	ug/L	
	76	Se			-241143.898	ug/L	
	77	Se			15006.042	ug/L	
	78	Se			15199.393	ug/L	
	79	Br			86751.690	ug/L	
>	72	Ge			1668753.514	ug/L	
	108	Cd			5.977	ug/L	
	114	Cd			60.315	ug/L	
	109	Ag			135.337	ug/L	
>	115	In			1540216.761	ug/L	
	208	207.977			1109.097	ug/L	
	207	Pb			463.017	ug/L	
	206	Pb			567.025	ug/L	
>	169	Tm			994467.461	ug/L	

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
⌈	Ca	44	
|	V	51	
|	Cr	52	
|	Fe	54	
|	Fe	57	
|	Zn	68	
|	As	75	
|	Se	82	
⌊>	Ge-1	72	
⌈	Ag	107	
|	Cd	111	
|	Ba	135	
⌊>	In-1	115	
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	
⌈	Cr	50	
|	Cr	53	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	

Sample ID: STD1 RECAL
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 14:48:28
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCV 1.021
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	5100.000000	4.084	1485679.691	ug/L	29499.590
	51	V	100.000000	3.820	1085171.096	ug/L	-25163.541
	52	Cr	100.000000	3.654	1003042.831	ug/L	35160.535
	54	Fe	5100.000000	3.218	4151044.824	ug/L	89965.726
	57	Fe	5100.000000	2.723	1678733.014	ug/L	10486.581
	68	Zn	100.000000	2.683	96131.855	ug/L	1481.781
	75	As	100.000000	3.035	261670.486	ug/L	14024.955
	82	Se	100.000000	3.865	24890.108	ug/L	1385.294
>	72	Ge-1			1678956.155	ug/L	1668753.514
	107	Ag	50.000000	3.800	487400.281	ug/L	375.344
	111	Cd	100.000000	3.203	224105.214	ug/L	39.260
	135	Ba	100.000000	3.096	214593.582	ug/L	119.001
>	115	In-1			1561569.121	ug/L	1540216.761
	205	Tl	50.000000	3.278	913194.055	ug/L	7108.392
	208	Pb	100.000000	3.590	2421354.554	ug/L	2139.139
>	169	Tm-1			1009286.322	ug/L	994467.461
	50	Cr	100.000000	0.416	19206.866	ug/L	-1134.763
	53	Cr	100.000000	15.262	219796.764	ug/L	165610.380
	67	Zn	100.000000	5.463	11551.308	ug/L	4498.117
	66	Zn	100.000000	2.667	49612.750	ug/L	243.013
	76	Se	100.000000	26.013	-235626.965	ug/L	-241143.898
	77	Se	100.000000	8.026	26747.632	ug/L	15006.042
	78	Se	100.000000	4.087	74365.463	ug/L	15199.393
	79	Br	100.000000	16.421	113117.497	ug/L	86751.690
>	72	Ge			1678956.155	ug/L	1668753.514
	108	Cd	100.000000	4.908	15486.081	ug/L	5.977
	114	Cd	100.000000	3.486	535049.292	ug/L	60.315
	109	Ag	50.000000	3.977	167677.299	ug/L	135.337
>	115	In			1561569.121	ug/L	1540216.761
	208	207.977	100.000000	3.765	1241570.998	ug/L	1109.097
	207	Pb	100.000000	3.698	506296.297	ug/L	463.017
	206	Pb	100.000000	3.235	673487.259	ug/L	567.025
>	169	Tm			1009286.322	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	
Ag	107	
Cd	111	
Ba	135	
In-1	115	
Tl	205	
Pb	208	
Tm-1	169	
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	
Cd	108	
Cd	114	
Ag	109	
In	115	
207.977	208	
Pb	207	
Pb	206	
Tm	169	

Sample ID: CCV 2
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 15:11:36
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCV 2.023
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	5179.035342	1.592	1509718.184	ug/L	29499.590
	51	V	101.471233	2.114	1102568.718	ug/L	-25163.541
	52	Cr	101.410242	1.726	1017560.204	ug/L	35160.535
	54	Fe	5209.048685	1.086	4241268.014	ug/L	89965.726
	57	Fe	5213.681054	1.056	1717139.089	ug/L	10486.581
	68	Zn	101.447997	0.303	97564.929	ug/L	1481.781
	75	As	101.837680	0.781	266408.307	ug/L	14024.955
	82	Se	100.819462	1.681	25105.658	ug/L	1385.294
>	72	Ge-1			1679083.901	ug/L	1668753.514
	107	Ag	51.150800	1.041	498389.178	ug/L	375.344
	111	Cd	101.908962	0.563	228260.000	ug/L	39.260
	135	Ba	102.264729	0.579	219323.625	ug/L	119.001
>	115	In-1			1559574.845	ug/L	1540216.761
	205	Tl	50.733779	0.956	916704.553	ug/L	7108.392
	208	Pb	102.013806	0.228	2444257.174	ug/L	2139.139
>	169	Tm-1			998078.570	ug/L	994467.461
	50	Cr	98.950790	8.861	19002.921	ug/L	-1134.763
	53	Cr	109.463526	11.594	225023.956	ug/L	165610.380
	67	Zn	101.254538	5.102	11645.793	ug/L	4498.117
	66	Zn	101.867492	0.524	50565.349	ug/L	243.013
	76	Se	90.096914	17.310	-236294.448	ug/L	-241143.898
	77	Se	103.792621	3.985	27214.025	ug/L	15006.042
	78	Se	101.439457	0.193	75276.596	ug/L	15199.393
	79	Br	61.425022	16.761	103198.209	ug/L	86751.690
>	72	Ge			1679083.901	ug/L	1668753.514
	108	Cd	103.384909	0.685	16004.027	ug/L	5.977
	114	Cd	102.187542	0.618	546517.105	ug/L	60.315
	109	Ag	51.555224	0.643	172831.214	ug/L	135.337
>	115	In			1559574.845	ug/L	1540216.761
	208	207.977	101.963457	0.242	1252735.119	ug/L	1109.097
	207	Pb	101.772535	0.154	509873.702	ug/L	463.017
	206	Pb	102.288000	0.418	681648.353	ug/L	567.025
>	169	Tm			998078.570	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	100.619
Ag	107	
Cd	111	
Ba	135	
In-1	115	101.257
Tl	205	
Pb	208	
Tm-1	169	100.363
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.619
Cd	108	
Cd	114	
Ag	109	
In	115	101.257
207.977	208	
Pb	207	
Pb	206	
Tm	169	100.363

Sample ID: CCB 2
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 15:15:29
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCB 2.024
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	-1.698145	118.173	29473.117	ug/L	29499.590
	51	V	0.345837	35.605	-21678.198	ug/L	-25163.541
	52	Cr	-0.280488	33.370	32967.543	ug/L	35160.535
	54	Fe	-0.473617	300.001	90994.372	ug/L	89965.726
	57	Fe	-1.197805	51.857	10255.715	ug/L	10486.581
	68	Zn	-0.061899	164.005	1445.838	ug/L	1481.781
	75	As	0.249449	79.047	14867.806	ug/L	14024.955
	82	Se	0.161187	118.347	1445.379	ug/L	1385.294
>	72	Ge-1			1694907.363	ug/L	1668753.514
	107	Ag	-0.004324	99.531	341.343	ug/L	375.344
	111	Cd	0.002577	114.772	46.009	ug/L	39.260
	135	Ba	-0.007980	43.380	104.334	ug/L	119.001
>	115	In-1			1574605.799	ug/L	1540216.761
	205	Tl	0.295803	57.944	12528.202	ug/L	7108.392
	208	Pb	0.008533	60.381	2363.836	ug/L	2139.139
>	169	Tm-1			1003552.767	ug/L	994467.461
	50	Cr	0.254028	11.403	-1100.353	ug/L	-1134.763
	53	Cr	-13.766054	18.727	160794.476	ug/L	165610.380
	67	Zn	-2.734418	10.785	4374.539	ug/L	4498.117
	66	Zn	0.019806	89.651	256.681	ug/L	243.013
	76	Se	-0.006482	135618.186	-244924.432	ug/L	-241143.898
	77	Se	-2.115497	83.015	14991.686	ug/L	15006.042
	78	Se	0.216650	20.445	15566.879	ug/L	15199.393
	79	Br	-2.226218	51.891	87528.352	ug/L	86751.690
>	72	Ge			1694907.363	ug/L	1668753.514
	108	Cd	0.011378	96.850	7.890	ug/L	5.977
	114	Cd	0.002229	96.375	73.635	ug/L	60.315
	109	Ag	-0.010363	40.779	103.336	ug/L	135.337
>	115	In			1574605.799	ug/L	1540216.761
	208	207.977	0.007878	94.950	1216.450	ug/L	1109.097
	207	Pb	0.010242	33.691	518.688	ug/L	463.017
	206	Pb	0.008457	40.494	628.698	ug/L	567.025
>	169	Tm			1003552.767	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	101.567
Ag	107	
Cd	111	
Ba	135	
In-1	115	102.233
Tl	205	
Pb	208	
Tm-1	169	100.914
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.567
Cd	108	
Cd	114	
Ag	109	
In	115	102.233
207.977	208	
Pb	207	
Pb	206	
Tm	169	100.914

Sample ID: LLSTD3
Sample Description: LLSTD@3ppbSe
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 15:19:21
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\LLSTD3.025
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 127
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	15.953120	4.471	34525.743	ug/L	29499.590
	51	V	0.413166	93.623	-20893.850	ug/L	-25163.541
	52	Cr	0.121829	16.346	36861.452	ug/L	35160.535
	54	Fe	17.675306	3.719	105474.932	ug/L	89965.726
	57	Fe	16.720599	2.611	16157.405	ug/L	10486.581
	68	Zn	0.372891	12.694	1859.356	ug/L	1481.781
	75	As	0.027757	608.466	14298.721	ug/L	14024.955
	82	Se	2.861170	8.159	2083.856	ug/L	1385.294
>	72	Ge-1			1693033.756	ug/L	1668753.514
	107	Ag	-0.016084	13.512	226.671	ug/L	375.344
	111	Cd	-0.008561	17.729	20.882	ug/L	39.260
	135	Ba	0.135313	8.128	416.347	ug/L	119.001
>	115	In-1			1581968.033	ug/L	1540216.761
	205	Tl	-0.211292	8.398	3364.562	ug/L	7108.392
	208	Pb	0.008048	14.526	2351.837	ug/L	2139.139
>	169	Tm-1			1003333.912	ug/L	994467.461
	50	Cr	0.335393	36.273	-1082.491	ug/L	-1134.763
	53	Cr	2.263541	70.917	169235.138	ug/L	165610.380
	67	Zn	-0.686284	118.488	4514.814	ug/L	4498.117
	66	Zn	0.376437	3.221	434.041	ug/L	243.013
	76	Se	21.605383	90.678	-243122.113	ug/L	-241143.898
	77	Se	12.644184	12.420	16712.015	ug/L	15006.042
	78	Se	3.086568	9.892	17260.504	ug/L	15199.393
	79	Br	35.459880	7.753	97283.094	ug/L	86751.690
>	72	Ge			1693033.756	ug/L	1668753.514
	108	Cd	0.009317	470.855	7.582	ug/L	5.977
	114	Cd	-0.008199	26.218	17.523	ug/L	60.315
	109	Ag	-0.017862	14.462	78.335	ug/L	135.337
>	115	In			1581968.033	ug/L	1540216.761
	208	207.977	0.010169	5.281	1244.455	ug/L	1109.097
	207	Pb	0.008129	54.105	508.020	ug/L	463.017
	206	Pb	0.004075	7.661	599.362	ug/L	567.025
>	169	Tm			1003333.912	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	101.455
Ag	107	
Cd	111	
Ba	135	
In-1	115	102.711
Tl	205	
Pb	208	
Tm-1	169	100.892
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.455
Cd	108	
Cd	114	
Ag	109	
In	115	102.711
207.977	208	
Pb	207	
Pb	206	
Tm	169	100.892

Report Date/Time: Wednesday, November 10, 2010 15:20:57
Page 2
Sample ID: LLSTD3

Sample ID: L9QF0B
Sample Description: G0K090000-206 BLK
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 15:31:05
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9QF0B.026
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 21
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	-3.542119	38.978	30088.305	ug/L	29499.590
	51	V	-2.489160	30.908	-55570.182	ug/L	-25163.541
	52	Cr	2.506188	1.608	62600.400	ug/L	35160.535
	54	Fe	77.260577	2.248	159603.823	ug/L	89965.726
	57	Fe	25.772306	1.476	19926.137	ug/L	10486.581
	68	Zn	1.451543	5.623	3007.791	ug/L	1481.781
	75	As	-0.118086	45.518	14502.527	ug/L	14024.955
	82	Se	-0.454856	52.867	1350.742	ug/L	1385.294
>	72	Ge-1			1762186.882	ug/L	1668753.514
	107	Ag	-0.003105	124.803	360.010	ug/L	375.344
	111	Cd	-0.001812	155.608	36.735	ug/L	39.260
	135	Ba	0.192635	5.297	549.024	ug/L	119.001
>	115	In-1			1605343.315	ug/L	1540216.761
	205	Tl	-0.315372	0.417	1528.184	ug/L	7108.392
	208	Pb	0.010404	18.922	2474.187	ug/L	2139.139
>	169	Tm-1			1030636.331	ug/L	994467.461
	50	Cr	-2.595046	8.229	-1752.780	ug/L	-1134.763
	53	Cr	175.060936	6.094	272814.139	ug/L	165610.380
	67	Zn	38.516789	4.251	7591.997	ug/L	4498.117
	66	Zn	1.029743	0.220	790.471	ug/L	243.013
	76	Se	2.495219	481.820	-254460.993	ug/L	-241143.898
	77	Se	97.218068	3.549	27752.638	ug/L	15006.042
	78	Se	-0.075825	297.866	16002.782	ug/L	15199.393
	79	Br	728.777173	19.524	289984.029	ug/L	86751.690
>	72	Ge			1762186.882	ug/L	1668753.514
	108	Cd	0.034508	123.228	11.730	ug/L	5.977
	114	Cd	-0.020237	60.934	-48.605	ug/L	60.315
	109	Ag	-0.000975	380.819	137.671	ug/L	135.337
>	115	In			1605343.315	ug/L	1540216.761
	208	207.977	0.011646	14.772	1297.132	ug/L	1109.097
	207	Pb	0.008603	75.268	524.022	ug/L	463.017
	206	Pb	0.009469	48.248	653.034	ug/L	567.025
>	169	Tm			1030636.331	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	105.599
Ag	107	
Cd	111	
Ba	135	
In-1	115	104.228
Tl	205	
Pb	208	
Tm-1	169	103.637
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	105.599
Cd	108	
Cd	114	
Ag	109	
In	115	104.228
207.977	208	
Pb	207	
Pb	206	
Tm	169	103.637

Sample ID: L9QF0C
Sample Description: G0K090000-206 LCS
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 15:34:52
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9QF0C.027
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 104
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	1180.309454	0.197	372439.015	ug/L	29499.590
	51	V	203.681440	0.357	2271966.783	ug/L	-25163.541
	52	Cr	208.870238	0.632	2088961.111	ug/L	35160.535
	54	Fe	1104.350564	0.451	984908.849	ug/L	89965.726
	57	Fe	1022.150983	0.958	350249.845	ug/L	10486.581
	68	Zn	200.499897	0.502	194214.811	ug/L	1481.781
	75	As	189.868513	0.320	491721.243	ug/L	14024.955
	82	Se	185.300645	0.150	45643.352	ug/L	1385.294
>	72	Ge-1			1704088.036	ug/L	1668753.514
	107	Ag	51.153109	0.524	493542.819	ug/L	375.344
	111	Cd	195.380114	1.200	433326.249	ug/L	39.260
	135	Ba	202.421205	0.922	429780.213	ug/L	119.001
>	115	In-1			1544349.072	ug/L	1540216.761
	205	Tl	50.018556	2.252	914908.700	ug/L	7108.392
	208	Pb	199.706385	0.865	4841056.873	ug/L	2139.139
>	169	Tm-1			1010287.083	ug/L	994467.461
	50	Cr	181.169572	0.704	36262.653	ug/L	-1134.763
	53	Cr	635.099448	1.070	512754.050	ug/L	165610.380
	67	Zn	304.074259	0.727	26285.806	ug/L	4498.117
	66	Zn	196.356532	0.768	98685.694	ug/L	243.013
	76	Se	146.268666	26.212	-235793.301	ug/L	-241143.898
	77	Se	376.119548	0.761	59870.863	ug/L	15006.042
	78	Se	188.287982	0.861	128519.224	ug/L	15199.393
	79	Br	766.403662	17.436	290053.746	ug/L	86751.690
>	72	Ge			1704088.036	ug/L	1668753.514
	108	Cd	193.566664	0.271	29666.772	ug/L	5.977
	114	Cd	194.665535	0.487	1030887.443	ug/L	60.315
	109	Ag	51.419763	0.948	170691.222	ug/L	135.337
>	115	In			1544349.072	ug/L	1540216.761
	208	207.977	203.980287	1.062	2535410.953	ug/L	1109.097
	207	Pb	216.801165	0.545	1098864.046	ug/L	463.017
	206	Pb	178.976316	0.840	1206781.874	ug/L	567.025
>	169	Tm			1010287.083	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	102.117
Ag	107	
Cd	111	
Ba	135	
In-1	115	100.268
Tl	205	
Pb	208	
Tm-1	169	101.591
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	102.117
Cd	108	
Cd	114	
Ag	109	
In	115	100.268
207.977	208	
Pb	207	
Pb	206	
Tm	169	101.591

Sample ID: L9FXNS
Sample Description: G0K020530-12 MS
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 15:38:36
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXNS.028
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 105
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	3970.148478	0.590	1121124.971	ug/L	29499.590
	51	V	431.420453	0.537	4593323.428	ug/L	-25163.541
	52	Cr	370.530248	0.578	3489661.771	ug/L	35160.535
	54	Fe	116460.402526	0.827	89445788.417	ug/L	89965.726
	57	Fe	114560.697079	0.546	36118584.041	ug/L	10486.581
	68	Zn	362.725637	0.650	332228.003	ug/L	1481.781
	75	As	177.918930	0.615	438043.340	ug/L	14024.955
	82	Se	170.134447	0.577	39872.502	ug/L	1385.294
>	72	Ge-1			1616914.218	ug/L	1668753.514
	107	Ag	48.022874	0.416	430578.996	ug/L	375.344
	111	Cd	188.913512	0.641	389338.124	ug/L	39.260
	135	Ba	679.133891	1.520	1339602.840	ug/L	119.001
>	115	In-1			1435102.968	ug/L	1540216.761
	205	Tl	50.197217	0.583	832179.045	ug/L	7108.392
	208	Pb	294.851275	0.730	6477044.212	ug/L	2139.139
>	169	Tm-1			915614.569	ug/L	994467.461
	50	Cr	389.927818	3.700	75304.989	ug/L	-1134.763
	53	Cr	910.211380	1.704	627717.500	ug/L	165610.380
	67	Zn	524.522823	2.417	39863.671	ug/L	4498.117
	66	Zn	371.303767	0.566	176860.963	ug/L	243.013
	76	Se	-18.775280	188.479	-234929.911	ug/L	-241143.898
	77	Se	301.913854	1.277	48469.557	ug/L	15006.042
	78	Se	165.932581	0.417	109211.914	ug/L	15199.393
	79	Br	656.339178	22.143	247796.343	ug/L	86751.690
>	72	Ge			1616914.218	ug/L	1668753.514
	108	Cd	129.480146	0.721	18442.557	ug/L	5.977
	114	Cd	185.436807	1.238	912501.276	ug/L	60.315
	109	Ag	47.317675	1.116	145967.381	ug/L	135.337
>	115	In			1435102.968	ug/L	1540216.761
	208	207.977	300.298169	0.865	3382603.003	ug/L	1109.097
	207	Pb	314.658924	0.848	1445229.386	ug/L	463.017
	206	Pb	269.919346	0.624	1649211.822	ug/L	567.025
>	169	Tm			915614.569	ug/L	994467.461

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Ca	44	
	V	51	
	Cr	52	
	Fe	54	
	Fe	57	
	Zn	68	
	As	75	
	Se	82	
>	Ge-1	72	96.894
	Ag	107	
	Cd	111	
	Ba	135	
>	In-1	115	93.175
	Tl	205	
	Pb	208	
>	Tm-1	169	92.071
	Cr	50	
	Cr	53	
	Zn	67	
	Zn	66	
	Se	76	
	Se	77	
	Se	78	
	Br	79	
>	Ge	72	96.894
	Cd	108	
	Cd	114	
	Ag	109	
>	In	115	93.175
	207.977	208	
	Pb	207	
	Pb	206	
>	Tm	169	92.071

SHargrave

Sample ID: L9FXND
Sample Description: G0K020530-12 SD
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 15:42:20
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXND.029
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 106
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	3331.397116	0.622	1028300.915	ug/L	29499.590
	51	V	559.005996	0.345	6482084.979	ug/L	-25163.541
	52	Cr	344.582586	0.775	3532868.356	ug/L	35160.535
	54	Fe	185190.052837	0.421	154666668.635	ug/L	89965.726
	57	Fe	183010.201679	0.919	62759500.000	ug/L	10486.581
	68	Zn	390.831557	0.403	389271.907	ug/L	1481.781
	75	As	201.058329	0.851	536535.633	ug/L	14024.955
	82	Se	168.084090	0.960	42866.669	ug/L	1385.294
>	72	Ge-1			1758874.005	ug/L	1668753.514
	107	Ag	47.736185	0.362	450158.759	ug/L	375.344
	111	Cd	187.864001	0.207	407217.068	ug/L	39.260
	135	Ba	569.632600	0.798	1181819.588	ug/L	119.001
>	115	In-1			1509355.903	ug/L	1540216.761
	205	Tl	46.239715	1.576	783487.126	ug/L	7108.392
	208	Pb	267.408721	0.379	6000387.003	ug/L	2139.139
>	169	Tm-1			935232.079	ug/L	994467.461
	50	Cr	363.293664	3.350	76250.276	ug/L	-1134.763
	53	Cr	845.723656	1.024	646820.534	ug/L	165610.380
	67	Zn	551.695544	0.496	45364.283	ug/L	4498.117
	66	Zn	396.585431	0.713	205469.587	ug/L	243.013
	76	Se	-60.093156	45.167	-258605.787	ug/L	-241143.898
	77	Se	279.434940	1.210	49973.315	ug/L	15006.042
	78	Se	161.908366	1.598	116298.579	ug/L	15199.393
	79	Br	488.400337	22.648	223899.586	ug/L	86751.690
>	72	Ge			1758874.005	ug/L	1668753.514
	108	Cd	131.386963	2.277	19682.031	ug/L	5.977
	114	Cd	182.337856	0.353	943723.924	ug/L	60.315
	109	Ag	47.195364	0.666	153126.439	ug/L	135.337
>	115	In			1509355.903	ug/L	1540216.761
	208	207.977	272.535382	0.574	3135792.427	ug/L	1109.097
	207	Pb	285.301536	0.450	1338563.226	ug/L	463.017
	206	Pb	244.506621	0.285	1526031.350	ug/L	567.025
>	169	Tm			935232.079	ug/L	994467.461

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
⌈	Ca	44	
|	V	51	
|	Cr	52	
|	Fe	54	
|	Fe	57	
|	Zn	68	
|	As	75	
|	Se	82	
⌊>	Ge-1	72	105.400
⌈	Ag	107	
|	Cd	111	
|	Ba	135	
⌊>	In-1	115	97.996
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	94.044
⌈	Cr	50	
|	Cr	53	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	105.400
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	97.996
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	94.044

Sample ID: L9FXN
Sample Description: G0K020530-12
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 15:46:04
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXN.030
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 46
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	2626.059535	0.817	771821.144	ug/L	29499.590
	51	V	225.670500	0.639	2456629.335	ug/L	-25163.541
	52	Cr	175.042595	0.630	1712242.471	ug/L	35160.535
	54	Fe	114373.217748	0.662	90252502.048	ug/L	89965.726
	57	Fe	113124.553956	0.450	36644176.054	ug/L	10486.581
	68	Zn	172.510882	0.444	163115.772	ug/L	1481.781
	75	As	19.654899	1.791	62137.348	ug/L	14024.955
	82	Se	7.425508	2.557	3106.785	ug/L	1385.294
>	72	Ge-1			1661284.636	ug/L	1668753.514
	107	Ag	0.638962	1.917	6332.816	ug/L	375.344
	111	Cd	3.049653	1.453	6590.846	ug/L	39.260
	135	Ba	448.576429	0.698	922664.312	ug/L	119.001
>	115	In-1			1496411.922	ug/L	1540216.761
	205	Tl	1.837018	4.310	36578.249	ug/L	7108.392
	208	Pb	99.494403	0.305	2176184.847	ug/L	2139.139
>	169	Tm-1			911100.714	ug/L	994467.461
	50	Cr	247.159119	2.723	48637.077	ug/L	-1134.763
	53	Cr	471.586153	0.774	413607.233	ug/L	165610.380
	67	Zn	284.010679	1.484	24229.812	ug/L	4498.117
	66	Zn	183.264019	0.758	89810.475	ug/L	243.013
	76	Se	-104.817109	20.887	-247359.303	ug/L	-241143.898
	77	Se	38.454383	5.893	19379.304	ug/L	15006.042
	78	Se	6.337872	1.367	18839.193	ug/L	15199.393
	79	Br	435.070259	17.376	197996.970	ug/L	86751.690
>	72	Ge			1661284.636	ug/L	1668753.514
	108	Cd	-62.145917	4.691	-9218.207	ug/L	5.977
	114	Cd	0.383338	5.146	2025.502	ug/L	60.315
	109	Ag	0.313707	6.012	1139.286	ug/L	135.337
>	115	In			1496411.922	ug/L	1540216.761
	208	207.977	100.883187	0.366	1131454.582	ug/L	1109.097
	207	Pb	102.135389	0.139	467099.334	ug/L	463.017
	206	Pb	94.948752	0.501	577630.931	ug/L	567.025
>	169	Tm			911100.714	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	99.552
Ag	107	
Cd	111	
Ba	135	
In-1	115	97.156
Tl	205	
Pb	208	
Tm-1	169	91.617
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	99.552
Cd	108	
Cd	114	
Ag	109	
In	115	97.156
207.977	208	
Pb	207	
Pb	206	
Tm	169	91.617

Sample ID: L9FXNP5
Sample Description: G0K020530-12 5X
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 15:49:47
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXNP5.031
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 47
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	568.926879	0.786	194071.294	ug/L	29499.590
	51	V	48.898246	0.141	523065.223	ug/L	-25163.541
	52	Cr	36.793358	0.330	395400.167	ug/L	35160.535
	54	Fe	23936.276470	0.670	19342974.193	ug/L	89965.726
	57	Fe	23823.904031	0.114	7881917.393	ug/L	10486.581
	68	Zn	41.067309	0.811	40762.175	ug/L	1481.781
	75	As	4.771820	3.339	26177.581	ug/L	14024.955
	82	Se	1.635982	10.375	1795.471	ug/L	1385.294
>	72	Ge-1			1694898.846	ug/L	1668753.514
	107	Ag	0.103458	3.520	1409.156	ug/L	375.344
	111	Cd	0.618230	4.697	1447.022	ug/L	39.260
	135	Ba	91.168345	0.267	198645.282	ug/L	119.001
>	115	In-1			1584313.385	ug/L	1540216.761
	205	Tl	0.184676	3.252	10044.255	ug/L	7108.392
	208	Pb	20.392761	1.144	471483.349	ug/L	2139.139
>	169	Tm-1			959794.058	ug/L	994467.461
	50	Cr	56.062690	9.151	10365.846	ug/L	-1134.763
	53	Cr	91.430616	6.343	217409.008	ug/L	165610.380
	67	Zn	69.246777	2.782	9482.411	ug/L	4498.117
	66	Zn	42.633906	1.379	21505.953	ug/L	243.013
	76	Se	45.716089	31.663	-241678.039	ug/L	-241143.898
	77	Se	-6.139668	22.483	14518.252	ug/L	15006.042
	78	Se	2.787540	16.314	17101.261	ug/L	15199.393
	79	Br	0.803230	2175.400	88330.231	ug/L	86751.690
>	72	Ge			1694898.846	ug/L	1668753.514
	108	Cd	-12.612732	8.921	-1977.396	ug/L	5.977
	114	Cd	0.060746	19.197	391.988	ug/L	60.315
	109	Ag	0.045207	5.633	293.019	ug/L	135.337
>	115	In			1584313.385	ug/L	1540216.761
	208	207.977	20.752672	1.125	246023.623	ug/L	1109.097
	207	Pb	20.959358	0.515	101328.707	ug/L	463.017
	206	Pb	19.303309	1.766	124131.020	ug/L	567.025
>	169	Tm			959794.058	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	101.567
Ag	107	
Cd	111	
Ba	135	
In-1	115	102.863
Tl	205	
Pb	208	
Tm-1	169	96.513
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.567
Cd	108	
Cd	114	
Ag	109	
In	115	102.863
207.977	208	
Pb	207	
Pb	206	
Tm	169	96.513

Sample ID: L9FXNZ
Sample Description: G0K020530-12 PS
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 15:53:31
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXNZ.032
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 48
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	3596.668303	0.434	1042852.656	ug/L	29499.590
|	51	V	400.072199	0.910	4360314.781	ug/L	-25163.541
|	52	Cr	359.087905	1.142	3464459.231	ug/L	35160.535
|	54	Fe	113402.656667	0.439	89197689.795	ug/L	89965.726
|	57	Fe	112263.194149	0.711	36247091.995	ug/L	10486.581
|	68	Zn	353.672009	0.663	331773.438	ug/L	1481.781
|	75	As	203.541984	0.677	511211.025	ug/L	14024.955
|	82	Se	194.799892	0.961	46554.442	ug/L	1385.294
⌊>	72	Ge-1			1655876.725	ug/L	1668753.514
⌈	107	Ag	50.243453	0.695	473206.190	ug/L	375.344
|	111	Cd	196.704751	0.722	425851.169	ug/L	39.260
|	135	Ba	632.225131	0.268	1310094.108	ug/L	119.001
⌊>	115	In-1			1507545.863	ug/L	1540216.761
⌈	205	Tl	51.173807	0.586	837823.104	ug/L	7108.392
|	208	Pb	282.753016	0.511	6134921.549	ug/L	2139.139
⌊>	169	Tm-1			904359.809	ug/L	994467.461
⌈	50	Cr	390.035901	5.236	77155.016	ug/L	-1134.763
|	53	Cr	902.190948	1.641	638657.948	ug/L	165610.380
|	67	Zn	505.819204	1.277	39528.141	ug/L	4498.117
|	66	Zn	362.269408	0.312	176724.147	ug/L	243.013
|	76	Se	66.514735	17.316	-234669.717	ug/L	-241143.898
|	77	Se	330.342842	0.621	52907.515	ug/L	15006.042
|	78	Se	189.613944	0.040	125653.512	ug/L	15199.393
|	79	Br	649.025386	24.778	252086.512	ug/L	86751.690
⌊>	72	Ge			1655876.725	ug/L	1668753.514
⌈	108	Cd	132.098498	5.186	19763.032	ug/L	5.977
|	114	Cd	192.231849	0.812	993693.147	ug/L	60.315
|	109	Ag	49.567362	1.295	160615.511	ug/L	135.337
⌊>	115	In			1507545.863	ug/L	1540216.761
⌈	208	207.977	287.806603	0.592	3201998.972	ug/L	1109.097
|	207	Pb	303.234016	0.376	1375665.222	ug/L	463.017
|	206	Pb	258.039987	0.475	1557257.355	ug/L	567.025
⌊>	169	Tm			904359.809	ug/L	994467.461

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
⌈	Ca	44	
|	V	51	
|	Cr	52	
|	Fe	54	
|	Fe	57	
|	Zn	68	
|	As	75	
|	Se	82	
⌊>	Ge-1	72	99.228
⌈	Ag	107	
|	Cd	111	
|	Ba	135	
⌊>	In-1	115	97.879
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	90.939
⌈	Cr	50	
|	Cr	53	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	99.228
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	97.879
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	90.939

Sample ID: L9FXD
Sample Description: G0K020530-4
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 15:57:15
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXD.033
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 49
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	10588.061497	0.617	3000718.648	ug/L	29499.590
|	51	V	253.141054	0.492	2738663.297	ug/L	-25163.541
|	52	Cr	148.586765	0.646	1448154.514	ug/L	35160.535
|	54	Fe	86755.214198	0.542	67986910.781	ug/L	89965.726
|	57	Fe	85687.513154	0.503	27556753.475	ug/L	10486.581
|	68	Zn	227.762722	0.281	213322.689	ug/L	1481.781
|	75	As	32.805944	0.710	93691.692	ug/L	14024.955
|	82	Se	4.973823	1.303	2518.108	ug/L	1385.294
⌊>	72	Ge-1			1649140.256	ug/L	1668753.514
⌈	107	Ag	0.516260	1.838	5278.523	ug/L	375.344
|	111	Cd	2.988770	2.184	6574.280	ug/L	39.260
|	135	Ba	449.539284	1.035	940653.171	ug/L	119.001
⌊>	115	In-1			1522373.397	ug/L	1540216.761
⌈	205	Tl	1.335572	1.131	28202.692	ug/L	7108.392
|	208	Pb	85.462603	0.981	1858442.244	ug/L	2139.139
⌊>	169	Tm-1			905724.650	ug/L	994467.461
⌈	50	Cr	396.542489	1.865	78120.081	ug/L	-1134.763
|	53	Cr	420.751069	1.125	384007.223	ug/L	165610.380
|	67	Zn	341.062632	1.253	27996.155	ug/L	4498.117
|	66	Zn	235.639427	1.239	114557.512	ug/L	243.013
|	76	Se	-51.521106	64.228	-241880.425	ug/L	-241143.898
|	77	Se	44.978664	3.643	19986.625	ug/L	15006.042
|	78	Se	5.680506	7.152	18319.801	ug/L	15199.393
|	79	Br	568.933112	16.609	230268.632	ug/L	86751.690
⌊>	72	Ge			1649140.256	ug/L	1668753.514
⌈	108	Cd	-16.829212	3.538	-2535.177	ug/L	5.977
|	114	Cd	0.722245	1.034	3829.945	ug/L	60.315
|	109	Ag	0.211477	1.065	825.150	ug/L	135.337
⌊>	115	In			1522373.397	ug/L	1540216.761
⌈	208	207.977	87.049150	0.976	970643.731	ug/L	1109.097
|	207	Pb	87.477461	1.309	397742.373	ug/L	463.017
|	206	Pb	81.023052	0.988	490056.140	ug/L	567.025
⌊>	169	Tm			905724.650	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	98.825
Ag	107	
Cd	111	
Ba	135	
In-1	115	98.842
Tl	205	
Pb	208	
Tm-1	169	91.076
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	98.825
Cd	108	
Cd	114	
Ag	109	
In	115	98.842
207.977	208	
Pb	207	
Pb	206	
Tm	169	91.076

Sample ID: L9FXE
Sample Description: G0K020530-5
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:01:00
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXE.034
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 50
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	3828.903136	0.070	1135574.246	ug/L	29499.590
	51	V	264.271034	0.721	2942444.747	ug/L	-25163.541
	52	Cr	166.843088	0.343	1668442.517	ug/L	35160.535
	54	Fe	211692.511642	0.414	170524796.754	ug/L	89965.726
	57	Fe	209730.519560	0.936	69374117.048	ug/L	10486.581
	68	Zn	227.953381	0.709	219637.186	ug/L	1481.781
	75	As	44.307707	1.094	125171.601	ug/L	14024.955
	82	Se	5.027561	6.686	2602.967	ug/L	1385.294
>	72	Ge-1			1696619.158	ug/L	1668753.514
	107	Ag	0.668808	2.793	6604.426	ug/L	375.344
	111	Cd	2.828645	2.573	6108.820	ug/L	39.260
	135	Ba	326.428982	0.594	670722.031	ug/L	119.001
>	115	In-1			1494754.788	ug/L	1540216.761
	205	Tl	1.407240	1.196	28067.096	ug/L	7108.392
	208	Pb	90.656802	0.508	1883937.851	ug/L	2139.139
>	169	Tm-1			865562.520	ug/L	994467.461
	50	Cr	293.181151	4.066	59128.469	ug/L	-1134.763
	53	Cr	410.494065	0.263	389500.579	ug/L	165610.380
	67	Zn	320.537157	0.480	27340.812	ug/L	4498.117
	66	Zn	231.632790	0.177	115865.396	ug/L	243.013
	76	Se	-175.973744	9.522	-257679.650	ug/L	-241143.898
	77	Se	12.966172	12.707	16785.149	ug/L	15006.042
	78	Se	5.395397	8.128	18676.189	ug/L	15199.393
	79	Br	276.381008	15.485	160572.237	ug/L	86751.690
>	72	Ge			1696619.158	ug/L	1668753.514
	108	Cd	-1.373269	83.597	-197.128	ug/L	5.977
	114	Cd	0.129085	8.558	720.349	ug/L	60.315
	109	Ag	0.190489	3.157	742.788	ug/L	135.337
>	115	In			1494754.788	ug/L	1540216.761
	208	207.977	92.223241	0.751	982711.455	ug/L	1109.097
	207	Pb	92.846120	0.721	403428.630	ug/L	463.017
	206	Pb	86.123173	0.196	497797.766	ug/L	567.025
>	169	Tm			865562.520	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	101.670
Ag	107	
Cd	111	
Ba	135	
In-1	115	97.048
Tl	205	
Pb	208	
Tm-1	169	87.038
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.670
Cd	108	
Cd	114	
Ag	109	
In	115	97.048
207.977	208	
Pb	207	
Pb	206	
Tm	169	87.038

Sample ID: CCV 3
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 16:04:51
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCV 3.035
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	5012.845839	0.929	1385892.941	ug/L	29499.590
	51	V	99.427849	0.599	1023499.006	ug/L	-25163.541
	52	Cr	99.867271	0.547	950276.183	ug/L	35160.535
	54	Fe	5142.496754	1.368	3969545.721	ug/L	89965.726
	57	Fe	5192.422885	0.938	1620885.640	ug/L	10486.581
	68	Zn	101.178164	0.651	92232.176	ug/L	1481.781
	75	As	103.651845	0.109	256774.503	ug/L	14024.955
	82	Se	104.429640	0.699	24600.487	ug/L	1385.294
>	72	Ge-1			1591509.812	ug/L	1668753.514
	107	Ag	50.730138	0.819	489940.595	ug/L	375.344
	111	Cd	101.517515	0.101	225383.348	ug/L	39.260
	135	Ba	103.161386	0.832	219291.805	ug/L	119.001
>	115	In-1			1545816.377	ug/L	1540216.761
	205	Tl	50.055096	1.384	877832.972	ug/L	7108.392
	208	Pb	100.118492	0.266	2327974.273	ug/L	2139.139
>	169	Tm-1			968585.862	ug/L	994467.461
	50	Cr	93.747487	3.784	17000.076	ug/L	-1134.763
	53	Cr	124.137126	4.633	220665.237	ug/L	165610.380
	67	Zn	109.414812	6.980	11578.785	ug/L	4498.117
	66	Zn	102.161195	0.305	48066.308	ug/L	243.013
	76	Se	155.652531	4.015	-219606.380	ug/L	-241143.898
	77	Se	106.315072	2.529	26071.000	ug/L	15006.042
	78	Se	105.764323	0.751	73774.693	ug/L	15199.393
	79	Br	111.393347	19.624	110097.889	ug/L	86751.690
>	72	Ge			1591509.812	ug/L	1668753.514
	108	Cd	103.897029	0.973	15941.715	ug/L	5.977
	114	Cd	101.891502	0.477	540129.027	ug/L	60.315
	109	Ag	51.304152	1.020	170473.898	ug/L	135.337
>	115	In			1545816.377	ug/L	1540216.761
	208	207.977	99.858960	0.719	1190621.452	ug/L	1109.097
	207	Pb	100.352017	0.381	487913.133	ug/L	463.017
	206	Pb	100.421403	0.242	649439.688	ug/L	567.025
>	169	Tm			968585.862	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	95.371
Ag	107	
Cd	111	
Ba	135	
In-1	115	100.364
Tl	205	
Pb	208	
Tm-1	169	97.397
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	95.371
Cd	108	
Cd	114	
Ag	109	
In	115	100.364
207.977	208	
Pb	207	
Pb	206	
Tm	169	97.397

Sample ID: CCB 3
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 16:08:44
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCB 3.036
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44 Ca	12.416182	5.589	32974.886	ug/L	29499.590
	51 V	-0.411534	19.045	-29661.171	ug/L	-25163.541
	52 Cr	-0.735078	5.119	28042.665	ug/L	35160.535
	54 Fe	3.663830	15.697	92721.546	ug/L	89965.726
	57 Fe	6.507784	9.340	12584.442	ug/L	10486.581
	68 Zn	0.051543	128.941	1527.832	ug/L	1481.781
	75 As	0.743612	30.271	15831.996	ug/L	14024.955
	82 Se	0.349176	57.664	1464.661	ug/L	1385.294
>	72 Ge-1			1666156.013	ug/L	1668753.514
	107 Ag	-0.015145	12.993	238.338	ug/L	375.344
	111 Cd	0.001036	311.335	43.066	ug/L	39.260
	135 Ba	0.004335	127.998	133.001	ug/L	119.001
>	115 In-1			1597556.038	ug/L	1540216.761
	205 Tl	0.258950	64.835	11395.341	ug/L	7108.392
	208 Pb	0.017987	12.288	2489.191	ug/L	2139.139
>	169 Tm-1			964013.218	ug/L	994467.461
	50 Cr	-0.706410	38.408	-1275.530	ug/L	-1134.763
	53 Cr	5.529730	30.472	168275.876	ug/L	165610.380
	67 Zn	-0.839447	60.284	4432.652	ug/L	4498.117
	66 Zn	0.015756	129.208	250.347	ug/L	243.013
	76 Se	87.724473	19.950	-234645.950	ug/L	-241143.898
	77 Se	-2.196694	56.600	14727.921	ug/L	15006.042
	78 Se	2.849921	7.218	16847.789	ug/L	15199.393
	79 Br	28.942995	15.796	94060.125	ug/L	86751.690
>	72 Ge			1666156.013	ug/L	1668753.514
	108 Cd	0.054018	52.792	14.767	ug/L	5.977
	114 Cd	0.009561	100.523	115.167	ug/L	60.315
	109 Ag	-0.016913	12.922	82.335	ug/L	135.337
>	115 In			1597556.038	ug/L	1540216.761
	208 207.977	0.020168	6.656	1314.136	ug/L	1109.097
	207 Pb	0.014036	9.358	516.688	ug/L	463.017
	206 Pb	0.016937	29.532	658.367	ug/L	567.025
>	169 Tm			964013.218	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	99.844
Ag	107	
Cd	111	
Ba	135	
In-1	115	103.723
Tl	205	
Pb	208	
Tm-1	169	96.938
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	99.844
Cd	108	
Cd	114	
Ag	109	
In	115	103.723
207.977	208	
Pb	207	
Pb	206	
Tm	169	96.938

Sample ID: CCV 4
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 16:12:36
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCV 4.037
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44 Ca	4985.583588	0.942	1418826.517	ug/L	29499.590
	51 V	99.821402	0.552	1057699.975	ug/L	-25163.541
	52 Cr	100.285085	0.779	982023.595	ug/L	35160.535
	54 Fe	5166.062603	0.631	4103974.817	ug/L	89965.726
	57 Fe	5174.920215	0.822	1662735.197	ug/L	10486.581
	68 Zn	100.363935	1.063	94178.721	ug/L	1481.781
	75 As	103.448588	1.180	263789.749	ug/L	14024.955
	82 Se	104.313614	1.068	25292.958	ug/L	1385.294
⌊>	72 Ge-1			1638068.943	ug/L	1668753.514
⌈	107 Ag	50.276688	0.568	499539.573	ug/L	375.344
	111 Cd	100.307027	0.830	229116.952	ug/L	39.260
	135 Ba	101.037918	0.744	220975.664	ug/L	119.001
⌊>	115 In-1			1590382.588	ug/L	1540216.761
⌈	205 Tl	49.587364	0.793	878922.209	ug/L	7108.392
	208 Pb	98.738995	0.334	2320351.378	ug/L	2139.139
⌊>	169 Tm-1			978878.882	ug/L	994467.461
⌈	50 Cr	96.086994	3.664	17962.513	ug/L	-1134.763
	53 Cr	117.313983	7.002	223572.954	ug/L	165610.380
	67 Zn	102.280297	1.791	11429.335	ug/L	4498.117
	66 Zn	101.277468	0.552	49045.897	ug/L	243.013
	76 Se	175.316859	10.626	-224682.614	ug/L	-241143.898
	77 Se	108.927211	1.136	27130.758	ug/L	15006.042
	78 Se	105.266566	1.445	75643.402	ug/L	15199.393
	79 Br	111.711466	1.888	113412.386	ug/L	86751.690
⌊>	72 Ge			1638068.943	ug/L	1668753.514
⌈	108 Cd	101.850956	0.762	16077.876	ug/L	5.977
	114 Cd	100.817655	0.860	549827.166	ug/L	60.315
	109 Ag	50.391043	1.070	172267.464	ug/L	135.337
⌊>	115 In			1590382.588	ug/L	1540216.761
⌈	208 207.977	98.496003	0.250	1186884.500	ug/L	1109.097
	207 Pb	98.653381	0.607	484759.783	ug/L	463.017
	206 Pb	99.251326	0.774	648707.095	ug/L	567.025
⌊>	169 Tm			978878.882	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	98.161
Ag	107	
Cd	111	
Ba	135	
In-1	115	103.257
Tl	205	
Pb	208	
Tm-1	169	98.432
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	98.161
Cd	108	
Cd	114	
Ag	109	
In	115	103.257
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.432

Report Date/Time: Wednesday, November 10, 2010 16:14:13
Page 2
Sample ID: CCV 4

Sample ID: CCB 4
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 16:16:29
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCB 4.038
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	16.926519	5.576	34576.683	ug/L	29499.590
|	51	V	-0.724777	4.881	-33431.242	ug/L	-25163.541
|	52	Cr	-0.312397	8.749	32406.978	ug/L	35160.535
|	54	Fe	4.698478	44.787	94424.636	ug/L	89965.726
|	57	Fe	6.468258	26.777	12690.078	ug/L	10486.581
|	68	Zn	0.084504	75.406	1573.564	ug/L	1481.781
|	75	As	0.634806	11.269	15710.518	ug/L	14024.955
|	82	Se	0.283123	66.228	1462.875	ug/L	1385.294
⌊>	72	Ge-1			1681902.828	ug/L	1668753.514
⌈	107	Ag	-0.015957	8.342	231.004	ug/L	375.344
|	111	Cd	0.004656	36.303	51.588	ug/L	39.260
|	135	Ba	0.000972	841.726	126.001	ug/L	119.001
⌊>	115	In-1			1603123.286	ug/L	1540216.761
⌈	205	Tl	0.066728	101.324	8067.850	ug/L	7108.392
|	208	Pb	0.005532	87.144	2206.815	ug/L	2139.139
⌊>	169	Tm-1			966516.263	ug/L	994467.461
⌈	50	Cr	-0.599201	36.384	-1265.859	ug/L	-1134.763
|	53	Cr	20.389706	12.850	177804.571	ug/L	165610.380
|	67	Zn	3.271535	23.607	4763.988	ug/L	4498.117
|	66	Zn	-0.007156	619.110	241.346	ug/L	243.013
|	76	Se	76.356896	23.182	-237662.572	ug/L	-241143.898
|	77	Se	5.735927	14.271	15794.709	ug/L	15006.042
|	78	Se	2.529741	7.354	16817.337	ug/L	15199.393
|	79	Br	19.478069	25.320	92492.177	ug/L	86751.690
⌊>	72	Ge			1681902.828	ug/L	1668753.514
⌈	108	Cd	-0.038489	100.828	0.089	ug/L	5.977
|	114	Cd	0.000372	830.265	64.822	ug/L	60.315
|	109	Ag	-0.022424	9.891	63.668	ug/L	135.337
⌊>	115	In			1603123.286	ug/L	1540216.761
⌈	208	207.977	0.005755	38.007	1146.437	ug/L	1109.097
|	207	Pb	0.006572	171.383	481.685	ug/L	463.017
|	206	Pb	0.004339	201.379	578.693	ug/L	567.025
⌊>	169	Tm			966516.263	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	100.788
Ag	107	
Cd	111	
Ba	135	
In-1	115	104.084
Tl	205	
Pb	208	
Tm-1	169	97.189
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.788
Cd	108	
Cd	114	
Ag	109	
In	115	104.084
207.977	208	
Pb	207	
Pb	206	
Tm	169	97.189

Sample ID: L9FXF
Sample Description: G0K020530-6
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:20:16
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXF.039
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 51
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
44	Ca	8395.849547	0.195	2378261.292	ug/L	29499.590
51	V	289.899895	0.342	3130326.067	ug/L	-25163.541
52	Cr	170.451706	0.498	1651055.263	ug/L	35160.535
54	Fe	178470.787388	0.408	139330482.306	ug/L	89965.726
57	Fe	177122.210485	0.373	56776795.368	ug/L	10486.581
68	Zn	231.349961	0.194	215988.417	ug/L	1481.781
75	As	47.049230	0.783	127946.543	ug/L	14024.955
82	Se	4.077202	7.568	2303.787	ug/L	1385.294
72	Ge-1			1644090.034	ug/L	1668753.514
107	Ag	0.606039	1.824	5894.730	ug/L	375.344
111	Cd	2.767335	4.303	5854.184	ug/L	39.260
135	Ba	304.965150	0.414	613635.759	ug/L	119.001
115	In-1			1463742.784	ug/L	1540216.761
205	Tl	1.686708	1.995	31686.373	ug/L	7108.392
208	Pb	119.354670	0.334	2424188.777	ug/L	2139.139
169	Tm-1			846173.103	ug/L	994467.461
50	Cr	309.293911	2.242	60518.244	ug/L	-1134.763
53	Cr	438.022904	0.346	391815.789	ug/L	165610.380
67	Zn	330.863742	0.356	27204.518	ug/L	4498.117
66	Zn	234.176824	0.326	113509.989	ug/L	243.013
76	Se	-143.118308	6.491	-247436.270	ug/L	-241143.898
77	Se	32.570190	3.353	18505.817	ug/L	15006.042
78	Se	4.757789	5.624	17730.058	ug/L	15199.393
79	Br	707.214569	11.585	265037.089	ug/L	86751.690
72	Ge			1644090.034	ug/L	1668753.514
108	Cd	2.789487	25.595	410.461	ug/L	5.977
114	Cd	0.398782	1.652	2058.686	ug/L	60.315
109	Ag	0.185158	5.419	710.778	ug/L	135.337
115	In			1463742.784	ug/L	1540216.761
208	207.977	121.171685	0.516	1261968.091	ug/L	1109.097
207	Pb	123.076274	0.251	522674.518	ug/L	463.017
206	Pb	113.207204	0.745	639546.169	ug/L	567.025
169	Tm			846173.103	ug/L	994467.461

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
⌈	Ca	44	
|	V	51	
|	Cr	52	
|	Fe	54	
|	Fe	57	
|	Zn	68	
|	As	75	
|	Se	82	
⌊>	Ge-1	72	98.522
⌈	Ag	107	
|	Cd	111	
|	Ba	135	
⌊>	In-1	115	95.035
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	85.088
⌈	Cr	50	
|	Cr	53	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	98.522
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	95.035
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	85.088

Sample ID: L9FXG
Sample Description: G0K020530-7
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:24:01
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXG.040
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 52
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	3263.608200	0.892	981930.648	ug/L	29499.590
	51	V	213.830014	0.594	2399356.788	ug/L	-25163.541
	52	Cr	150.471979	0.088	1523098.499	ug/L	35160.535
	54	Fe	129031.858306	0.780	105000338.383	ug/L	89965.726
	57	Fe	128544.769548	0.066	42942552.254	ug/L	10486.581
	68	Zn	189.200322	0.290	184350.227	ug/L	1481.781
	75	As	58.802312	0.567	163048.094	ug/L	14024.955
	82	Se	4.443077	4.727	2488.413	ug/L	1385.294
>	72	Ge-1			1713319.808	ug/L	1668753.514
	107	Ag	0.479107	1.032	4946.255	ug/L	375.344
	111	Cd	2.420381	5.281	5354.755	ug/L	39.260
	135	Ba	467.759415	0.545	983157.225	ug/L	119.001
>	115	In-1			1529087.395	ug/L	1540216.761
	205	Tl	0.906268	2.745	21118.329	ug/L	7108.392
	208	Pb	65.861202	0.555	1425837.162	ug/L	2139.139
>	169	Tm-1			901397.641	ug/L	994467.461
	50	Cr	409.389400	4.197	83859.633	ug/L	-1134.763
	53	Cr	413.632226	0.902	395041.445	ug/L	165610.380
	67	Zn	296.026700	1.174	25851.538	ug/L	4498.117
	66	Zn	201.460048	0.396	101797.948	ug/L	243.013
	76	Se	-100.237484	24.111	-254781.377	ug/L	-241143.898
	77	Se	33.054877	5.431	19342.222	ug/L	15006.042
	78	Se	4.852879	3.592	18533.449	ug/L	15199.393
	79	Br	635.568540	19.904	257115.668	ug/L	86751.690
>	72	Ge			1713319.808	ug/L	1668753.514
	108	Cd	-32.265496	2.212	-4889.761	ug/L	5.977
	114	Cd	0.166759	4.014	934.359	ug/L	60.315
	109	Ag	0.200880	4.602	794.139	ug/L	135.337
>	115	In			1529087.395	ug/L	1540216.761
	208	207.977	66.993676	0.732	743686.417	ug/L	1109.097
	207	Pb	67.233604	0.535	304351.328	ug/L	463.017
	206	Pb	62.741723	0.505	377799.418	ug/L	567.025
>	169	Tm			901397.641	ug/L	994467.461

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Ca	44	
	V	51	
	Cr	52	
	Fe	54	
	Fe	57	
	Zn	68	
	As	75	
	Se	82	
>	Ge-1	72	102.671
	Ag	107	
	Cd	111	
	Ba	135	
>	In-1	115	99.277
	Tl	205	
	Pb	208	
>	Tm-1	169	90.641
	Cr	50	
	Cr	53	
	Zn	67	
	Zn	66	
	Se	76	
	Se	77	
	Se	78	
	Br	79	
>	Ge	72	102.671
	Cd	108	
	Cd	114	
	Ag	109	
>	In	115	99.277
	207.977	208	
	Pb	207	
	Pb	206	
>	Tm	169	90.641

Sample ID: L9FXH
Sample Description: G0K020530-8
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:27:47
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXH.041
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 53
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	4726.226088	0.282	1376793.872	ug/L	29499.590
	51	V	239.231827	0.832	2627120.890	ug/L	-25163.541
	52	Cr	165.755739	0.715	1636572.390	ug/L	35160.535
	54	Fe	141131.266497	0.406	112259656.305	ug/L	89965.726
	57	Fe	139822.685657	0.390	45660777.517	ug/L	10486.581
	68	Zn	232.566736	0.912	221179.091	ug/L	1481.781
	75	As	144.876276	0.894	372093.880	ug/L	14024.955
	82	Se	5.453585	4.216	2669.664	ug/L	1385.294
>	72	Ge-1			1674868.285	ug/L	1668753.514
	107	Ag	0.583845	2.647	5792.303	ug/L	375.344
	111	Cd	2.756904	1.694	5935.002	ug/L	39.260
	135	Ba	404.979505	0.416	829217.773	ug/L	119.001
>	115	In-1			1489553.174	ug/L	1540216.761
	205	Tl	0.925840	3.085	21168.827	ug/L	7108.392
	208	Pb	72.251293	0.938	1544649.362	ug/L	2139.139
>	169	Tm-1			890253.774	ug/L	994467.461
	50	Cr	371.907787	1.299	74360.708	ug/L	-1134.763
	53	Cr	468.291237	1.671	415244.022	ug/L	165610.380
	67	Zn	344.375413	2.154	28661.978	ug/L	4498.117
	66	Zn	238.172593	0.471	117602.278	ug/L	243.013
	76	Se	-99.981941	10.285	-249040.823	ug/L	-241143.898
	77	Se	46.340018	2.256	20454.987	ug/L	15006.042
	78	Se	5.534275	6.050	18519.328	ug/L	15199.393
	79	Br	684.943789	20.013	264180.758	ug/L	86751.690
>	72	Ge			1674868.285	ug/L	1668753.514
	108	Cd	-27.701627	1.938	-4088.478	ug/L	5.977
	114	Cd	0.175767	4.944	956.128	ug/L	60.315
	109	Ag	0.231919	0.911	872.834	ug/L	135.337
>	115	In			1489553.174	ug/L	1540216.761
	208	207.977	73.739188	0.836	808353.275	ug/L	1109.097
	207	Pb	73.737882	0.950	329621.546	ug/L	463.017
	206	Pb	68.390735	1.251	406674.540	ug/L	567.025
>	169	Tm			890253.774	ug/L	994467.461

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
⌈	Ca	44	
|	V	51	
|	Cr	52	
|	Fe	54	
|	Fe	57	
|	Zn	68	
|	As	75	
|	Se	82	
⌊>	Ge-1	72	100.366
⌈	Ag	107	
|	Cd	111	
|	Ba	135	
⌊>	In-1	115	96.711
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	89.521
⌈	Cr	50	
|	Cr	53	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	100.366
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	96.711
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	89.521

Sample ID: L9FXJ
Sample Description: G0K020530-9
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:31:33
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXJ.042
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 54
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	5414.126964	1.176	1537367.201	ug/L	29499.590
	51	V	228.776237	0.614	2454722.323	ug/L	-25163.541
	52	Cr	57.962473	0.709	581826.122	ug/L	35160.535
	54	Fe	57501.862619	0.969	44762801.140	ug/L	89965.726
	57	Fe	56946.310064	0.765	18184101.684	ug/L	10486.581
	68	Zn	107.139900	0.548	100389.867	ug/L	1481.781
	75	As	70.100743	0.562	183091.434	ug/L	14024.955
	82	Se	1.682848	22.772	1744.352	ug/L	1385.294
>	72	Ge-1			1637208.787	ug/L	1668753.514
	107	Ag	0.264233	2.337	2851.639	ug/L	375.344
	111	Cd	2.637924	2.565	5743.922	ug/L	39.260
	135	Ba	117.146382	0.954	242611.256	ug/L	119.001
>	115	In-1			1506095.354	ug/L	1540216.761
	205	Tl	0.131633	5.847	8576.109	ug/L	7108.392
	208	Pb	335.145956	0.079	7249155.402	ug/L	2139.139
>	169	Tm-1			901567.346	ug/L	994467.461
	50	Cr	300.313631	1.304	58474.938	ug/L	-1134.763
	53	Cr	172.105718	3.170	251924.634	ug/L	165610.380
	67	Zn	169.610829	1.148	16037.385	ug/L	4498.117
	66	Zn	107.503929	0.299	52020.002	ug/L	243.013
	76	Se	-10.481027	132.032	-237302.458	ug/L	-241143.898
	77	Se	14.505628	11.640	16374.071	ug/L	15006.042
	78	Se	3.453610	4.137	16903.925	ug/L	15199.393
	79	Br	514.859931	15.775	215403.773	ug/L	86751.690
>	72	Ge			1637208.787	ug/L	1668753.514
	108	Cd	-0.766224	136.778	-108.906	ug/L	5.977
	114	Cd	1.689091	0.817	8781.533	ug/L	60.315
	109	Ag	0.132839	7.962	562.070	ug/L	135.337
>	115	In			1506095.354	ug/L	1540216.761
	208	207.977	340.902464	0.159	3780983.583	ug/L	1109.097
	207	Pb	354.147401	0.493	1601654.665	ug/L	463.017
	206	Pb	310.249293	0.122	1866517.154	ug/L	567.025
>	169	Tm			901567.346	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	98.110
Ag	107	
Cd	111	
Ba	135	
In-1	115	97.785
Tl	205	
Pb	208	
Tm-1	169	90.658
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	98.110
Cd	108	
Cd	114	
Ag	109	
In	115	97.785
207.977	208	
Pb	207	
Pb	206	
Tm	169	90.658

Sample ID: L9FXL
Sample Description: G0K020530-10
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:35:20
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXL.043
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 55
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	3248.447612	0.724	947236.970	ug/L	29499.590
|	51	V	193.748152	0.677	2104373.671	ug/L	-25163.541
|	52	Cr	120.796951	1.114	1191766.920	ug/L	35160.535
|	54	Fe	118731.499678	1.268	93632702.090	ug/L	89965.726
|	57	Fe	118047.105140	0.597	38215282.205	ug/L	10486.581
|	68	Zn	129.804748	0.455	123024.570	ug/L	1481.781
|	75	As	29.238524	0.600	85579.348	ug/L	14024.955
|	82	Se	1.985854	8.797	1839.936	ug/L	1385.294
⌊>	72	Ge-1			1660271.185	ug/L	1668753.514
⌈	107	Ag	0.443698	3.302	4544.623	ug/L	375.344
|	111	Cd	2.034147	2.148	4443.366	ug/L	39.260
|	135	Ba	248.932474	0.650	516053.917	ug/L	119.001
⌊>	115	In-1			1507997.996	ug/L	1540216.761
⌈	205	Tl	0.431154	3.847	13565.781	ug/L	7108.392
|	208	Pb	67.114298	0.618	1468267.101	ug/L	2139.139
⌊>	169	Tm-1			910934.008	ug/L	994467.461
⌈	50	Cr	370.863589	3.251	73491.163	ug/L	-1134.763
|	53	Cr	305.426348	2.034	325781.093	ug/L	165610.380
|	67	Zn	201.608663	0.589	18488.568	ug/L	4498.117
|	66	Zn	136.580938	0.608	66953.565	ug/L	243.013
|	76	Se	-56.430841	10.611	-243843.581	ug/L	-241143.898
|	77	Se	11.542414	9.995	16262.201	ug/L	15006.042
|	78	Se	2.775843	8.226	16745.032	ug/L	15199.393
|	79	Br	389.784339	15.969	186179.752	ug/L	86751.690
⌊>	72	Ge			1660271.185	ug/L	1668753.514
⌈	108	Cd	4.666014	9.541	703.832	ug/L	5.977
|	114	Cd	0.243596	4.350	1318.438	ug/L	60.315
|	109	Ag	0.153926	5.532	631.088	ug/L	135.337
⌊>	115	In			1507997.996	ug/L	1540216.761
⌈	208	207.977	68.194491	0.678	764991.714	ug/L	1109.097
|	207	Pb	68.735356	0.403	314423.599	ug/L	463.017
|	206	Pb	63.904279	0.797	388851.788	ug/L	567.025
⌊>	169	Tm			910934.008	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	99.492
Ag	107	
Cd	111	
Ba	135	
In-1	115	97.908
Tl	205	
Pb	208	
Tm-1	169	91.600
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	99.492
Cd	108	
Cd	114	
Ag	109	
In	115	97.908
207.977	208	
Pb	207	
Pb	206	
Tm	169	91.600

Sample ID: L9FXM
Sample Description: G0K020530-11
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:39:07
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXM.044
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 56
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	9175.893349	0.905	2486883.996	ug/L	29499.590
	51	V	117.458506	0.710	1200643.751	ug/L	-25163.541
	52	Cr	150.734080	0.845	1402207.504	ug/L	35160.535
	54	Fe	59491.258378	0.749	44538877.645	ug/L	89965.726
	57	Fe	58665.039049	0.742	18017296.344	ug/L	10486.581
	68	Zn	315.085012	0.290	281235.203	ug/L	1481.781
	75	As	22.624484	0.489	65800.605	ug/L	14024.955
	82	Se	4.075193	5.091	2206.073	ug/L	1385.294
>	72	Ge-1			1574681.416	ug/L	1668753.514
	107	Ag	0.801689	0.354	7637.247	ug/L	375.344
	111	Cd	3.155422	3.290	6629.664	ug/L	39.260
	135	Ba	392.545096	0.398	785203.389	ug/L	119.001
>	115	In-1			1455180.504	ug/L	1540216.761
	205	Tl	1.665930	3.658	32835.532	ug/L	7108.392
	208	Pb	82.413344	0.423	1752755.782	ug/L	2139.139
>	169	Tm-1			885768.044	ug/L	994467.461
	50	Cr	217.386859	5.407	40418.186	ug/L	-1134.763
	53	Cr	403.092370	2.145	357797.367	ug/L	165610.380
	67	Zn	395.838013	0.571	30339.500	ug/L	4498.117
	66	Zn	313.082433	0.264	145271.024	ug/L	243.013
	76	Se	2.616692	297.137	-227377.251	ug/L	-241143.898
	77	Se	33.300669	7.648	17804.086	ug/L	15006.042
	78	Se	4.941551	7.085	17082.882	ug/L	15199.393
	79	Br	389.460310	7.740	176564.146	ug/L	86751.690
>	72	Ge			1574681.416	ug/L	1668753.514
	108	Cd	-50.656509	3.837	-7306.547	ug/L	5.977
	114	Cd	2.348331	2.465	11775.061	ug/L	60.315
	109	Ag	0.769524	2.875	2533.413	ug/L	135.337
>	115	In			1455180.504	ug/L	1540216.761
	208	207.977	83.815165	0.412	914046.348	ug/L	1109.097
	207	Pb	85.026605	0.577	378105.571	ug/L	463.017
	206	Pb	77.864501	0.660	460603.863	ug/L	567.025
>	169	Tm			885768.044	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	94.363
Ag	107	
Cd	111	
Ba	135	
In-1	115	94.479
Tl	205	
Pb	208	
Tm-1	169	89.070
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	94.363
Cd	108	
Cd	114	
Ag	109	
In	115	94.479
207.977	208	
Pb	207	
Pb	206	
Tm	169	89.070

SHargrave

Sample ID: L9FXQ
Sample Description: G0K020530-13
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:42:54
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXQ.045
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 57
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	44	Ca	8176.354482	0.246	2324388.465	ug/L	29499.590
	51	V	204.613871	1.517	2209144.354	ug/L	-25163.541
	52	Cr	164.899011	1.456	1603468.682	ug/L	35160.535
	54	Fe	127327.822700	0.481	99747774.518	ug/L	89965.726
	57	Fe	126554.305812	1.232	40698863.958	ug/L	10486.581
	68	Zn	1679.659106	0.552	1563999.071	ug/L	1481.781
	75	As	96.490132	0.743	248691.022	ug/L	14024.955
	82	Se	4.806563	5.767	2479.624	ug/L	1385.294
>	72	Ge-1			1649421.298	ug/L	1668753.514
	107	Ag	0.513412	0.999	5101.044	ug/L	375.344
	111	Cd	3.363478	1.731	7181.565	ug/L	39.260
	135	Ba	402.603716	1.019	818565.682	ug/L	119.001
>	115	In-1			1479131.675	ug/L	1540216.761
	205	Tl	1.001825	1.939	22350.517	ug/L	7108.392
	208	Pb	159.587823	0.373	3404549.649	ug/L	2139.139
>	169	Tm-1			888948.470	ug/L	994467.461
	50	Cr	249.931222	0.843	48844.979	ug/L	-1134.763
	53	Cr	439.814939	1.318	394008.725	ug/L	165610.380
	67	Zn	1848.716898	0.957	132099.671	ug/L	4498.117
	66	Zn	1624.712796	0.806	788622.772	ug/L	243.013
	76	Se	-82.910330	2.948	-244077.584	ug/L	-241143.898
	77	Se	38.670993	6.176	19265.061	ug/L	15006.042
	78	Se	4.715772	1.020	17762.422	ug/L	15199.393
	79	Br	323.705962	7.852	168202.165	ug/L	86751.690
>	72	Ge			1649421.298	ug/L	1668753.514
	108	Cd	-32.893610	4.250	-4821.644	ug/L	5.977
	114	Cd	1.005377	3.642	5156.270	ug/L	60.315
	109	Ag	0.191478	9.294	738.454	ug/L	135.337
>	115	In			1479131.675	ug/L	1540216.761
	208	207.977	160.251736	0.294	1753006.812	ug/L	1109.097
	207	Pb	163.522378	0.589	729423.477	ug/L	463.017
	206	Pb	155.406090	0.551	922119.360	ug/L	567.025
>	169	Tm			888948.470	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	98.842
Ag	107	
Cd	111	
Ba	135	
In-1	115	96.034
Tl	205	
Pb	208	
Tm-1	169	89.389
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	98.842
Cd	108	
Cd	114	
Ag	109	
In	115	96.034
207.977	208	
Pb	207	
Pb	206	
Tm	169	89.389

Sample ID: L9FXW
Sample Description: G0K020530-14
Batch ID: 313206
Sample Date/Time: Wednesday, November 10, 2010 16:46:42
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\L9FXW.046
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 58
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
44	Ca	1260.413620	0.168	376308.246	ug/L	29499.590
51	V	170.541951	0.256	1805243.437	ug/L	-25163.541
52	Cr	160.470634	0.170	1534247.578	ug/L	35160.535
54	Fe	114042.114734	1.017	87796734.656	ug/L	89965.726
57	Fe	113771.790845	0.996	35954748.778	ug/L	10486.581
68	Zn	113.940253	0.631	105590.641	ug/L	1481.781
75	As	16.683828	0.408	53517.523	ug/L	14024.955
82	Se	10.426209	3.381	3712.226	ug/L	1385.294
72	Ge-1			1620712.530	ug/L	1668753.514
107	Ag	0.521145	1.243	5110.051	ug/L	375.344
111	Cd	2.719416	4.151	5742.058	ug/L	39.260
135	Ba	377.991437	0.804	759186.953	ug/L	119.001
115	In-1			1461144.988	ug/L	1540216.761
205	Tl	1.263048	1.117	25959.510	ug/L	7108.392
208	Pb	88.516775	1.000	1849033.730	ug/L	2139.139
169	Tm-1			870081.046	ug/L	994467.461
50	Cr	235.215027	1.365	45102.264	ug/L	-1134.763
53	Cr	435.225669	0.847	384803.573	ug/L	165610.380
67	Zn	208.721855	1.819	18530.920	ug/L	4498.117
66	Zn	123.838669	0.809	59284.303	ug/L	243.013
76	Se	-63.761784	18.002	-238530.960	ug/L	-241143.898
77	Se	42.640785	2.363	19376.962	ug/L	15006.042
78	Se	10.776696	3.702	20912.613	ug/L	15199.393
79	Br	248.095874	12.995	146338.015	ug/L	86751.690
72	Ge			1620712.530	ug/L	1668753.514
108	Cd	-33.637064	6.174	-4869.340	ug/L	5.977
114	Cd	0.160955	4.758	863.390	ug/L	60.315
109	Ag	0.162068	8.255	636.756	ug/L	135.337
115	In			1461144.988	ug/L	1540216.761
208	207.977	90.305252	0.762	967283.693	ug/L	1109.097
207	Pb	90.110783	1.860	393572.290	ug/L	463.017
206	Pb	84.021324	0.842	488177.748	ug/L	567.025
169	Tm			870081.046	ug/L	994467.461

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Ca	44	
	V	51	
	Cr	52	
	Fe	54	
	Fe	57	
	Zn	68	
	As	75	
	Se	82	
>	Ge-1	72	97.121
	Ag	107	
	Cd	111	
	Ba	135	
>	In-1	115	94.866
	Tl	205	
	Pb	208	
>	Tm-1	169	87.492
	Cr	50	
	Cr	53	
	Zn	67	
	Zn	66	
	Se	76	
	Se	77	
	Se	78	
	Br	79	
>	Ge	72	97.121
	Cd	108	
	Cd	114	
	Ag	109	
>	In	115	94.866
	207.977	208	
	Pb	207	
	Pb	206	
>	Tm	169	87.492

Sample ID: CCV 5
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 16:50:35
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCV 5.047
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	5107.402277	1.438	1357768.312	ug/L	29499.590
|	51	V	100.262274	1.579	992971.434	ug/L	-25163.541
|	52	Cr	100.274976	1.684	917685.507	ug/L	35160.535
|	54	Fe	5119.208999	0.751	3801660.754	ug/L	89965.726
|	57	Fe	5151.257548	0.953	1546940.370	ug/L	10486.581
|	68	Zn	101.647979	0.836	89130.525	ug/L	1481.781
|	75	As	104.489898	1.012	248896.585	ug/L	14024.955
|	82	Se	105.265376	1.536	23842.725	ug/L	1385.294
⌊>	72	Ge-1			1531043.408	ug/L	1668753.514
⌈	107	Ag	51.400754	1.405	476321.699	ug/L	375.344
|	111	Cd	102.337408	1.541	218011.207	ug/L	39.260
|	135	Ba	104.330478	1.559	212811.396	ug/L	119.001
⌊>	115	In-1			1483415.214	ug/L	1540216.761
⌈	205	Tl	50.284950	1.933	853915.538	ug/L	7108.392
|	208	Pb	100.747879	1.242	2268567.050	ug/L	2139.139
⌊>	169	Tm-1			938106.190	ug/L	994467.461
⌈	50	Cr	91.619299	7.984	15957.032	ug/L	-1134.763
|	53	Cr	125.790549	2.631	213095.235	ug/L	165610.380
|	67	Zn	109.698122	3.112	11158.334	ug/L	4498.117
|	66	Zn	101.590208	0.862	45980.471	ug/L	243.013
|	76	Se	195.889439	7.804	-208676.249	ug/L	-241143.898
|	77	Se	109.750570	2.734	25445.231	ug/L	15006.042
|	78	Se	106.798910	2.098	71521.879	ug/L	15199.393
|	79	Br	111.744386	25.597	106051.839	ug/L	86751.690
⌊>	72	Ge			1531043.408	ug/L	1668753.514
⌈	108	Cd	104.883244	1.180	15442.170	ug/L	5.977
|	114	Cd	102.658828	1.826	522164.090	ug/L	60.315
|	109	Ag	51.139883	1.550	163052.046	ug/L	135.337
⌊>	115	In			1483415.214	ug/L	1540216.761
⌈	208	207.977	100.840386	1.491	1164303.852	ug/L	1109.097
|	207	Pb	100.045405	0.966	471059.797	ug/L	463.017
|	206	Pb	101.105417	1.090	633203.400	ug/L	567.025
⌊>	169	Tm			938106.190	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	91.748
Ag	107	
Cd	111	
Ba	135	
In-1	115	96.312
Tl	205	
Pb	208	
Tm-1	169	94.333
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	91.748
Cd	108	
Cd	114	
Ag	109	
In	115	96.312
207.977	208	
Pb	207	
Pb	206	
Tm	169	94.333

Sample ID: CCB 5
Sample Description:
Batch ID:
Sample Date/Time: Wednesday, November 10, 2010 16:54:28
Method File: c:\elandata\Method\0314158.mth
Dataset File: C:\elandata\Dataset\101110a1\CCB 5.048
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
⌈	44	Ca	5.908024	22.597	30537.429	ug/L	29499.590
|	51	V	-0.453885	56.219	-29574.190	ug/L	-25163.541
|	52	Cr	-0.876214	2.465	26179.073	ug/L	35160.535
|	54	Fe	2.636653	31.291	90172.948	ug/L	89965.726
|	57	Fe	6.178325	6.138	12241.143	ug/L	10486.581
|	68	Zn	0.048853	58.325	1496.361	ug/L	1481.781
|	75	As	0.570852	38.081	15113.744	ug/L	14024.955
|	82	Se	0.348681	107.414	1436.780	ug/L	1385.294
⌊>	72	Ge-1			1634602.770	ug/L	1668753.514
⌈	107	Ag	-0.019059	19.239	196.336	ug/L	375.344
|	111	Cd	0.005698	68.901	52.987	ug/L	39.260
|	135	Ba	0.011111	101.924	145.668	ug/L	119.001
⌊>	115	In-1			1572892.325	ug/L	1540216.761
⌈	205	Tl	0.244528	68.901	11101.470	ug/L	7108.392
|	208	Pb	0.017725	11.207	2476.187	ug/L	2139.139
⌊>	169	Tm-1			961119.540	ug/L	994467.461
⌈	50	Cr	-0.421523	45.554	-1194.904	ug/L	-1134.763
|	53	Cr	0.988550	174.681	162729.735	ug/L	165610.380
|	67	Zn	-1.622368	42.949	4295.055	ug/L	4498.117
|	66	Zn	0.015188	19.515	245.347	ug/L	243.013
|	76	Se	97.326404	16.246	-229545.061	ug/L	-241143.898
|	77	Se	-4.963694	13.098	14134.981	ug/L	15006.042
|	78	Se	2.744823	6.623	16468.587	ug/L	15199.393
|	79	Br	22.886920	18.724	90747.353	ug/L	86751.690
⌊>	72	Ge			1634602.770	ug/L	1668753.514
⌈	108	Cd	0.015314	50.893	8.495	ug/L	5.977
|	114	Cd	0.003155	92.993	78.689	ug/L	60.315
|	109	Ag	-0.016457	18.931	82.668	ug/L	135.337
⌊>	115	In			1572892.325	ug/L	1540216.761
⌈	208	207.977	0.018686	2.282	1292.798	ug/L	1109.097
|	207	Pb	0.016906	14.370	529.022	ug/L	463.017
|	206	Pb	0.016571	27.684	654.367	ug/L	567.025
⌊>	169	Tm			961119.540	ug/L	994467.461

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Ca	44	
V	51	
Cr	52	
Fe	54	
Fe	57	
Zn	68	
As	75	
Se	82	
Ge-1	72	97.954
Ag	107	
Cd	111	
Ba	135	
In-1	115	102.121
Tl	205	
Pb	208	
Tm-1	169	96.647
Cr	50	
Cr	53	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	97.954
Cd	108	
Cd	114	
Ag	109	
In	115	102.121
207.977	208	
Pb	207	
Pb	206	
Tm	169	96.647

TAL West Sac

RUN SUMMARY

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
1	Rinse 2X				2.0	11/10/10 12:36		☐
2	Blank				1.0	11/10/10 12:40		☐
3	Standard1				1.0	11/10/10 12:44		☐
4	ICV				1.0	11/10/10 12:48		☐
5	ICB				1.0	11/10/10 12:52		☐
6	LLSTD1				1.0	11/10/10 13:14		☐
7	LLSTD2				1.0	11/10/10 13:18		☐
8	ICSA				1.0	11/10/10 13:24		☐
9	ICSAB				1.0	11/10/10 13:28		☐
10	LRSTD1				1.0	11/10/10 13:36		☐
11	LRSTD2				1.0	11/10/10 13:39		☐
12	L9FXN N.I.	G0K020530-12	0313206	46	1.0	11/10/10 14:21		☐
13	L9J2N N.I.	G0K040545-1	0314158	46	1.0	11/10/10 14:24		☐
14	L9C2M N.I.	G0J300447-1	0314155	46	1.0	11/10/10 14:27		☐
15	L9G2Q N.I.	G0K030490-1	0314155	46	1.0	11/10/10 14:30		☐
16	L9LGE N.I.	G0K050462-1	0313205	46	1.0	11/10/10 14:32		☐
17	Rinse				1.0	11/10/10 14:44		☐
18	CCV 1				1.0	11/10/10 14:48		☐
19	CCB 1				1.0	11/10/10 14:52		☐
20	CCV 2				1.0	11/10/10 15:11		☐
21	CCB 2				1.0	11/10/10 15:15		☐
22	LLSTD3				1.0	11/10/10 15:19		☐
23	L9QF0B	G0K090000	0313206	46	1.0	11/10/10 15:31		☐
24	L9QF0C	G0K090000	0313206	46	1.0	11/10/10 15:34		☐
25	L9FXNS	G0K020530-12	0313206	46	1.0	11/10/10 15:38		☐
26	L9FXND	G0K020530-12	0313206	46	1.0	11/10/10 15:42		☐
27	L9FXN	G0K020530-12	0313206	46	1.0	11/10/10 15:46		☐
28	L9FXNP5	G0K020530	0313206		5.0	11/10/10 15:49		☐
29	L9FXNZ	G0K020530-12	0313206		1.0	11/10/10 15:53		☐
30	L9FXD	G0K020530-4	0313206	46	1.0	11/10/10 15:57		☐
31	L9FXE	G0K020530-5	0313206	46	1.0	11/10/10 16:01		☐
32	CCV 3				1.0	11/10/10 16:04		☐
33	CCB 3				1.0	11/10/10 16:08		☐
34	CCV 4				1.0	11/10/10 16:12		☐
35	CCB 4				1.0	11/10/10 16:16		☐
36	L9FXF	G0K020530-6	0313206	46	1.0	11/10/10 16:20		☐
37	L9FXG	G0K020530-7	0313206	46	1.0	11/10/10 16:24		☐
38	L9FXH	G0K020530-8	0313206	46	1.0	11/10/10 16:27		☐
39	L9FXJ	G0K020530-9	0313206	46	1.0	11/10/10 16:31		☐
40	L9FXL	G0K020530-10	0313206	46	1.0	11/10/10 16:35		☐
41	L9FXM	G0K020530-11	0313206	46	1.0	11/10/10 16:39		☐
42	L9FXQ	G0K020530-13	0313206	46	1.0	11/10/10 16:42		☐
43	L9FXW	G0K020530-14	0313206	46	1.0	11/10/10 16:46		☐
44	CCV 5				1.0	11/10/10 16:50		☐
45	CCB 5				1.0	11/10/10 16:54		☐
46	CCV 6				1.0	11/10/10 16:58		☐

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst: hargraves**

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
47	CCB 6				1.0	11/10/10 17:02		☐
48	L9RP7B	G0K100000	0314158	46	1.0	11/10/10 17:06		☐
49	L9RP7C	G0K100000	0314158	46	1.0	11/10/10 17:09		☐
50	L9J2NS	G0K040545-1	0314158	46	1.0	11/10/10 17:13		☐
51	L9J2ND	G0K040545-1	0314158	46	1.0	11/10/10 17:17		☐
52	L9J2N	G0K040545-1	0314158	46	1.0	11/10/10 17:21		☐
53	L9J2NP5	G0K040545	0314158		5.0	11/10/10 17:24		☐
54	L9J2NZ	G0K040545-1	0314158		1.0	11/10/10 17:28		☐
55	CCV 7				1.0	11/10/10 17:32		☐
56	CCB 7				1.0	11/10/10 17:36		☐
57	CCV 8				1.0	11/10/10 17:40		☐
58	CCB 8				1.0	11/10/10 17:43		☐
61	CCV 9				1.0	11/10/10 17:46		☐
62	CCB 9				1.0	11/10/10 17:50		☐
63	L9PX2B	G0K080000	0312407	46	1.0	11/10/10 17:53		☐
64	L9PX2C	G0K080000	0312407	46	1.0	11/10/10 17:56		☐
65	L8CN7S	G0J120540-4	0307225	46	1.0	11/10/10 17:59		☐
66	L8CN7D	G0J120540-4	0307225	46	1.0	11/10/10 18:02		☐
67	L8CN7	G0J120540-4	0307225	46	1.0	11/10/10 18:05		☐
68	L8CN7P5	G0J120540	0307225		5.0	11/10/10 18:08		☐
69	L8CN7Z	G0J120540-4	0307225		1.0	11/10/10 18:11		☐
70	L8CN3	G0J120540-1	0307225	46	1.0	11/10/10 18:14		☐
71	L8CN5	G0J120540-2	0307225	46	1.0	11/10/10 18:18		☐
72	CCV 10				1.0	11/10/10 18:21		☐
73	CCB 10				1.0	11/10/10 18:24		☐
74	CCV 11				1.0	11/10/10 18:27		☐
75	CCB 11				1.0	11/10/10 18:30		☐
76	L8CN6	G0J120540-3	0307225	46	1.0	11/10/10 18:34		☐
77	L8CN8	G0J120540-5	0307225	46	1.0	11/10/10 18:37		☐
78	L8CN9	G0J120540-6	0307225	46	1.0	11/10/10 18:40		☐
79	L8CPD	G0J120540-7	0307225	46	1.0	11/10/10 18:43		☐
80	L8CPF	G0J120540-8	0307225	46	1.0	11/10/10 18:46		☐
81	L8CPG	G0J120540-9	0307225	46	1.0	11/10/10 18:49		☐
82	L8CPL	G0J120540-10	0307225	46	1.0	11/10/10 18:52		☐
83	CCV 12				1.0	11/10/10 18:56		☐
84	CCB 12				1.0	11/10/10 18:59		☐
85	CCV 13				1.0	11/10/10 19:02		☐
86	CCB 13				1.0	11/10/10 19:05		☐
87	L8CPN	G0J120540-11	0307225	46	1.0	11/10/10 19:09		☐
88	L8CPQ	G0J120540-12	0307225	46	1.0	11/10/10 19:12		☐
89	L8CPR	G0J120540-13	0307225	46	1.0	11/10/10 19:15		☐
90	L8CPT	G0J120540-14	0307225	46	1.0	11/10/10 19:18		☐
91	L8CPV	G0J120540-15	0307225	46	1.0	11/10/10 19:21		☐
92	L8CPX	G0J120540-16	0307225	46	1.0	11/10/10 19:24		☐
93	L8CP1	G0J120540-17	0307225	46	1.0	11/10/10 19:28		☐
94	CCV 14				1.0	11/10/10 19:31		☐

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst: hargraves**

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
95	CCB 14				1.0	11/10/10 19:34		☐
96	CCV 15				1.0	11/10/10 19:37		☐
97	CCB 15				1.0	11/10/10 19:41		☐
98	L9RP1B	G0K100000	0314155	46	1.0	11/10/10 19:44		☐
99	L9RP1C	G0K100000	0314155	46	1.0	11/10/10 19:47		☐
100	L9C2MS	G0J300447-1	0314155	46	1.0	11/10/10 19:50		☐
101	L9C2MD	G0J300447-1	0314155	46	1.0	11/10/10 19:53		☐
102	L9C2M	G0J300447-1	0314155	46	1.0	11/10/10 19:56		☐
103	L9C2MP5	G0J300447	0314155		5.0	11/10/10 20:00		☐
104	L9C2MZ	G0J300447-1	0314155		1.0	11/10/10 20:03		☐
105	L9C2Q	G0J300447-2	0314155	46	1.0	11/10/10 20:06		☐
106	L9C2T	G0J300447-3	0314155	46	1.0	11/10/10 20:09		☐
107	CCV 16				1.0	11/10/10 20:12		☐
108	CCB 16				1.0	11/10/10 20:15		☐
109	CCV 17				1.0	11/10/10 20:19		☐
110	CCB 17				1.0	11/10/10 20:22		☐
111	L9G2Q	G0K030490-1	0314155	46	1.0	11/10/10 20:25		☐
112	L9G23	G0K030490-2	0314155	46	1.0	11/10/10 20:28		☐
113	L9G23S	G0K030490-2	0314155	46	1.0	11/10/10 20:31		☐
114	L9G23D	G0K030490-2	0314155	46	1.0	11/10/10 20:34		☐
115	CCV 18				1.0	11/10/10 20:38		☐
116	CCB 18				1.0	11/10/10 20:41		☐
117	CCV 19				1.0	11/10/10 20:44		☐
118	CCB 19				1.0	11/10/10 20:47		☐
119	L9QFLB	G0K090000	0313205	46	1.0	11/10/10 20:51		☐
120	L9QFLC	G0K090000	0313205	46	1.0	11/10/10 20:54		☐
121	L9LGES	G0K050462-1	0313205	46	1.0	11/10/10 20:57		☐
122	L9LGED	G0K050462-1	0313205	46	1.0	11/10/10 21:00		☐
123	L9LGE	G0K050462-1	0313205	46	1.0	11/10/10 21:03		☐
124	L9LGEP5	G0K050462	0313205		5.0	11/10/10 21:06		☐
125	L9LGEZ	G0K050462-1	0313205		1.0	11/10/10 21:10		☐
126	L9LGF	G0K050462-2	0313205	46	1.0	11/10/10 21:13		☐
127	CCV 20				1.0	11/10/10 21:16		☐
128	CCB 20				1.0	11/10/10 21:19		☐
129	CCV 21				1.0	11/10/10 21:22		☐
130	CCB 21				1.0	11/10/10 21:26		☐
131	L9LGG	G0K050462-3	0313205	46	1.0	11/10/10 21:29		☐
132	L9LGH	G0K050462-4	0313205	46	1.0	11/10/10 21:32		☐
133	L9LGJ	G0K050462-5	0313205	46	1.0	11/10/10 21:35		☐
134	L9LGK	G0K050462-6	0313205	46	1.0	11/10/10 21:38		☐
135	L9LGL	G0K050462-7	0313205	46	1.0	11/10/10 21:42		☐
136	L9LGM	G0K050462-8	0313205	46	1.0	11/10/10 21:45		☐
137	L9LGN	G0K050462-9	0313205	46	1.0	11/10/10 21:48		☐
138	CCV 22				1.0	11/10/10 21:51		☐
139	CCB 22				1.0	11/10/10 21:54		☐
142	CCV 23				1.0	11/10/10 21:58		☐

TAL West Sac RUN SUMMARY

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
143	CCB 23				1.0	11/10/10 22:01		☐
144	L7FK8B	G01240000	0267217	46	1.0	11/10/10 22:04		☐
145	L7FK8C	G01240000	0267217	46	1.0	11/10/10 22:07		☐
146	L676JS	G01200468-10	0267217	46	1.0	11/10/10 22:10		☐
147	L676JD	G01200468-10	0267217	46	1.0	11/10/10 22:13		☐
148	L676J	G01200468-10	0267217	46	1.0	11/10/10 22:17		☐
149	L676JP5	G01200468	0267217		5.0	11/10/10 22:20		☐
150	L676JZ	G01200468-10	0267217		1.0	11/10/10 22:23		☐
151	L6754	G01200468-1	0267217	46	1.0	11/10/10 22:26		☐
152	CCV 24				1.0	11/10/10 22:29		☐
153	CCB 24				1.0	11/10/10 22:33		☐
154	CCV 25				1.0	11/10/10 22:36		☐
155	CCB 25				1.0	11/10/10 22:39		☐
156	L6758	G01200468-2	0267217	46	1.0	11/10/10 22:42		☐
157	L6759	G01200468-3	0267217	46	1.0	11/10/10 22:45		☐
158	L676A	G01200468-4	0267217	46	1.0	11/10/10 22:49		☐
159	L676C	G01200468-5	0267217	46	1.0	11/10/10 22:52		☐
160	L676E	G01200468-6	0267217	46	1.0	11/10/10 22:55		☐
161	L676F	G01200468-7	0267217	46	1.0	11/10/10 22:58		☐
162	L676G	G01200468-8	0267217	46	1.0	11/10/10 23:01		☐
163	CCV 26				1.0	11/10/10 23:04		☐
164	CCB 26				1.0	11/10/10 23:08		☐
165	CCV 27				1.0	11/10/10 23:11		☐
166	CCB 27				1.0	11/10/10 23:14		☐
167	L676H	G01200468-9	0267217	46	1.0	11/10/10 23:17		☐
168	L676L	G01200468-12	0267217	46	1.0	11/10/10 23:20		☐
169	L676M	G01200468-13	0267217	46	1.0	11/10/10 23:24		☐
170	L676N	G01200468-14	0267217	46	1.0	11/10/10 23:27		☐
171	L676P	G01200468-15	0267217	46	1.0	11/10/10 23:30		☐
172	L676Q	G01200468-16	0267217	46	1.0	11/10/10 23:33		☐
173	L676R	G01200468-17	0267217	46	1.0	11/10/10 23:36		☐
174	CCV 28				1.0	11/10/10 23:39		☐
175	CCB 28				1.0	11/10/10 23:43		☐
176	CCV 29				1.0	11/10/10 23:46		☐
177	CCB 29				1.0	11/10/10 23:49		☐
178	L7FLJB	G01240000	0267220	46	1.0	11/10/10 23:52		☐
179	L7FLJC	G01240000	0267220	46	1.0	11/10/10 23:56		☐
180	L676W	G01200468-19	0267220	46	1.0	11/10/10 23:59		☐
181	L676WP5	G01200468	0267220		5.0	11/11/10 00:02		☐
182	L676WZ	G01200468-19	0267220		1.0	11/11/10 00:05		☐
183	L676X	G01200468-20	0267220	46	1.0	11/11/10 00:08		☐
184	L6760	G01200468-21	0267220	46	1.0	11/11/10 00:11		☐
185	L6761	G01200468-22	0267220	46	1.0	11/11/10 00:14		☐
186	L6763	G01200468-24	0267220	46	1.0	11/11/10 00:17		☐
187	CCV 30				1.0	11/11/10 00:21		☐
188	CCB 30				1.0	11/11/10 00:24		☐

TAL West Sac RUN SUMMARY

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst: hargraves**

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
189	CCV 31				1.0	11/11/10 00:27		☐
190	CCB 31				1.0	11/11/10 00:31		☐
191	L8XA5B	G0J220000	0295183	46	1.0	11/11/10 00:34		☐
192	L8XA5C	G0J220000	0295183	46	1.0	11/11/10 00:37		☐
193	L676TS	G0I200468-18	0295183	46	1.0	11/11/10 00:40		☐
194	L676TD	G0I200468-18	0295183	46	1.0	11/11/10 00:43		☐
195	L676T	G0I200468-18	0295183	46	1.0	11/11/10 00:46		☐
196	L676TP5	G0I200468	0295183		5.0	11/11/10 00:49		☐
197	L676TZ	G0I200468-18	0295183		1.0	11/11/10 00:53		☐
198	CCV 32				1.0	11/11/10 00:56		☐
199	CCB 32				1.0	11/11/10 00:59		☐

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
1	Rinse 2X	11/10/10 12:36	84.0	82.7	81.6	☐
2	Blank	11/10/10 12:40	100.0	100.0	100.0	☑
3	Standard1	11/10/10 12:44	97.6	97.1	99.0	☑
4	ICV	11/10/10 12:48	102.0	97.6	98.4	☑
5	ICB	11/10/10 12:52	99.5	98.1	99.3	☑
6	LLSTD1	11/10/10 13:14	102.5	100.5	100.5	☑
7	LLSTD2	11/10/10 13:18	103.8	102.4	101.5	☑
8	ICSA	11/10/10 13:24	86.0	85.7	86.9	☑
9	ICSAB	11/10/10 13:28	86.1	86.9	88.4	☑
10	LRSTD1	11/10/10 13:36	89.4	90.0	99.0	☑
11	LRSTD2	11/10/10 13:39	88.7	86.4	96.1	☑
12	L9FXN N.I.	11/10/10 14:21	4.9	0.4	4.0	☐
13	L9J2N N.I.	11/10/10 14:24	6.4	0.6	2.5	☐
14	L9C2M N.I.	11/10/10 14:27	18.5	0.6	4.0	☐
15	L9G2Q N.I.	11/10/10 14:30	18.1	0.6	3.5	☐
16	L9LGE N.I.	11/10/10 14:32	4.2	0.3	3.2	☐
17	Rinse	11/10/10 14:44	97.2	89.3	96.6	☑
18	CCV 1	11/10/10 14:48	94.8	88.5	96.8	☑
19	CCB 1	11/10/10 14:52	94.2	87.3	95.4	☑
20	CCV 2	11/10/10 15:11	94.8	88.4	95.7	☑
21	CCB 2	11/10/10 15:15	95.7	89.2	96.2	☑
22	LLSTD3	11/10/10 15:19	95.6	89.6	96.2	☑
23	L9QF0B	11/10/10 15:31	99.5	91.0	98.8	☑
24	L9QF0C	11/10/10 15:34	96.2	87.5	96.9	☑
25	L9FXNS	11/10/10 15:36	91.3	81.3	87.8	☑
26	L9FXND	11/10/10 15:42	99.3	85.5	89.7	☑
27	L9FXN	11/10/10 15:46	93.8	84.8	87.4	☑
28	L9FXNP5	11/10/10 15:49	95.7	89.8	92.0	☐
29	L9FXNZ	11/10/10 15:53	93.5	85.4	86.7	☑
30	L9FXD	11/10/10 15:57	93.1	86.3	86.8	☑
31	L9FXE	11/10/10 16:01	95.8	84.7	83.0	☑
32	CCV 3	11/10/10 16:04	89.8	87.6	92.9	☑
33	CCB 3	11/10/10 16:08	94.0	90.5	92.4	☑
34	CCV 4	11/10/10 16:12	92.5	90.1	93.9	☑
35	CCB 4	11/10/10 16:16	94.9	90.8	92.7	☑
36	L9FXF	11/10/10 16:20	92.8	82.9	81.1	☑
37	L9FXG	11/10/10 16:24	96.7	86.6	86.4	☑
38	L9FXH	11/10/10 16:27	94.5	84.4	85.4	☑
39	L9FXJ	11/10/10 16:31	92.4	85.3	86.4	☑
40	L9FXL	11/10/10 16:35	93.7	85.5	87.3	☑
41	L9FXM	11/10/10 16:39	88.9	82.5	84.9	☑
42	L9FXQ	11/10/10 16:42	93.1	83.8	85.2	☑
43	L9FXW	11/10/10 16:46	91.5	82.8	83.4	☑
44	CCV 5	11/10/10 16:50	86.4	84.1	89.9	☑
45	CCB 5	11/10/10 16:54	92.3	89.1	92.2	☑
46	CCV 6	11/10/10 16:58	89.7	86.6	90.1	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst: hargraves**

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
47	CCB 6	11/10/10 17:02	92.4	89.2	92.1	☑
48	L9RP7B	11/10/10 17:06	93.7	88.5	91.0	☑
49	L9RP7C	11/10/10 17:09	93.0	86.9	90.9	☑
50	L9J2NS	11/10/10 17:13	91.1	79.3	80.0	☑
51	L9J2ND	11/10/10 17:17	89.9	79.9	80.9	☑
52	L9J2N	11/10/10 17:21	89.3	78.4	80.4	☑
53	L9J2NP5	11/10/10 17:24	90.1	82.8	86.7	☐
54	L9J2NZ	11/10/10 17:28	88.1	78.0	80.6	☑
55	CCV 7	11/10/10 17:32	90.5	84.4	89.8	☑
56	CCB 7	11/10/10 17:36	91.5	85.9	89.6	☑
57	CCV 8	11/10/10 17:40	82.6	84.9	91.0	☑
58	CCB 8	11/10/10 17:43	82.9	85.2	91.2	☑
61	CCV 9	11/10/10 17:46	98.6	99.6	99.4	☑
62	CCB 9	11/10/10 17:50	100.5	99.5	99.1	☑
63	L9PX2B	11/10/10 17:53	101.8	100.3	100.4	☑
64	L9PX2C	11/10/10 17:56	101.8	99.9	100.5	☑
65	L8CN7S	11/10/10 17:59	99.2	90.3	84.7	☑
66	L8CN7D	11/10/10 18:02	101.5	94.7	86.8	☑
67	L8CN7	11/10/10 18:05	99.6	92.8	84.9	☑
68	L8CN7P5	11/10/10 18:08	97.0	94.3	92.4	☐
69	L8CN7Z	11/10/10 18:11	99.5	92.2	84.4	☑
70	L8CN3	11/10/10 18:14	98.4	91.5	85.0	☑
71	L8CN5	11/10/10 18:18	98.3	90.5	82.6	☑
72	CCV 10	11/10/10 18:21	94.3	93.6	96.8	☑
73	CCB 10	11/10/10 18:24	97.2	98.3	99.6	☑
74	CCV 11	11/10/10 18:27	97.6	96.5	97.5	☑
75	CCB 11	11/10/10 18:30	98.6	97.9	98.8	☑
76	L8CN6	11/10/10 18:34	100.2	92.0	86.9	☑
77	L8CN8	11/10/10 18:37	98.4	90.7	84.4	☑
78	L8CN9	11/10/10 18:40	96.3	91.6	86.8	☑
79	L8CPD	11/10/10 18:43	96.3	87.6	81.0	☑
80	L8CPF	11/10/10 18:46	96.3	87.8	80.8	☑
81	L8CPG	11/10/10 18:49	96.1	86.5	78.5	☑
82	L8CPL	11/10/10 18:52	96.3	85.3	77.4	☑
83	CCV 12	11/10/10 18:56	90.5	91.1	94.1	☑
84	CCB 12	11/10/10 18:59	93.2	92.5	94.4	☑
85	CCV 13	11/10/10 19:02	93.3	92.6	95.2	☑
86	CCB 13	11/10/10 19:05	94.7	93.1	95.5	☑
87	L8CPN	11/10/10 19:08	96.0	87.4	83.5	☑
88	L8CPQ	11/10/10 19:12	95.2	87.3	79.4	☑
89	L8CPR	11/10/10 19:15	95.0	87.5	81.4	☑
90	L8CPT	11/10/10 19:18	96.8	85.9	77.7	☑
91	L8CPV	11/10/10 19:21	94.5	86.8	85.7	☑
92	L8CPX	11/10/10 19:24	93.6	83.6	79.6	☑
93	L8CP1	11/10/10 19:28	93.1	83.8	76.0	☑
94	CCV 14	11/10/10 19:31	88.5	87.3	91.0	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: **101110A1** **Analyst: hargraves**

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
95	CCB 14	11/10/10 19:34	92.6	91.9	92.8	☑
96	CCV 15	11/10/10 19:37	91.9	90.1	92.1	☑
97	CCB 15	11/10/10 19:41	93.7	92.4	92.7	☑
98	L9RP1B	11/10/10 19:44	94.6	91.2	92.7	☑
99	L9RP1C	11/10/10 19:47	94.4	90.8	91.7	☑
100	L9C2MS	11/10/10 19:50	91.2	70.5	68.6	☑
101	L9C2MD	11/10/10 19:53	88.3	68.6	66.8	☑
102	L9C2M	11/10/10 19:56	88.6	70.1	68.6	☑
103	L9C2MP5	11/10/10 20:00	89.4	83.1	82.9	☐
104	L9C2MZ	11/10/10 20:03	86.9	69.5	68.0	☑
105	L9C2Q	11/10/10 20:06	85.5	66.7	65.4	☑
106	L9C2T	11/10/10 20:09	78.3	65.1	61.7	☑
107	CCV 16	11/10/10 20:12	91.2	86.0	89.4	☑
108	CCB 16	11/10/10 20:15	91.3	87.0	90.9	☑
109	CCV 17	11/10/10 20:19	91.4	86.6	90.3	☑
110	CCB 17	11/10/10 20:22	92.3	89.0	91.9	☑
111	L9G2Q	11/10/10 20:25	85.8	67.9	67.0	☑
112	L9G23	11/10/10 20:28	85.6	68.0	66.5	☑
113	L9G23S	11/10/10 20:31	83.2	64.2	63.0	☑
114	L9G23D	11/10/10 20:34	81.2	63.9	63.1	☑
115	CCV 18	11/10/10 20:38	85.2	87.1	87.6	☑
116	CCB 18	11/10/10 20:41	86.4	86.4	86.3	☑
117	CCV 19	11/10/10 20:44	84.5	85.7	86.2	☑
118	CCB 19	11/10/10 20:47	86.4	86.7	87.2	☑
119	L9QFLB	11/10/10 20:51	90.1	88.7	90.4	☑
120	L9QFLC	11/10/10 20:54	89.0	88.5	89.3	☑
121	L9LGES	11/10/10 20:57	81.0	76.5	74.1	☑
122	L9LGED	11/10/10 21:00	82.3	77.7	76.3	☑
123	L9LGE	11/10/10 21:03	81.4	77.9	76.4	☑
124	L9LGEP5	11/10/10 21:06	84.2	81.7	82.6	☐
125	L9LGEZ	11/10/10 21:10	79.4	76.0	74.3	☑
126	L9LGF	11/10/10 21:13	80.1	76.0	73.6	☑
127	CCV 20	11/10/10 21:16	84.9	84.6	85.7	☑
128	CCB 20	11/10/10 21:19	85.4	85.2	86.6	☑
129	CCV 21	11/10/10 21:22	84.2	85.3	86.8	☑
130	CCB 21	11/10/10 21:26	84.4	85.6	86.8	☑
131	L8LGG	11/10/10 21:29	78.1	76.7	76.0	☑
132	L9LGH	11/10/10 21:32	80.3	78.0	75.2	☑
133	L9LGJ	11/10/10 21:35	78.4	77.6	75.7	☑
134	L9LGK	11/10/10 21:38	77.8	77.1	74.7	☑
135	L9LGL	11/10/10 21:42	77.9	78.4	76.8	☑
136	L9LGM	11/10/10 21:45	78.9	76.5	73.9	☑
137	L9LGN	11/10/10 21:48	78.7	75.3	72.5	☑
138	CCV 22	11/10/10 21:51	83.5	83.6	83.8	☑
139	CCB 22	11/10/10 21:54	85.1	86.1	87.4	☑
142	CCV 23	11/10/10 21:58	96.3	98.5	98.7	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: **101110A1** **Analyst: hargraves**

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
143	CCB 23	11/10/10 22:01	98.7	99.4	98.7	☑
144	L7FK8B	11/10/10 22:04	102.0	99.1	99.6	☑
145	L7FK8C	11/10/10 22:07	104.4	97.3	98.0	☑
146	L676JS	11/10/10 22:10	97.2	90.4	86.0	☑
147	L676JD	11/10/10 22:13	99.3	91.3	91.5	☑
148	L676J	11/10/10 22:17	97.6	88.3	82.7	☑
149	L676JP5	11/10/10 22:20	98.9	96.3	94.3	☐
150	L676JZ	11/10/10 22:23	96.5	88.1	82.7	☑
151	L6754	11/10/10 22:26	92.0	86.5	81.3	☑
152	CCV 24	11/10/10 22:29	95.5	98.6	96.7	☑
153	CCB 24	11/10/10 22:33	98.5	101.1	97.3	☑
154	CCV 25	11/10/10 22:36	95.8	101.0	98.0	☑
155	CCB 25	11/10/10 22:39	99.5	101.5	97.2	☑
156	L6758	11/10/10 22:42	95.9	88.4	83.2	☑
157	L6759	11/10/10 22:45	95.3	89.3	84.3	☑
158	L676A	11/10/10 22:49	102.0	95.1	93.5	☑
159	L676C	11/10/10 22:52	95.7	87.4	81.3	☑
160	L676E	11/10/10 22:55	97.2	90.8	85.0	☑
161	L676F	11/10/10 22:58	96.0	87.0	80.2	☑
162	L676G	11/10/10 23:01	93.9	84.8	78.6	☑
163	CCV 26	11/10/10 23:04	93.7	98.8	96.4	☑
164	CCB 26	11/10/10 23:08	97.7	100.5	96.8	☑
165	CCV 27	11/10/10 23:11	94.5	100.8	97.1	☑
166	CCB 27	11/10/10 23:14	96.9	98.3	94.7	☑
167	L676H	11/10/10 23:17	94.1	85.2	79.8	☑
168	L676L	11/10/10 23:20	98.2	90.0	87.8	☑
169	L676M	11/10/10 23:24	94.0	85.7	79.3	☑
170	L676N	11/10/10 23:27	94.8	85.7	80.0	☑
171	L676P	11/10/10 23:30	94.6	86.1	80.4	☑
172	L676Q	11/10/10 23:33	94.4	83.9	78.6	☑
173	L676R	11/10/10 23:36	93.4	83.6	77.7	☑
174	CCV 28	11/10/10 23:39	95.4	97.1	95.1	☑
175	CCB 28	11/10/10 23:43	96.6	99.6	96.5	☑
176	CCV 29	11/10/10 23:46	94.9	99.5	96.1	☑
177	CCB 29	11/10/10 23:49	98.6	100.7	96.9	☑
178	L7FLJB	11/10/10 23:52	103.1	100.8	97.0	☑
179	L7FLJC	11/10/10 23:56	101.8	99.2	95.4	☑
180	L676W	11/10/10 23:59	95.5	85.9	80.1	☑
181	L676WP5	11/11/10 00:02	97.1	94.7	93.1	☐
182	L676WZ	11/11/10 00:05	93.3	85.0	79.8	☑
183	L676X	11/11/10 00:08	92.7	83.7	78.1	☑
184	L6760	11/11/10 00:11	93.3	83.3	77.8	☑
185	L6761	11/11/10 00:14	93.9	83.5	78.2	☑
186	L6763	11/11/10 00:17	93.8	81.7	76.6	☑
187	CCV 30	11/11/10 00:21	94.0	95.2	94.0	☑
188	CCB 30	11/11/10 00:24	95.9	96.8	94.2	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/11/10 12:00:10

File ID: 101110A1 **Analyst:** hargraves

#	Sample ID	Analyzed Date	Germanium	Indium	Thulium	Q
189	CCV 31	11/11/10 00:27	93.2	97.4	93.6	☑
190	CCB 31	11/11/10 00:31	97.3	98.0	94.5	☑
191	L8XA5B	11/11/10 00:34	100.3	99.6	97.6	☑
192	L8XA5C	11/11/10 00:37	99.7	96.7	95.5	☑
193	L676TS	11/11/10 00:40	90.7	83.0	78.5	☑
194	L676TD	11/11/10 00:43	89.9	82.7	78.3	☑
195	L676T	11/11/10 00:46	90.1	84.9	80.3	☑
196	L676TP5	11/11/10 00:49	94.1	91.4	89.6	☐
197	L676TZ	11/11/10 00:53	89.6	84.2	80.1	☑
198	CCV 32	11/11/10 00:56	92.6	94.5	93.9	☑
199	CCB 32	11/11/10 00:59	96.3	98.2	96.2	☑

TAL West Sac

CALIBRATION CHECK SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Method: 6020 **Instrument: M01** **Batch: 101110A1**

Sample ID	Type	File - Sequence	Analyzed Date	Q
ICV	ICV	101110A1, 4	11/10/2010 12:48:36	☐
ICB	ICB	101110A1, 5	11/10/2010 12:52:28	☐
ICSA	ICSA	101110A1, 8	11/10/2010 13:24:44	☐
ICSAB	ICSAB	101110A1, 9	11/10/2010 13:28:33	☐
CCV 1	CCV	101110A1, 18	11/10/2010 14:48:28	☐
CCB 1	CCB	101110A1, 19	11/10/2010 14:52:21	☐
CCV 2	CCV	101110A1, 20	11/10/2010 15:11:36	☐
CCB 2	CCB	101110A1, 21	11/10/2010 15:15:29	☐
CCV 3	CCV	101110A1, 32	11/10/2010 16:04:51	☐
CCB 3	CCB	101110A1, 33	11/10/2010 16:08:44	☐
CCV 4	CCV	101110A1, 34	11/10/2010 16:12:36	☐
CCB 4	CCB	101110A1, 35	11/10/2010 16:16:29	☐
CCV 5	CCV	101110A1, 44	11/10/2010 16:50:35	☐
CCB 5	CCB	101110A1, 45	11/10/2010 16:54:28	☐
CCV 6	CCV	101110A1, 46	11/10/2010 16:58:20	☐
CCB 6	CCB	101110A1, 47	11/10/2010 17:02:13	☐
CCV 7	CCV	101110A1, 55	11/10/2010 17:32:38	☐
CCB 7	CCB	101110A1, 56	11/10/2010 17:36:30	☐
CCV 8	CCV	101110A1, 57	11/10/2010 17:40:23	☐
CCB 8	CCB	101110A1, 58	11/10/2010 17:43:38	☐
CCV 9	CCV	101110A1, 61	11/10/2010 17:46:52	☐
CCB 9	CCB	101110A1, 62	11/10/2010 17:50:07	☐
CCV 10	CCV	101110A1, 72	11/10/2010 18:21:15	☐
CCB 10	CCB	101110A1, 73	11/10/2010 18:24:29	☐
CCV 11	CCV	101110A1, 74	11/10/2010 18:27:44	☐
CCB 11	CCB	101110A1, 75	11/10/2010 18:30:58	☐
CCV 12	CCV	101110A1, 83	11/10/2010 18:56:11	☐
CCB 12	CCB	101110A1, 84	11/10/2010 18:59:25	☐
CCV 13	CCV	101110A1, 85	11/10/2010 19:02:40	☐
CCB 13	CCB	101110A1, 86	11/10/2010 19:05:54	☐
CCV 14	CCV	101110A1, 94	11/10/2010 19:31:26	☐
CCB 14	CCB	101110A1, 95	11/10/2010 19:34:40	☐
CCV 15	CCV	101110A1, 96	11/10/2010 19:37:54	☐
CCB 15	CCB	101110A1, 97	11/10/2010 19:41:09	☐
CCV 16	CCV	101110A1, 107	11/10/2010 20:12:36	☐
CCB 16	CCB	101110A1, 108	11/10/2010 20:15:52	☐
CCV 17	CCV	101110A1, 109	11/10/2010 20:19:08	☐
CCB 17	CCB	101110A1, 110	11/10/2010 20:22:22	☐
CCV 18	CCV	101110A1, 115	11/10/2010 20:38:07	☐
CCB 18	CCB	101110A1, 116	11/10/2010 20:41:22	☐
CCV 19	CCV	101110A1, 117	11/10/2010 20:44:38	☐
CCB 19	CCB	101110A1, 118	11/10/2010 20:47:55	☐
CCV 20	CCV	101110A1, 127	11/10/2010 21:16:23	☐
CCB 20	CCB	101110A1, 128	11/10/2010 21:19:40	☐
CCV 21	CCV	101110A1, 129	11/10/2010 21:22:57	☐
CCB 21	CCB	101110A1, 130	11/10/2010 21:26:14	☐

TAL West Sac

CALIBRATION CHECK SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Method: 6020 **Instrument: M01** **Batch: 101110A1**

Sample ID	Type	File - Sequence	Analyzed Date	Q
CCV 22	***CCV***	***101110A1, 138***	***11/10/2010 21:51:35***	☐
CCB 22	***CCB***	***101110A1, 139***	***11/10/2010 21:54:53***	☐
CCV 23	***CCV***	***101110A1, 142***	***11/10/2010 21:58:10***	☐
CCB 23	***CCB***	***101110A1, 143***	***11/10/2010 22:01:27***	☐
CCV 24	***CCV***	***101110A1, 152***	***11/10/2010 22:29:50***	☐
CCB 24	***CCB***	***101110A1, 153***	***11/10/2010 22:33:07***	☐
CCV 25	***CCV***	***101110A1, 154***	***11/10/2010 22:36:24***	☐
CCB 25	***CCB***	***101110A1, 155***	***11/10/2010 22:39:42***	☐
CCV 26	***CCV***	***101110A1, 163***	***11/10/2010 23:04:43***	☐
CCB 26	***CCB***	***101110A1, 164***	***11/10/2010 23:08:00***	☐
CCV 27	***CCV***	***101110A1, 165***	***11/10/2010 23:11:17***	☐
CCB 27	***CCB***	***101110A1, 166***	***11/10/2010 23:14:35***	☐
CCV 28	***CCV***	***101110A1, 174***	***11/10/2010 23:39:54***	☐
CCB 28	***CCB***	***101110A1, 175***	***11/10/2010 23:43:11***	☐
CCV 29	***CCV***	***101110A1, 176***	***11/10/2010 23:46:29***	☐
CCB 29	***CCB***	***101110A1, 177***	***11/10/2010 23:49:46***	☐
CCV 30	***CCV***	***101110A1, 187***	***11/11/2010 00:21:10***	☐
CCB 30	***CCB***	***101110A1, 188***	***11/11/2010 00:24:27***	☐
CCV 31	***CCV***	***101110A1, 189***	***11/11/2010 00:27:45***	☐
CCB 31	***CCB***	***101110A1, 190***	***11/11/2010 00:31:02***	☐
CCV 32	***CCV***	***101110A1, 198***	***11/11/2010 00:56:17***	☐
CCB 32	***CCB***	***101110A1, 199***	***11/11/2010 00:59:34***	☐

TAL West Sac

CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **ICV (ICV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 4 Method 6020_
Acquired: 11/10/2010 12:48:36 M01
Calibrated: 11/10/2010 12:40:45 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-62-2	Vanadium	51	949766	84.068	80.000	105	
7440-47-3	Chromium	52	914358	85.189	80.000	106	
7439-89-6	Iron	57	295201	784.23	800.00	98.0	
7440-66-6	Zinc	68	84007	81.430	80.000	102	
7440-38-2	Arsenic	75	230280	77.441	80.000	96.8	
7782-49-2	Selenium	78	68694	77.377	80.000	96.7	
7782-49-2	Selenium	82	22181	77.622	80.000	97.0	
7440-22-4	Silver	107	435849	40.150	40.000	100	
7440-43-9	Cadmium	111	197308	79.258	80.000	99.1	
7440-43-9	Cadmium	114	471992	79.063	80.000	98.8	
7440-39-3	Barium	135	186591	77.363	80.000	96.7	
7440-28-0	Thallium	205	713595	39.608	40.000	99.0	
7439-92-1	Lead	208	1893488	79.959	80.000	99.9	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1806804		☑
7440-74-6	Indium	115	1722539		☑
7440-30-4	Thulium	169	1026463		☑

Reviewed by: Date:

TAL West Sac

BLANK REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **ICB** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 5 Method 6020_
Acquired: 11/10/2010 12:52:28 M01
Calibrated: 11/10/2010 12:40:45 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-62-2	Vanadium	51	-40283	0.68654	10.0	3.1	0.0	
7440-47-3	Chromium	52	46415	0.08647	2.0	0.92	0.0	
7439-89-6	Iron	57	13469	-3.8149	50.0	17.0	0.0	
7440-66-6	Zinc	66	1599	0.33505	5.0	1.0	0.0	
7440-38-2	Arsenic	75	15598	-0.10749	2.0	0.50	0.0	
7782-49-2	Selenium	78	17631	-0.75108	2.0	1.7	0.0	
7782-49-2	Selenium	82	1590	-0.28235	2.0	1.7	0.0	
7440-22-4	Silver	107	102	0.00065	1.0	0.030	0.0	
7440-43-9	Cadmium	111	41	-0.00359	1.0	0.074	0.0	
7440-43-9	Cadmium	114	71	0.00240	1.0	0.074	0.0	
7440-39-3	Barium	135	121	0.00377	1.0	0.96	0.0	
7440-28-0	Thallium	205	8136	0.40342	1.0	0.34	0.0	
7439-92-1	Lead	208	1913	0.02960	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1762970		☑
7440-74-6	Indium	115	1731554		☑
7440-30-4	Thulium	169	1035374		☑

Reviewed by: Date:

TAL West Sac

CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **ICSA** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 8 Method 6020_
Acquired: 11/10/2010 13:24:44 M01
Calibrated: 11/10/2010 12:40:45 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-62-2	Vanadium	51	-19365	2.2201		*	☑
7440-47-3	Chromium	52	37929	-0.16962		*	☑
7439-89-6	Iron	57	28792607	95541	100000	95.5	☑
7440-66-6	Zinc	68	3140	2.3887		*	☑
7440-38-2	Arsenic	75	16070	1.0043		*	☑
7782-49-2	Selenium	78	17229	2.8759		*	
7782-49-2	Selenium	82	1324	-0.52325		*	☑
7440-22-4	Silver	107	1694	0.16893		*	☑
7440-43-9	Cadmium	111	2229	0.99947		*	☑
7440-43-9	Cadmium	114	21446	4.0815		*	
7440-39-3	Barium	135	6203	2.8843		*	
7440-28-0	Thallium	205	4275	0.22418		*	☑
7439-92-1	Lead	208	11446	0.49726		*	☑

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1524537		☑
7440-74-6	Indium	115	1512825		☑
7440-30-4	Thulium	169	906337		☑

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CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **ICSAB** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 9 Method 6020_
Acquired: 11/10/2010 13:28:33 M01
Calibrated: 11/10/2010 12:40:45 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-62-2	Vanadium	51	951263	99.090	100.00	99.1	☑
7440-47-3	Chromium	52	881438	98.044	100.00	98.0	☑
7439-89-6	Iron	57	27979255	92855	100100	92.8	☑
7440-66-6	Zinc	68	79623	91.664	100.00	91.7	☑
7440-38-2	Arsenic	75	249126	101.00	100.00	101	☑
7782-49-2	Selenium	78	75281	109.14	100.00	109	☑
7782-49-2	Selenium	82	25573	108.49	100.00	108	☑
7440-22-4	Silver	107	447610	46.357	50.000	92.7	☑
7440-43-9	Cadmium	111	216777	97.893	100.00	97.9	☑
7440-43-9	Cadmium	114	529891	99.785	100.00	99.8	☑
7440-39-3	Barium	135	221361	103.19	100.00	103	☑
7440-28-0	Thallium	205	783733	48.447	50.000	96.9	☑
7439-92-1	Lead	208	2085562	98.098	100.00	98.1	☑

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1524767		☑
7440-74-6	Indium	115	1533046		☑
7440-30-4	Thulium	169	922365		☑

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CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 1 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 18 Method 6020_
Acquired: 11/10/2010 14:48:28 M01
Calibrated: 11/10/2010 12:40:45 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-62-2	Vanadium	51	1085171	102.49	100.00	102	
7440-47-3	Chromium	52	1003043	101.47	100.00	101	
7439-89-6	Iron	57	1678733	5019.4	5100.0	98.4	
7440-66-6	Zinc	68	96132	100.63	100.00	101	
7440-38-2	Arsenic	75	261670	96.068	100.00	96.1	
7782-49-2	Selenium	78	74365	94.948	100.00	94.9	
7782-49-2	Selenium	82	24890	95.155	100.00	95.2	
7440-22-4	Silver	107	487400	49.564	50.000	99.1	
7440-43-9	Cadmium	111	224105	99.374	100.00	99.4	
7440-43-9	Cadmium	114	535049	98.941	100.00	98.9	
7440-39-3	Barium	135	214594	98.215	100.00	98.2	
7440-28-0	Thallium	205	913194	51.592	50.000	103	
7439-92-1	Lead	208	2421355	104.07	100.00	104	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1678956		☑
7440-74-6	Indium	115	1561569		☑
7440-30-4	Thulium	169	1009286		☑

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Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 1** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 19 Method 6020_
Acquired: 11/10/2010 14:52:21 M01
Calibrated: 11/10/2010 12:40:45 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-62-2	Vanadium	51	-25164	1.8677	10.0	3.1	0.0	
7440-47-3	Chromium	52	35161	-0.84602	2.0	0.92	0.0	
7439-89-6	Iron	57	10487	-10.672	50.0	17.0	0.0	
7440-66-6	Zinc	68	1482	0.30165	5.0	1.0	0.0	
7440-38-2	Arsenic	75	14025	-0.39507	2.0	0.50	0.0	
7782-49-2	Selenium	78	15199	-3.2371	2.0	1.7	0.0	
7782-49-2	Selenium	82	1385	-0.77112	2.0	1.7	0.0	
7440-22-4	Silver	107	375	0.03000	1.0	0.030	0.0	
7440-43-9	Cadmium	111	39	-0.00223	1.0	0.074	0.0	
7440-43-9	Cadmium	114	60	0.00195	1.0	0.074	0.0	
7440-39-3	Barium	135	119	0.00917	1.0	0.96	0.0	
7440-28-0	Thallium	205	7108	0.36322	1.0	0.34	0.0	
7439-92-1	Lead	208	2139	0.04280	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1668754		☑
7440-74-6	Indium	115	1540217		☑
7440-30-4	Thullum	169	994467		☑

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CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 2 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 20 Method 6020_
Acquired: 11/10/2010 15:11:36 M01
Calibrated: 11/10/2010 12:40:45 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-62-2	Vanadium	51	1102569	103.97	100.00	104	
7440-47-3	Chromium	52	1017560	102.91	100.00	103	
7439-89-6	Iron	57	1717139	5131.5	5100.0	101	
7440-66-6	Zinc	68	97565	102.08	100.00	102	
7440-38-2	Arsenic	75	266408	97.841	100.00	97.8	
7782-49-2	Selenium	78	75277	96.362	100.00	96.4	
7782-49-2	Selenium	82	25106	95.941	100.00	95.9	
7440-22-4	Silver	107	498389	50.704	50.000	101	
7440-43-9	Cadmium	111	228260	101.27	100.00	101	
7440-43-9	Cadmium	114	546517	101.11	100.00	101	
7440-39-3	Barium	135	219324	100.44	100.00	100	
7440-28-0	Thallium	205	916705	52.344	50.000	105	
7439-92-1	Lead	208	2444257	106.18	100.00	106	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1679084		☑
7440-74-6	Indium	115	1559575		☑
7440-30-4	Thulium	169	988079		☑

Reviewed by: Date:

TAL West Sac

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Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 2** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 21 Method 6020_
Acquired: 11/10/2010 15:15:29 M01
Calibrated: 11/10/2010 12:40:45 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-62-2	Vanadium	51	-21678	2.2165	10.0	3.1	0.0	
7440-47-3	Chromium	52	32968	-1.1332	2.0	0.92	0.0	
7439-89-6	Iron	57	10256	-11.858	50.0	17.0	0.0	
7440-66-6	Zinc	68	1446	0.23918	5.0	1.0	0.0	
7440-38-2	Arsenic	75	14868	-0.15682	2.0	0.50	0.0	
7782-49-2	Selenium	78	15567	-3.0266	2.0	1.7	0.0	
7782-49-2	Selenium	82	1445	-0.61774	2.0	1.7	0.0	
7440-22-4	Silver	107	341	0.02570	1.0	0.030	0.0	
7440-43-9	Cadmium	111	46	0.00034	1.0	0.074	0.0	
7440-43-9	Cadmium	114	74	0.00416	1.0	0.074	0.0	
7440-39-3	Barium	135	104	0.00135	1.0	0.96	0.0	
7440-28-0	Thallium	205	12528	0.66593	1.0	0.34	0.0	
7439-92-1	Lead	208	2364	0.05162	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1694907		☑
7440-74-6	Indium	115	1574606		☑
7440-30-4	Thulium	169	1003553		☑

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CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 3 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 32 Method 6020_
Acquired: 11/10/2010 16:04:51 M01
Calibrated: 11/10/2010 15:19:21 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-62-2	Vanadium	51	1023499	101.91	100.00	102	
7440-47-3	Chromium	52	950276	101.33	100.00	101	
7439-89-6	Iron	57	1620886	5110.6	5100.0	100	
7440-66-6	Zinc	68	92232	101.81	100.00	102	
7440-38-2	Arsenic	75	256775	99.591	100.00	99.6	
7782-49-2	Selenium	78	73775	100.61	100.00	101	
7782-49-2	Selenium	82	24600	99.404	100.00	99.4	
7440-22-4	Silver	107	489941	50.288	50.000	101	
7440-43-9	Cadmium	111	225383	100.88	100.00	101	
7440-43-9	Cadmium	114	540129	100.81	100.00	101	
7440-39-3	Barium	135	219292	101.32	100.00	101	
7440-28-0	Thallium	205	877833	51.648	50.000	103	
7439-92-1	Lead	208	2327974	104.19	100.00	104	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1591510		☑
7440-74-6	Indium	115	1545816		☑
7440-30-4	Thulium	169	968586		☑

Reviewed by: Date:

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Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 3** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 33 Method 6020_
Acquired: 11/10/2010 16:08:44 M01
Calibrated: 11/10/2010 15:19:21 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-62-2	Vanadium	51	-29861	1.4544	10.0	3.1	0.0	
7440-47-3	Chromium	52	28043	-1.5983	2.0	0.92	0.0	
7439-89-6	Iron	57	12584	-4.2577	50.0	17.0	0.0	
7440-66-8	Zinc	68	1528	0.35299	5.0	1.0	0.0	
7440-38-2	Arsenic	75	15832	0.31987	2.0	0.50	0.0	
7782-49-2	Selenium	78	16848	-0.44107	2.0	1.7	0.0	
7782-49-2	Selenium	82	1465	-0.43741	2.0	1.7	0.0	
7440-22-4	Silver	107	238	0.01498	1.0	0.030	0.0	
7440-43-9	Cadmium	111	43	-0.00120	1.0	0.074	0.0	
7440-43-9	Cadmium	114	115	0.01141	1.0	0.074	0.0	
7440-39-3	Barium	135	133	0.01344	1.0	0.96	0.0	
7440-28-0	Thallium	205	11395	0.62817	1.0	0.34	0.0	
7439-92-1	Lead	208	2489	0.06145	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1666156		☑
7440-74-6	Indium	115	1597556		☑
7440-30-4	Thulium	169	964013		☑

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CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 4 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 34 Method 6020_
Acquired: 11/10/2010 16:12:36 M01
Calibrated: 11/10/2010 15:19:21 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-62-2	Vanadium	51	1057700	102.31	100.00	102	
7440-47-3	Chromium	52	982024	101.76	100.00	102	
7439-89-6	Iron	57	1662735	5093.3	5100.0	99.9	
7440-66-6	Zinc	68	94179	100.99	100.00	101	
7440-38-2	Arsenic	75	263790	99.395	100.00	99.4	
7782-49-2	Selenium	78	75643	100.12	100.00	100	
7782-49-2	Selenium	82	25293	99.293	100.00	99.3	
7440-22-4	Silver	107	499540	49.838	50.000	99.7	
7440-43-9	Cadmium	111	229117	99.679	100.00	99.7	
7440-43-9	Cadmium	114	549827	99.750	100.00	99.8	
7440-39-3	Barium	135	220976	99.234	100.00	99.2	
7440-28-0	Thallium	205	878922	51.169	50.000	102	
7439-92-1	Lead	208	2320351	102.76	100.00	103	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1638069		☑
7440-74-6	Indium	115	1590383		☑
7440-30-4	Thulium	169	978879		☑

Reviewed by: Date:

TAL West Sac

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Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 4** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 35 Method 6020_
Acquired: 11/10/2010 16:16:29 M01
Calibrated: 11/10/2010 15:19:21 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-62-2	Vanadium	51	-33431	1.1392	10.0	3.1	0.0	
7440-47-3	Chromium	52	32407	-1.1659	2.0	0.92	0.0	
7439-89-6	Iron	57	12690	-4.2966	50.0	17.0	0.0	
7440-66-6	Zinc	68	1574	0.38606	5.0	1.0	0.0	
7440-38-2	Arsenic	75	15711	0.21491	2.0	0.50	0.0	
7782-49-2	Selenium	78	16817	-0.75544	2.0	1.7	0.0	
7782-49-2	Selenium	82	1463	-0.50077	2.0	1.7	0.0	
7440-22-4	Silver	107	231	0.01417	1.0	0.030	0.0	
7440-43-9	Cadmium	111	52	0.00240	1.0	0.074	0.0	
7440-43-9	Cadmium	114	65	0.00232	1.0	0.074	0.0	
7440-39-3	Barium	135	126	0.01014	1.0	0.96	0.0	
7440-28-0	Thallium	205	8068	0.43122	1.0	0.34	0.0	
7439-92-1	Lead	208	2207	0.04849	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1661903		☑
7440-74-6	Indium	115	1603123		☑
7440-30-4	Thulium	169	966516		☑

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CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 5 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 44 Method 6020_
Acquired: 11/10/2010 16:50:35 M01
Calibrated: 11/10/2010 15:19:21 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-62-2	Vanadium	51	992971	102.75	100.00	103	
7440-47-3	Chromium	52	917686	101.75	100.00	102	
7439-89-6	Iron	57	1546940	5070.0	5100.0	99.4	
7440-66-6	Zinc	68	89131	102.28	100.00	102	
7440-38-2	Arsenic	75	248897	100.40	100.00	100	
7782-49-2	Selenium	78	71522	101.62	100.00	102	
7782-49-2	Selenium	82	23843	100.21	100.00	100	
7440-22-4	Silver	107	476322	50.952	50.000	102	
7440-43-9	Cadmium	111	218011	101.70	100.00	102	
7440-43-9	Cadmium	114	522184	101.57	100.00	102	
7440-39-3	Barium	135	212811	102.47	100.00	102	
7440-28-0	Thallium	205	853916	51.884	50.000	104	
7439-92-1	Lead	208	2268567	104.85	100.00	105	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1531043		☑
7440-74-6	Indium	115	1483415		☑
7440-30-4	Thulium	169	938106		☑

Reviewed by: Date:

TAL West Sac

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Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 11:37:19

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 5** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 45 Method 6020_
Acquired: 11/10/2010 16:54:28 M01
Calibrated: 11/10/2010 15:19:21 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-62-2	Vanadium	51	-29574	1.4118	10.0	3.1	0.0	
7440-47-3	Chromium	52	26179	-1.7427	2.0	0.92	0.0	
7439-89-6	Iron	57	12241	-4.5826	50.0	17.0	0.0	
7440-66-6	Zinc	68	1496	0.35029	5.0	1.0	0.0	
7440-38-2	Arsenic	75	15114	0.15322	2.0	0.50	0.0	
7782-49-2	Selenium	78	16469	-0.54426	2.0	1.7	0.0	
7782-49-2	Selenium	82	1437	-0.43789	2.0	1.7	0.0	
7440-22-4	Silver	107	196	0.01110	1.0	0.030	0.0	
7440-43-9	Cadmium	111	53	0.00344	1.0	0.074	0.0	
7440-43-9	Cadmium	114	79	0.00508	1.0	0.074	0.0	
7440-39-3	Barium	135	146	0.02009	1.0	0.96	0.0	
7440-28-0	Thallium	205	11101	0.61339	1.0	0.34	0.0	
7439-92-1	Lead	208	2476	0.08118	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1634603		☑
7440-74-6	Indium	115	1572892		☑
7440-30-4	Thulium	169	961120		☑

Reviewed by: Date:

TAL West Sac

SERIAL DILUTION

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 12:03:48

Department: 120 (Metals) Source: MetEdit

Sample: **L9FXNP5** Serial Dilution: **5.00** Sample Dilution: **1.00**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 28 Method 6020_
Acquired: 11/10/2010 15:49:47 M01 Matrix: SOLID
Calibrated: 11/10/2010 15:19:21 Units: ug/L

CASN	Analyte Name	M/S	Area	Dilution	Sample	%Diff.	MDL	Flag	Q
7440-62-2	Vanadium	51	523065	255.35	228.94	11.5		*	
7440-47-3	Chromium	52	395400	183.99	178.25	3.22	2.0	NC	☑
7439-89-6	Iron	57	7881917	117434	111563	5.26		*	
7440-66-6	Zinc	68	40762	207.51	173.37	19.7		*	
7440-38-2	Arsenic	75	26178	21.028	18.563	13.3	1.5	NC	☑
7782-49-2	Selenium	78	17101	-2.5116	2.9837	184	1.0	NC	☑
7782-49-2	Selenium	82	1795	3.9849	6.3507	37.3	1.0	NC	☑
7440-22-4	Silver	107	1409	0.66238	0.66299	0.0931	0.30	NC	☑
7440-43-9	Cadmium	111	1447	3.0607	3.0284	1.07	0.50	NC	☑
7440-43-9	Cadmium	114	392	0.31028	0.38123	18.6	0.50	NC	☑
7440-39-3	Barium	135	198645	447.71	440.54	1.63	1.0	1.6	☑
7440-28-0	Thallium	205	10044	2.7603	2.2450	23.0		*	
7439-92-1	Lead	208	471483	106.28	103.54	2.65	0.60	2.6	☑

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1694899		☐
7440-74-6	Indium	115	1584313		☐
7440-30-4	Thulium	169	959794		☐

** Analyte not requested for this batch, no MDL*

NC : Serial dilution concentration < 100 X MDL

E : Difference greater than Limit (10%)

Reviewed by: Date:

TAL West Sac

SAMPLE SPIKE

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/11/10 12:03:57

Department: 120 (Metals) Source: MetEdit

Sample: **L9FXNZ** Spike Dilution: **1.00** Sample Dilution: **1.00**

Instrument: **ICPMS M01** Channel 261
File: 101110A1 # 29 Method 6020_
Acquired: 11/10/2010 15:53:31 M01 Matrix: SOLID
Calibrated: 11/10/2010 15:19:21 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	Sample	%Rec.	Spike	Flag	Q
7440-62-2	Vanadium	51	4360315	404.43	228.94	87.7	200		☑
7440-47-3	Chromium	52	3464459	366.55	178.25	94.2	200		☑
7439-89-6	Iron	57	36247092	110714	111563	0.00	1000	*	☐
7440-66-6	Zinc	68	331773	355.12	173.37	90.9	200		☑
7440-38-2	Arsenic	75	511211	195.95	18.563	88.7	200		☑
7782-49-2	Selenium	78	125654	182.94	2.9837	90.0	200		☑
7782-49-2	Selenium	82	46554	186.09	6.3507	89.9	200		☑
7440-22-4	Silver	107	473206	49.806	0.66299	98.3	50.0		☑
7440-43-9	Cadmium	111	425851	195.48	3.0284	96.2	200		☑
7440-43-9	Cadmium	114	993693	190.19	0.38123	94.9	200		☑
7440-39-3	Barium	135	1310094	620.89	440.54	90.2	200		☑
7440-28-0	Thallium	205	837823	52.794	2.2450	101	50.0		☑
7439-92-1	Lead	208	6134922	294.18	103.54	95.3	200		☑

CASN	ISTD Name	M/S	Area	Amount	Q
7440-56-4	Germanium	72	1655877		☑
7440-74-6	Indium	115	1507546		☑
7440-30-4	Thulium	169	904360		☑

Reviewed by: Date:

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ICP-MS Data Review Checklist
Level I and Level II

Instrument ID (Circle one): M01 M02		Method 6020 SOP SAC-MT-0001	
File Number 101113A1	Batch Numbers 0312224, 0312242, 0309208, 0312226, 0312227, 0312245 0309202,	Date 11/13/10	Analyst S. HARGRAVE BRJ

Lot Numbers	YES	NO	NA
G0K010425, G0K020530, G0J280529, G0J300458, G0K040578, G0J290449, G0J300442, G0K020501			
1. Copy of analysis protocol used included?	✓		
2. ICVs & CCVs within 10% of true value or recal and rerun?	✓		
3. ICB & CCBs < reporting limit or recal and rerun?	✓		
4. 10 samples or less analyzed between calibration checks?	✓		
5. All parameters within linear range?	✓		
6. LCS/LCSD within limits?	✓		
7. Prep blank value < reporting limit or all samples >20x blank?	✓		
8. Internal standard intensities for samples (unless followed by dilution) are > 30% and <120% of the Calibration Blank intensities?	✓		
9. Appropriate dilution factors applied to data?	✓		
10. Matrix spike and spike dup within customer defined limits?	✓		
11. Each batch checked for presence of internal standard in samples?	✓		
12. Anomalies entered using Clouseau?			✓

COMMENTS: _____

REVIEWED BY: SH DATE: 11-16-10	DATA ENTERED BY: BRJ DATE: 11/15/10

Dataset Report

Perkin Elmer ICPMS M01
SOP No. SAC-MT-0001
Method 6020,200.8
User Name: metal
Computer Name: SACP317BFB
Dataset File Path: c:\elandata\dataset\101113a1\
Report Date/Time: Monday, November 15, 2010 10:18:33

The Dataset

Batch ID	Sample ID	Date and Time	Read Type	Description
	TUNE SHARGRAVE	12:30:20 Sat 13-Nov-10	Sample	
	AUTOLENS SHARGF	12:33:14 Sat 13-Nov-10	Sample	Auto Lens Calib
	DAILY SHARGRAVE	12:35:42 Sat 13-Nov-10	Sample	
	Rinse 2X	12:44:09 Sat 13-Nov-10	Sample	
	Blank	12:48:33 Sat 13-Nov-10	Blank	
	Standard 1	12:52:51 Sat 13-Nov-10	Standard #1	
	ICV	12:56:53 Sat 13-Nov-10	Sample	
	ICB	13:01:01 Sat 13-Nov-10	Sample	
	LLSTD1	13:05:07 Sat 13-Nov-10	Sample	LLSTD@10X - out Cr, Se70
	LLSTD2	13:09:10 Sat 13-Nov-10	Sample	LLSTD@5X - Cr (> ±20% OSM)
	ICSA	13:13:15 Sat 13-Nov-10	Sample	
	ICSAB	13:17:20 Sat 13-Nov-10	Sample	
	LRSTD1	13:36:55 Sat 13-Nov-10	Sample	LRSTD@10ppmPb5ppmBaCdCr~~As~~SE100pPbAg out As
	Rinse	13:42:58 Sat 13-Nov-10	Sample	
	LRSTD2	13:47:04 Sat 13-Nov-10	Sample	LRSTD@~~5~~10ppmAs ✓
312224	L9DQC N.I.	14:05:08 Sat 13-Nov-10	Sample	G0K010425-1 N.I.
312242	L9FW8 N.I.	14:07:54 Sat 13-Nov-10	Sample	G0K020530-1 N.I.
309208	L880Q N.I.	14:10:41 Sat 13-Nov-10	Sample	G0J280529-3 N.I.
312236	L9C4M N.I.	14:13:28 Sat 13-Nov-10	Sample	G0J300458-1 N.I.
312245	L9KEHF N.I.	14:16:15 Sat 13-Nov-10	Sample	G0K040578-2 N.I.
309202	L9AM2FN.I.	14:19:03 Sat 13-Nov-10	Sample	G0J290449-3 N.I.
309202	L9C17F N.I.	14:21:51 Sat 13-Nov-10	Sample	G0J300442-2 N.I.
309202	L9FJXF N.I.	14:24:40 Sat 13-Nov-10	Sample	G0K020501-3 N.I.
	Rinse	14:36:32 Sat 13-Nov-10	Sample	
	CCV 1 >RECAL	15:19:32 Sat 13-Nov-10	Sample	
	CCB 1	15:23:40 Sat 13-Nov-10	Sample	
	CCV 2	15:27:48 Sat 13-Nov-10	Sample	
	CCB 2	15:31:57 Sat 13-Nov-10	Sample	
	LLSTD3	15:36:03 Sat 13-Nov-10	Sample	LLSTD@5ppbCr ✓
312224	L9PCQB	15:45:08 Sat 13-Nov-10	Sample	G0K080000-224 BLK
312224	L9PCQC	15:49:09 Sat 13-Nov-10	Sample	G0K080000-224 LCS
312224	L9DQC	15:53:07 Sat 13-Nov-10	Sample	G0K010425-1
312224	L9DQCP5	15:57:06 Sat 13-Nov-10	Sample	G0K010425-1 5X
312224	L9DQCZ	16:01:05 Sat 13-Nov-10	Sample	G0K010425-1 PS
	CCV 3	16:05:12 Sat 13-Nov-10	Sample	
	CCB 3	16:09:20 Sat 13-Nov-10	Sample	
	CCV 4	16:13:28 Sat 13-Nov-10	Sample	
	CCB 4	16:17:36 Sat 13-Nov-10	Sample	
312242	L9PEMB	16:21:40 Sat 13-Nov-10	Sample	G0K080000-242 BLK
312242	L9PEMC	16:25:41 Sat 13-Nov-10	Sample	G0K080000-242 LCS
312242	L9FW8S	16:29:39 Sat 13-Nov-10	Sample	G0K020530-1 MS
312242	L9FW8D	16:33:38 Sat 13-Nov-10	Sample	G0K020530-1 SD
312242	L9FW8	16:37:38 Sat 13-Nov-10	Sample	G0K020530-1
312242	L9FW8P5	16:41:38 Sat 13-Nov-10	Sample	G0K020530-1 5X
312242	L9FW8Z	16:45:39 Sat 13-Nov-10	Sample	G0K020530-1 PS
312242	L9FXA	16:49:40 Sat 13-Nov-10	Sample	G0K020530-2
312242	L9FXC	16:53:41 Sat 13-Nov-10	Sample	G0K020530-3
	CCV 5	16:57:48 Sat 13-Nov-10	Sample	
	CCB 5	17:01:56 Sat 13-Nov-10	Sample	

SHORT LIST	CCV 6	17:06:04 Sat 13-Nov-10	Sample	
	CCB 6	17:09:17 Sat 13-Nov-10	Sample	
	CCV 7	17:12:29 Sat 13-Nov-10	Sample	
	CCB 7	17:15:42 Sat 13-Nov-10	Sample	
309208	L9LHGB	17:18:50 Sat 13-Nov-10	Sample	G0K050000-208 BLK
309208	L9LHGC	17:21:57 Sat 13-Nov-10	Sample	G0K050000-208 LCS
309208	L880QS	17:25:01 Sat 13-Nov-10	Sample	G0J280529-3 MS
309208	L880QD	17:28:05 Sat 13-Nov-10	Sample	G0J280529-3 SD
309208	L880Q	17:31:11 Sat 13-Nov-10	Sample	G0J280529-3
309208	L880QP5	17:34:18 Sat 13-Nov-10	Sample	G0J280529-3 5X
309208	L880QZ	17:37:25 Sat 13-Nov-10	Sample	G0J280529-3 PS
309208	L880P	17:40:32 Sat 13-Nov-10	Sample	G0J280529-2
309208	L880R	17:43:40 Sat 13-Nov-10	Sample	G0J280529-4
	CCV 8	17:46:52 Sat 13-Nov-10	Sample	
	CCB 8	17:50:05 Sat 13-Nov-10	Sample	
	CCV 9	17:53:17 Sat 13-Nov-10	Sample	
	CCB 9	17:56:30 Sat 13-Nov-10	Sample	
309208	L880T	17:59:38 Sat 13-Nov-10	Sample	G0J280529-5
309208	L880V	18:02:47 Sat 13-Nov-10	Sample	G0J280529-6
309208	L880W	18:05:55 Sat 13-Nov-10	Sample	G0J280529-7
309208	L880X	18:09:05 Sat 13-Nov-10	Sample	G0J280529-8
309208	L8801	18:12:15 Sat 13-Nov-10	Sample	G0J280529-9
309208	L8802	18:15:25 Sat 13-Nov-10	Sample	G0J280529-10
309208	L8804	18:18:31 Sat 13-Nov-10	Sample	G0J280529-11
	CCV 10	18:21:41 Sat 13-Nov-10	Sample	
	CCB 10	18:24:54 Sat 13-Nov-10	Sample	
	CCV 11	18:28:07 Sat 13-Nov-10	Sample	
	CCB 11	18:31:19 Sat 13-Nov-10	Sample	
312236	L9PD4B	18:34:29 Sat 13-Nov-10	Sample	G0K080000-236 BLK > RERUN Se
312236	L9PD4C	18:37:35 Sat 13-Nov-10	Sample	G0K080000-236 LCS
312236	L9C4MS	18:40:38 Sat 13-Nov-10	Sample	G0J300458-1 MS
312236	L9C4MD	18:43:41 Sat 13-Nov-10	Sample	G0J300458-1 SD
312236	L9C4M	18:46:44 Sat 13-Nov-10	Sample	G0J300458-1 — AIR - DO NOT REPORT - RERUN
312236	L9C4MP5	18:49:48 Sat 13-Nov-10	Sample	G0J300458-1 5X RERUN Se ~~2 Sp~~ 1x BAD w/ISTD
312236	L9C4MZ	18:52:51 Sat 13-Nov-10	Sample	G0J300458-1 PS
312236	L9C5D	18:55:56 Sat 13-Nov-10	Sample	G0J300458-2
312236	L9C5E	18:59:00 Sat 13-Nov-10	Sample	G0J300458-3
	CCV 12 > RECAL	19:02:11 Sat 13-Nov-10	Sample	- OUT Se
	CCB 12	19:05:24 Sat 13-Nov-10	Sample	- OUT Se TB
	CCV 13	19:08:36 Sat 13-Nov-10	Sample	
	CCB 13	19:11:49 Sat 13-Nov-10	Sample	
312227	L9PC2BF	19:14:58 Sat 13-Nov-10	Sample	G0K080000-227 BLK
312227	L9PC2CF	19:18:05 Sat 13-Nov-10	Sample	G0K080000-227 LCS
312227	L9C4MSF	19:21:10 Sat 13-Nov-10	Sample	G0J300458-1 MS
312227	L9C4MDF	19:24:16 Sat 13-Nov-10	Sample	G0J300458-1 SD
312227	L9C4MF	19:27:21 Sat 13-Nov-10	Sample	G0J300458-1
312227	L9C4MP5F	19:30:24 Sat 13-Nov-10	Sample	G0J300458-1 5X
312227	L9C4MZF	19:33:28 Sat 13-Nov-10	Sample	G0J300458-1PS
312227	L9C5DF	19:36:33 Sat 13-Nov-10	Sample	G0J300458-2
312227	L9C5EF	19:39:37 Sat 13-Nov-10	Sample	G0J300458-3
	CCV 14 > RECAL	19:42:49 Sat 13-Nov-10	Sample	
	CCB 14	19:46:01 Sat 13-Nov-10	Sample	
SHORT LIST	CCV 15	19:49:13 Sat 13-Nov-10	Sample	
	CCB 15	19:51:53 Sat 13-Nov-10	Sample	
	CCV 16	19:54:33 Sat 13-Nov-10	Sample	
	CCB 16	19:57:13 Sat 13-Nov-10	Sample	
312245	L9PE3BF	19:59:49 Sat 13-Nov-10	Sample	G0K080000-245 BLK
312245	L9PE3CF	20:02:25 Sat 13-Nov-10	Sample	G0K080000-245 LCS
312245	L9KEHSF	20:04:58 Sat 13-Nov-10	Sample	G0K040578-2 MS
312245	L9KEHDF	20:07:33 Sat 13-Nov-10	Sample	G0K040578-2 SD

312245	L9KEHF	20:10:10 Sat 13-Nov-10	Sample	G0K040578-2
312245	L9KEHP5F	20:12:43 Sat 13-Nov-10	Sample	G0K040578-2 5X
312245	L9KEHZF	20:15:17 Sat 13-Nov-10	Sample	G0K040578-2 PS
312245	L9KENF	20:17:51 Sat 13-Nov-10	Sample	G0K040578-3
	CCV 17	20:20:30 Sat 13-Nov-10	Sample	
	CCB 17	20:23:10 Sat 13-Nov-10	Sample	
	CCV 18	20:25:50 Sat 13-Nov-10	Sample	
	CCB 18	20:28:30 Sat 13-Nov-10	Sample	
309202	L9LFRBF	20:31:06 Sat 13-Nov-10	Sample	G0K050000-202 BLK
309202	L9LFRCF	20:33:42 Sat 13-Nov-10	Sample	G0K050000-202 LCS
309202	L9AM2SF	20:36:18 Sat 13-Nov-10	Sample	G0J290449-3 MS
309202	L9AM2DF	20:38:53 Sat 13-Nov-10	Sample	G0J290449-3 SD
309202	L9AM2F	20:41:28 Sat 13-Nov-10	Sample	G0J290449-3
309202	L9AM2P5F	20:44:03 Sat 13-Nov-10	Sample	G0J290449-3 5X
309202	L9AM2ZF	20:46:38 Sat 13-Nov-10	Sample	G0J290449-3 PS
309202	L9ANNF	20:49:13 Sat 13-Nov-10	Sample	G0J290449-4
	CCV 19	20:51:53 Sat 13-Nov-10	Sample	
	CCB 19	20:54:33 Sat 13-Nov-10	Sample	
	CCV 20	20:57:13 Sat 13-Nov-10	Sample	
	CCB 20	20:59:53 Sat 13-Nov-10	Sample	
309202	L9C17SF	21:02:28 Sat 13-Nov-10	Sample	G0J300442-2 MS
309202	L9C17DF	21:05:04 Sat 13-Nov-10	Sample	G0J300442-2 SD
309202	L9C17F	21:07:41 Sat 13-Nov-10	Sample	G0J300442-2
309202	L9FJXSF	21:10:18 Sat 13-Nov-10	Sample	G0K020501-3 MS
309202	L9FJXDF	21:12:52 Sat 13-Nov-10	Sample	G0K020501-3 SD
309202	L9FJXF	21:15:22 Sat 13-Nov-10	Sample	G0K020501-3
	CCV 21	21:17:59 Sat 13-Nov-10	Sample	
	CCB 21	21:20:39 Sat 13-Nov-10	Sample	

TAL West Sac

RUN SUMMARY

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/15/10 12:56:24

File ID: 101113A1 Analyst: jonesb

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
1	Rinse 2X				2.0	11/13/10 12:44		☐
2	Blank				1.0	11/13/10 12:48		☐
3	Standard1				1.0	11/13/10 12:52		☐
4	ICV				1.0	11/13/10 12:56		☐
5	ICB				1.0	11/13/10 13:01		☐
6	LLSTD1				1.0	11/13/10 13:05		☐
7	LLSTD2				1.0	11/13/10 13:09		☐
8	ICSA				1.0	11/13/10 13:13		☐
9	ICSAB				1.0	11/13/10 13:17		☐
10	LRSTD1				1.0	11/13/10 13:36		☐
11	Rinse				1.0	11/13/10 13:42		☐
12	LRSTD2				1.0	11/13/10 13:47		☐
13	Rinse				1.0	11/13/10 14:36		☐
14	CCV 1				1.0	11/13/10 15:19		☐
15	CCB 1				1.0	11/13/10 15:23		☐
18	CCV 2				1.0	11/13/10 15:27		☐
19	CCB 2				1.0	11/13/10 15:31		☐
20	LLSTD3				1.0	11/13/10 15:36		☐
21	L9PCQB	G0K080000	0312224	04	1.0	11/13/10 15:45		☐
22	L9PCQC	G0K080000	0312224	04	1.0	11/13/10 15:49		☐
23	L9DQC	G0K010425-1	0312224	04	1.0	11/13/10 15:53		☐
24	L9DQCP5	G0K010425	0312224		5.0	11/13/10 15:57		☐
25	L9DQCZ	G0K010425-1	0312224		1.0	11/13/10 16:01		☐
26	CCV 3				1.0	11/13/10 16:05		☐
27	CCB 3				1.0	11/13/10 16:09		☐
28	CCV 4				1.0	11/13/10 16:13		☐
29	CCB 4				1.0	11/13/10 16:17		☐
30	L9PEMB	G0K080000	0312242	04	1.0	11/13/10 16:21		☐
31	L9PEMC	G0K080000	0312242	04	1.0	11/13/10 16:25		☐
32	L9FW8S	G0K020530-1	0312242	04	1.0	11/13/10 16:29		☐
33	L9FW8D	G0K020530-1	0312242	04	1.0	11/13/10 16:33		☐
34	L9FW8	G0K020530-1	0312242	04	1.0	11/13/10 16:37		☐
35	L9FW8P5	G0K020530	0312242		5.0	11/13/10 16:41		☐
36	L9FW8Z	G0K020530-1	0312242		1.0	11/13/10 16:45		☐
37	L9FXA	G0K020530-2	0312242	04	1.0	11/13/10 16:49		☐
38	L9FXC	G0K020530-3	0312242	04	1.0	11/13/10 16:53		☐
39	CCV 5				1.0	11/13/10 16:57		☐
40	CCB 5				1.0	11/13/10 17:01		☐
41	CCV 6				1.0	11/13/10 17:06		☐
42	CCB 6				1.0	11/13/10 17:09		☐
43	CCV 7				1.0	11/13/10 17:12		☐
44	CCB 7				1.0	11/13/10 17:15		☐
45	L9LHGB	G0K050000	0309208	04	1.0	11/13/10 17:18		☐
46	L9LHGC	G0K050000	0309208	04	1.0	11/13/10 17:21		☐
47	L880QS	G0J280529-3	0309208	04	1.0	11/13/10 17:25		☐
48	L880QD	G0J280529-3	0309208	04	1.0	11/13/10 17:28		☐

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/15/10 12:56:24

File ID: **101113A1** **Analyst: jonesb**

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
49	L880Q	G0J280529-3	0309208	04	1.0	11/13/10 17:31		☐
50	L880QP5	G0J280529	0309208		5.0	11/13/10 17:34		☐
51	L880QZ	G0J280529-3	0309208		1.0	11/13/10 17:37		☐
52	L880P	G0J280529-2	0309208	04	1.0	11/13/10 17:40		☐
53	L880R	G0J280529-4	0309208	04	1.0	11/13/10 17:43		☐
54	CCV 8				1.0	11/13/10 17:46		☐
55	CCB 8				1.0	11/13/10 17:50		☐
56	CCV 9				1.0	11/13/10 17:53		☐
57	CCB 9				1.0	11/13/10 17:56		☐
58	L880T	G0J280529-5	0309208	04	1.0	11/13/10 17:59		☐
59	L880V	G0J280529-6	0309208	04	1.0	11/13/10 18:02		☐
60	L880W	G0J280529-7	0309208	04	1.0	11/13/10 18:05		☐
61	L880X	G0J280529-8	0309208	04	1.0	11/13/10 18:09		☐
62	L8801	G0J280529-9	0309208	04	1.0	11/13/10 18:12		☐
63	L8802	G0J280529-10	0309208	04	1.0	11/13/10 18:15		☐
64	L8804	G0J280529-11	0309208	04	1.0	11/13/10 18:18		☐
65	CCV 10				1.0	11/13/10 18:21		☐
66	CCB 10				1.0	11/13/10 18:24		☐
67	CCV 11				1.0	11/13/10 18:28		☐
68	CCB 11				1.0	11/13/10 18:31		☐
69	L9PD4B	G0K080000	0312236	04	1.0	11/13/10 18:34		☐
70	L9PD4C	G0K080000	0312236	04	1.0	11/13/10 18:37		☐
71	L9C4MS	G0J300458-1	0312236	04	1.0	11/13/10 18:40		☐
72	L9C4MD	G0J300458-1	0312236	04	1.0	11/13/10 18:43		☐
73	L9C4M	G0J300458-1	0312236	04	1.0	11/13/10 18:46		☐
74	L9C4MP5	G0J300458	0312236		5.0	11/13/10 18:49		☐
75	L9C4MZ	G0J300458-1	0312236		1.0	11/13/10 18:52		☐
76	L9C5D	G0J300458-2	0312236	04	1.0	11/13/10 18:55		☐
77	L9C5E	G0J300458-3	0312236	04	1.0	11/13/10 18:59		☐
78	CCV 12				1.0	11/13/10 19:02		☐
79	CCB 12				1.0	11/13/10 19:05		☐
82	CCV 13				1.0	11/13/10 19:08		☐
83	CCB 13				1.0	11/13/10 19:11		☐
84	L9PC2BF	G0K080000	0312227	00	1.0	11/13/10 19:14		☐
85	L9PC2CF	G0K080000	0312227	00	1.0	11/13/10 19:18		☐
86	L9C4MSF	G0J300458-1	0312227	00	1.0	11/13/10 19:21		☐
87	L9C4MDF	G0J300458-1	0312227	00	1.0	11/13/10 19:24		☐
88	L9C4MF	G0J300458-1	0312227	00	1.0	11/13/10 19:27		☐
89	L9C4MP5F	G0J300458	0312227		5.0	11/13/10 19:30		☐
90	L9C4MZF	G0J300458-1	0312227		1.0	11/13/10 19:33		☐
91	L9C5DF	G0J300458-2	0312227	00	1.0	11/13/10 19:36		☐
92	L9C5EF	G0J300458-3	0312227	00	1.0	11/13/10 19:39		☐
93	CCV 14				1.0	11/13/10 19:42		☐
94	CCB 14				1.0	11/13/10 19:46		☐
97	CCV 15				1.0	11/13/10 19:49		☐
98	CCB 15				1.0	11/13/10 19:51		☐

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/15/10 12:56:24

File ID: 101113A1 **Analyst: jonesb**

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
99	CCV 16				1.0	11/13/10 19:54		☐
100	CCB 16				1.0	11/13/10 19:57		☐
101	L9PE3BF	G0K080000	0312245	00	1.0	11/13/10 19:59		☐
102	L9PE3CF	G0K080000	0312245	00	1.0	11/13/10 20:02		☐
103	L9KEHSF	G0K040578-2	0312245	00	1.0	11/13/10 20:04		☐
104	L9KEHDF	G0K040578-2	0312245	00	1.0	11/13/10 20:07		☐
105	L9KEHF	G0K040578-2	0312245	00	1.0	11/13/10 20:10		☐
106	L9KEHP5F	G0K040578	0312245		5.0	11/13/10 20:12		☐
107	L9KEHZF	G0K040578-2	0312245		1.0	11/13/10 20:15		☐
108	L9KENF	G0K040578-3	0312245	00	1.0	11/13/10 20:17		☐
109	CCV 17				1.0	11/13/10 20:20		☐
110	CCB 17				1.0	11/13/10 20:23		☐
111	CCV 18				1.0	11/13/10 20:25		☐
112	CCB 18				1.0	11/13/10 20:28		☐
113	L9LFRBF	G0K050000	0309202	00	1.0	11/13/10 20:31		☐
114	L9LFRCF	G0K050000	0309202	00	1.0	11/13/10 20:33		☐
115	L9AM2SF	G0J290449-3	0309202	00	1.0	11/13/10 20:36		☐
116	L9AM2DF	G0J290449-3	0309202	00	1.0	11/13/10 20:38		☐
117	L9AM2F	G0J290449-3	0309202	00	1.0	11/13/10 20:41		☐
118	L9AM2P5F	G0J290449	0309202		5.0	11/13/10 20:44		☐
119	L9AM2ZF	G0J290449-3	0309202		1.0	11/13/10 20:46		☐
120	L9ANNF	G0J290449-4	0309202	00	1.0	11/13/10 20:49		☐
121	CCV 19				1.0	11/13/10 20:51		☐
122	CCB 19				1.0	11/13/10 20:54		☐
123	CCV 20				1.0	11/13/10 20:57		☐
124	CCB 20				1.0	11/13/10 20:59		☐
125	L9C17SF	G0J300442-2	0309202	00	1.0	11/13/10 21:02		☐
126	L9C17DF	G0J300442-2	0309202	00	1.0	11/13/10 21:05		☐
127	L9C17F	G0J300442-2	0309202	00	1.0	11/13/10 21:07		☐
128	L9FJXSF	G0K020501-3	0309202	00	1.0	11/13/10 21:10		☐
129	L9FJXDF	G0K020501-3	0309202	00	1.0	11/13/10 21:12		☐
130	L9FJXF	G0K020501-3	0309202	00	1.0	11/13/10 21:15		☐
131	CCV 21				1.0	11/13/10 21:17		☐
132	CCB 21				1.0	11/13/10 21:20		☐

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/15/10 12:56:24

File ID: 101113A1 **Analyst: ionesb**

#	Sample ID	Analyzed Date	Germanium	Indium	Lithium-6	Thulium	Q
1	Rinse 2X	11/13/10 12:44	94.8	94.5	94.2	93.2	☐
2	Blank	11/13/10 12:48	100.0	100.0	100.0	100.0	☑
3	Standard1	11/13/10 12:52	100.3	99.0	100.9	99.1	☑
4	ICV	11/13/10 12:56	100.9	100.4	103.8	100.1	☑
5	ICB	11/13/10 13:01	100.3	100.3	101.9	99.2	☑
6	LLSTD1	11/13/10 13:05	102.4	101.6	103.7	100.6	☑
7	LLSTD2	11/13/10 13:09	101.8	101.2	103.0	99.8	☑
8	ICSA	11/13/10 13:13	92.2	90.8	98.4	89.7	☑
9	ICSAB	11/13/10 13:17	93.5	91.6	102.0	90.9	☑
10	LRSTD1	11/13/10 13:36	98.6	99.3	107.2	100.5	☑
11	Rinse	11/13/10 13:42	101.5	101.1	110.7	104.7	☑
12	LRSTD2	11/13/10 13:47	101.6	100.4	110.0	102.7	☑
13	Rinse	11/13/10 14:36	100.6	103.0	110.2	105.1	☑
14	CCV 1	11/13/10 15:19	103.9	103.2	117.4	108.9	☑
15	CCB 1	11/13/10 15:23	101.9	101.6	112.1	105.4	☑
18	CCV 2	11/13/10 15:27	101.0	99.5	101.8	99.5	☑
19	CCB 2	11/13/10 15:31	100.0	99.8	100.8	99.5	☑
20	LLSTD3	11/13/10 15:36	101.6	100.3	101.6	100.9	☑
21	L9PCQB	11/13/10 15:45	100.5	99.2	103.8	99.7	☑
22	L9PCQC	11/13/10 15:49	99.6	97.8	104.4	98.6	☑
23	L9DQC	11/13/10 15:53	100.6	98.2	104.5	99.3	☑
24	L9DQCP5	11/13/10 15:57	99.7	98.0	102.6	98.9	☐
25	L9DQCZ	11/13/10 16:01	99.3	96.8	105.0	97.9	☑
26	CCV 3	11/13/10 16:05	100.9	97.5	104.2	98.4	☑
27	CCB 3	11/13/10 16:09	100.2	98.2	102.4	98.6	☑
28	CCV 4	11/13/10 16:13	100.3	96.4	101.9	97.6	☑
29	CCB 4	11/13/10 16:17	99.8	97.3	102.5	98.2	☑
30	L9PEMB	11/13/10 16:21	100.2	97.6	103.4	98.6	☑
31	L9PEMC	11/13/10 16:25	98.9	96.9	104.3	98.2	☑
32	L9FW8S	11/13/10 16:29	99.1	96.7	102.8	96.9	☑
33	L9FW8D	11/13/10 16:33	99.5	96.6	102.3	96.7	☑
34	L9FW8	11/13/10 16:37	100.3	97.4	101.9	98.8	☑
35	L9FW8P5	11/13/10 16:41	100.6	98.4	101.7	98.6	☐
36	L9FW8Z	11/13/10 16:45	99.1	95.4	103.0	96.0	☑
37	L9FXA	11/13/10 16:49	100.1	97.7	102.3	98.9	☑
38	L9FXC	11/13/10 16:53	98.8	96.9	101.4	97.4	☑
39	CCV 5	11/13/10 16:57	99.4	96.3	102.0	97.1	☑
40	CCB 5	11/13/10 17:01	98.2	96.3	101.6	97.0	☑
41	CCV 6	11/13/10 17:06	96.5	94.8		97.4	☑
42	CCB 6	11/13/10 17:09	96.9	96.9		98.9	☑
43	CCV 7	11/13/10 17:12	98.6	97.2		99.5	☑
44	CCB 7	11/13/10 17:15	97.7	97.4		99.0	☑
45	L9LHGB	11/13/10 17:18	97.8	97.8		99.6	☑
46	L9LHGC	11/13/10 17:21	97.1	96.5		98.4	☑
47	L880QS	11/13/10 17:25	96.2	94.2		96.0	☑
48	L880QD	11/13/10 17:28	95.7	93.3		95.7	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/15/10 12:56:24

File ID: **101113A1** **Analyst: ionesb**

#	Sample ID	Analyzed Date	Germanium	Indium	Lithium-6	Thulium	Q
49	L880Q	11/13/10 17:31	95.3	93.9		96.6	☑
50	L880QP5	11/13/10 17:34	96.4	95.7		98.5	☐
51	L880QZ	11/13/10 17:37	93.6	91.6		94.4	☑
52	L880P	11/13/10 17:40	96.3	95.5		99.7	☑
53	L880R	11/13/10 17:43	94.6	93.3		96.5	☑
54	CCV 8	11/13/10 17:46	96.2	94.1		98.4	☑
55	CCB 8	11/13/10 17:50	95.1	95.0		97.5	☑
56	CCV 9	11/13/10 17:53	96.5	94.1		98.6	☑
57	CCB 9	11/13/10 17:56	95.4	93.8		97.4	☑
58	L880T	11/13/10 17:59	93.1	90.9		95.5	☑
59	L880V	11/13/10 18:02	93.9	92.5		97.1	☑
60	L880W	11/13/10 18:05	93.9	92.3		95.5	☑
61	L880X	11/13/10 18:09	92.6	90.2		95.5	☑
62	L8801	11/13/10 18:12	93.3	91.0		95.0	☑
63	L8802	11/13/10 18:15	93.1	90.2		95.9	☑
64	L8804	11/13/10 18:18	92.1	89.4		95.7	☑
65	CCV 10	11/13/10 18:21	94.3	91.2		96.1	☑
66	CCB 10	11/13/10 18:24	94.6	93.4		98.0	☑
67	CCV 11	11/13/10 18:28	93.9	91.3		95.3	☑
68	CCB 11	11/13/10 18:31	93.1	92.1		96.9	☑
69	L9PD4B	11/13/10 18:34	93.2	92.8		98.0	☑
70	L9PD4C	11/13/10 18:37	93.9	92.6		96.8	☑
71	L9C4MS	11/13/10 18:40	76.6	81.1		78.8	☑
72	L9C4MD	11/13/10 18:43	72.6	81.9		79.9	☑
73	L9C4M	11/13/10 18:46	98.7	113.3		116.8	☑
74	L9C4MP5	11/13/10 18:49	80.8	89.0		90.3	☐
75	L9C4MZ	11/13/10 18:52	68.7	82.3		80.4	☐
76	L9C5D	11/13/10 18:55	66.2	81.7		80.0	☐
77	L9C5E	11/13/10 18:59	73.3	87.2		87.6	☑
78	CCV 12	11/13/10 19:02	80.4	95.4		96.3	☑
79	CCB 12	11/13/10 19:05	81.6	97.6		97.3	☑
82	CCV 13	11/13/10 19:08	100.8	98.6		100.2	☑
83	CCB 13	11/13/10 19:11	103.7	102.7		102.0	☑
84	L9PC2BF	11/13/10 19:14	101.3	100.3		99.7	☑
85	L9PC2CF	11/13/10 19:18	100.8	99.1		98.8	☑
86	L9C4MSF	11/13/10 19:21	78.3	81.7		80.6	☑
87	L9C4MDF	11/13/10 19:24	75.2	80.8		80.4	☑
88	L9C4MF	11/13/10 19:27	73.8	79.9		79.4	☑
89	L9C4MP5F	11/13/10 19:30	83.2	88.2		89.3	☐
90	L9C4MZF	11/13/10 19:33	73.6	80.3		80.7	☑
91	L9C5DF	11/13/10 19:36	76.4	84.0		84.3	☑
92	L9C5EF	11/13/10 19:39	90.8	95.6		99.0	☑
93	CCV 14	11/13/10 19:42	99.8	107.0		109.9	☑
94	CCB 14	11/13/10 19:46	97.9	106.3		107.4	☑
97	CCV 15	11/13/10 19:49				96.4	☑
98	CCB 15	11/13/10 19:51				97.5	☑

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/15/10 12:56:24

File ID: 101113A1 **Analyst:** jonesb

#	Sample ID	Analyzed Date	Germanium	Indium	Lithium-6	Thulium	Q
99	CCV 16	11/13/10 19:54				95.8	☑
100	CCB 16	11/13/10 19:57				97.4	☑
101	L9PE3BF	11/13/10 19:59				99.0	☑
102	L9PE3CF	11/13/10 20:02				95.9	☑
103	L9KEHSF	11/13/10 20:04				87.2	☑
104	L9KEHDF	11/13/10 20:07				82.4	☑
105	L9KEHF	11/13/10 20:10				83.9	☑
106	L9KEHP5F	11/13/10 20:12				92.3	☐
107	L9KEHZF	11/13/10 20:15				83.6	☑
108	L9KENF	11/13/10 20:17				87.4	☑
109	CCV 17	11/13/10 20:20				97.8	☑
110	CCB 17	11/13/10 20:23				97.7	☑
111	CCV 18	11/13/10 20:25				96.5	☑
112	CCB 18	11/13/10 20:28				96.0	☑
113	L9LFRBF	11/13/10 20:31				95.8	☑
114	L9LFRCF	11/13/10 20:33				94.0	☑
115	L9AM2SF	11/13/10 20:36				76.9	☑
116	L9AM2DF	11/13/10 20:38				85.2	☑
117	L9AM2F	11/13/10 20:41				81.3	☑
118	L9AM2P5F	11/13/10 20:44				91.5	☐
119	L9AM2ZF	11/13/10 20:46				82.5	☑
120	L9ANNF	11/13/10 20:49				87.8	☑
121	CCV 19	11/13/10 20:51				97.3	☑
122	CCB 19	11/13/10 20:54				96.3	☑
123	CCV 20	11/13/10 20:57				95.3	☑
124	CCB 20	11/13/10 20:59				95.9	☑
125	L9C17SF	11/13/10 21:02				73.8	☑
126	L9C17DF	11/13/10 21:05				77.8	☑
127	L9C17F	11/13/10 21:07				78.1	☑
128	L9FJXSF	11/13/10 21:10				106.2	☑
129	L9FJXDF	11/13/10 21:12				108.3	☑
130	L9FJXF	11/13/10 21:15				107.0	☑
131	CCV 21	11/13/10 21:17				117.6	☑
132	CCB 21	11/13/10 21:20				118.1	☑

TAL-W.SACRAMENTO - Elan 6000 ICPMS Perkin Elmer M01 Quantitative Method Report

File Name: 0312224.mth
File Path: C:\elandata\Method\0312224.mth

Timing Parameters

Sweeps/Reading: 50
Readings/Replicate: 1
Number of Replicates: 3
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: c:\elandata\Optimize\default.dac
QC Enabled: Yes
Settling Time: Normal

Analyte	Mass	Scan Mode	MCA Channels	Dwell Time	Integration Time
Sc	44.956	Peak Hopping	1	14.0 ms	700 ms
Li-1	6.015	Peak Hopping	1	14.0 ms	700 ms
Be	9.012	Peak Hopping	1	14.0 ms	700 ms
Ca	43.956	Peak Hopping	1	14.0 ms	700 ms
Cr	51.941	Peak Hopping	1	14.0 ms	700 ms
Ni	59.933	Peak Hopping	1	14.0 ms	700 ms
Cu	64.928	Peak Hopping	1	14.0 ms	700 ms
Zn	67.925	Peak Hopping	1	14.0 ms	700 ms
As	74.922	Peak Hopping	1	20.0 ms	1000 ms
Se	81.917	Peak Hopping	1	20.0 ms	1000 ms
Mo	96.906	Peak Hopping	1	14.0 ms	700 ms
Ge-1	71.922	Peak Hopping	1	14.0 ms	700 ms
Ag	106.905	Peak Hopping	1	14.0 ms	700 ms
Cd	110.904	Peak Hopping	1	14.0 ms	700 ms
Sb	120.904	Peak Hopping	1	14.0 ms	700 ms
Ba	134.906	Peak Hopping	1	14.0 ms	700 ms
In-1	114.904	Peak Hopping	1	14.0 ms	700 ms
Tl	204.975	Peak Hopping	1	14.0 ms	700 ms
Pb	207.977	Peak Hopping	1	14.0 ms	700 ms
Tm-1	168.934	Peak Hopping	1	14.0 ms	700 ms
Cr	49.946	Peak Hopping	1	5.0 ms	250 ms
Cr	52.941	Peak Hopping	1	5.0 ms	250 ms
Ni	60.931	Peak Hopping	1	5.0 ms	250 ms
Cu	62.930	Peak Hopping	1	5.0 ms	250 ms
Zn	66.927	Peak Hopping	1	5.0 ms	250 ms
Zn	65.926	Peak Hopping	1	5.0 ms	250 ms
Se	75.919	Peak Hopping	1	5.0 ms	250 ms
Se	76.920	Peak Hopping	1	20.0 ms	1000 ms
Se	77.917	Peak Hopping	1	20.0 ms	1000 ms
Br	78.918	Peak Hopping	1	20.0 ms	1000 ms
Ge	71.922	Peak Hopping	1	14.0 ms	700 ms
Cd	107.904	Peak Hopping	1	5.0 ms	250 ms
Cd	113.904	Peak Hopping	1	14.0 ms	700 ms
Ag	108.905	Peak Hopping	1	5.0 ms	250 ms
In	114.904	Peak Hopping	1	14.0 ms	700 ms
207.977	207.977	Peak Hopping	1	14.0 ms	700 ms
Pb	206.976	Peak Hopping	1	14.0 ms	700 ms
Pb	205.975	Peak Hopping	1	14.0 ms	700 ms
Tm	168.934	Peak Hopping	1	14.0 ms	700 ms

Signal Processing

Detector Mode:	Dual
Measurement Units:	Counts
AutoLens:	On
Spectral Peak Processing:	Average
Signal Profile Processing:	Average
Blank Subtraction:	After Internal Standard
Baseline Readings:	0
Smoothing:	Yes, Factor 5

Equations

Analyte	Mass	Corrections
Ni	59.933	-0.005 * Ca 43
Cu	64.928	-0.0078 * Ti 49
Zn	67.925	-0.03 * Ba 136
As	74.922	-3.1278 * Se 77 + 1.0177 * Se 78
Se	81.917	- 0.00182 * Br 79
Cd	110.904	-1.073 * Pd 108 + 0.712 * Pd 106
In-1	114.904	- 0.014032 * Sn 118
Pb	207.977	+ 1.0 * Pb 207 + 1.0 * Pb 206
Cr	49.946	- 0.739726 * Ti 47 - 0.002506 * V 51
Se	75.919	- 0.268980 * Ge 72
Se	77.917	- 0.030435 * Kr 83
Cd	107.904	- 1.184953 * Pd 105
Cd	113.904	- 0.026826 * Sn 118
In	114.904	- 0.014032 * Sn 118

Calibration Information

Analyte	Mass	Curve Type	Sample Units	Std Units	Std 1	Std 2	Std 3	Std 4
Sc	44.956	Linear Thru Zero	ug/L	ug/L				
Li-1	6.015	Linear Thru Zero	ug/L	ug/L				
Be	9.012	Linear Thru Zero	ug/L	ug/L	100			
Ca	43.956	Linear Thru Zero	ug/L	ug/L	5.1e+003			
Cr	51.941	Linear Thru Zero	ug/L	ug/L	100			
Ni	59.933	Linear Thru Zero	ug/L	ug/L	100			
Cu	64.928	Linear Thru Zero	ug/L	ug/L	100			
Zn	67.925	Linear Thru Zero	ug/L	ug/L	100			
As	74.922	Linear Thru Zero	ug/L	ug/L	100			
Se	81.917	Linear Thru Zero	ug/L	ug/L	100			
Mo	96.906	Linear Thru Zero	ug/L	ug/L	200			
Ge-1	71.922	Linear Thru Zero	ug/L	ug/L				
Ag	106.905	Linear Thru Zero	ug/L	ug/L	50			
Cd	110.904	Linear Thru Zero	ug/L	ug/L	100			
Sb	120.904	Linear Thru Zero	ug/L	ug/L	50			
Ba	134.906	Linear Thru Zero	ug/L	ug/L	100			
In-1	114.904	Linear Thru Zero	ug/L	ug/L				
Tl	204.975	Linear Thru Zero	ug/L	ug/L	50			
Pb	207.977	Linear Thru Zero	ug/L	ug/L	100			
Tm-1	168.934	Linear Thru Zero	ug/L	ug/L				
Cr	49.946	Linear Thru Zero	ug/L	ug/L	100			
Cr	52.941	Linear Thru Zero	ug/L	ug/L	100			
Ni	60.931	Linear Thru Zero	ug/L	ug/L	100			
Cu	62.930	Linear Thru Zero	ug/L	ug/L	100			

Zn	66.927	Linear Thru Zero	ug/L	ug/L	100
Zn	65.926	Linear Thru Zero	ug/L	ug/L	100
Se	75.919	Linear Thru Zero	ug/L	ug/L	100
Se	76.920	Linear Thru Zero	ug/L	ug/L	100
Se	77.917	Linear Thru Zero	ug/L	ug/L	100
Br	78.918	Linear Thru Zero	ug/L	ug/L	100
Ge	71.922	Linear Thru Zero	ug/L	ug/L	
Cd	107.904	Linear Thru Zero	ug/L	ug/L	100
Cd	113.904	Linear Thru Zero	ug/L	ug/L	100
Ag	108.905	Linear Thru Zero	ug/L	ug/L	50
In	114.904	Linear Thru Zero	ug/L	ug/L	
207.97	207.977	Linear Thru Zero	ug/L	ug/L	100
Pb	206.976	Linear Thru Zero	ug/L	ug/L	100
Pb	205.975	Linear Thru Zero	ug/L	ug/L	100
Tm	168.934	Linear Thru Zero	ug/L	ug/L	

TAL-W. SACRAMENTO - Perkin Elmer Elan 6000 ICPMS, M01 – Methods 6020, 200.8

AQUEOUS STANDARDS - 2 % HNO3, 1 % HCl

Standards for run:

Tuning standard: 4075-18E

Internal standard: 4075-22C

Blank, CCBs: 3185-41E

Standard 1- CCVs: 4075-22A

ICV: 4075-16D

ICSA: 4075-24C

ICSAB: 4075-24D

File Number: 101113A1

Instrument Tuning Report - Elan 6000

File Name: default.tun

Sample Information

Sample Date/Time: Saturday, November 13, 2010 12:30:20
Sample ID: TUNE SHARGRAVE

Analyte	Exact Mass	Meas. Mass	Mass DAC	Meas. Pk. Width	Res. DAC	Custom Res.
Li	7.016	7.027	1556	0.745	2030	
Be	9.012	9.029	2062	0.746	2015	
Mg	23.985	24.028	5727	0.728	1977	
Co	58.933	58.978	14297	0.728	1885	
In	114.904	114.878	27955	0.728	1839	
Ce	139.905	139.878	34040	0.727	1880	
Tl	204.975	204.979	49758	0.742	2091	
Pb	207.977	207.978	50472	0.722	2111	
U	238.050	238.076	57712	0.725	2270	

Report Date/Time: Saturday, November 13, 2010 12:32:10
Page 1

Elan 6000 Instrument Optomization Report

File Name c:\elandata\Optimize\default.dac
Path c:\elandata\Optimize

Sample Information

Sample Date/Time: Saturday, November 13, 2010 12:30:20
Sample ID: TUNE SHARGRAVE

Parameter Settings

Nebulizer Gas Flow	0.8
Lens Voltage	6.8
ICP RF Power	1050.0
Analog Stage Voltage	-1725.0
Pulse Stage Voltage	1300.0
Discriminator Threshold	70.0
AC Rod Offset	-7.0
Service DAC 1	60.0
Quadrupole Rod Offset	0.0
Exit Lens	0.0
Makeup Gas Flow [MGAS]	0.9
DRC Mode MGAS	0.9

AutoLens Calibration

Date:	12:33:14 Sat 13-Nov-10
Sample Filename:	AUTOLENS SHARGRAVE.002
Dataset Pathname:	101113a1\
Lens Voltage Start:	4.00 V
Lens Voltage End:	8.00 V
Lens Voltage Step:	0.25 V
Slope:	0.0119
Intercept:	5.7731

Analyte	Mass	Optimum Voltage	Maximum Intensity	# Points
Be	9.012	6.0 V	5859 cps	17
Co	58.933	6.3 V	196120 cps	17
In	114.904	7.3 V	424137 cps	17

Dual Detector Calibration

Date:	11:01:51 Mon 01-Nov-10
Sample Filename:	DUAL BJONES.1147
Dataset Pathname:	dual detector calibration\
Points Acquired:	37
Lens Voltage Start:	-3.00 V
Lens Voltage End:	15.00 V
Lens Voltage Step:	0.50 V

Analyte	Mass	Gain	N(max)
Li	6.015	6677	1.87e+009 cps
Li	7.016	6329	1.98e+009 cps

Be	9.012	5802	2.16e+009 cps
B	11.009	5983	2.09e+009 cps
Na	22.990	5762	2.17e+009 cps
Mg	23.985	5303	2.36e+009 cps
Mg	24.986	5212	2.40e+009 cps
Al	26.982	4890	2.56e+009 cps
P	30.994	4691	2.67e+009 cps
K	38.964	4445	2.82e+009 cps
Ca	42.959		cps
Ca	43.956	4460	2.81e+009 cps
Sc	44.956	4463	2.81e+009 cps
V	50.944	4449	2.81e+009 cps
Cr	51.941	4175	3.00e+009 cps
Fe	53.940	4126	3.03e+009 cps
Mn	54.938	4113	3.04e+009 cps
Fe	56.935	4042	3.10e+009 cps
Co	58.933	3951	3.17e+009 cps
Ni	59.933	3853	3.25e+009 cps
Cu	62.930	3756	3.33e+009 cps
Cu	64.928	3718	3.37e+009 cps
Zn	67.925	3744	3.34e+009 cps
Ge	71.922	3828	3.27e+009 cps
As	74.922	3788	3.31e+009 cps
Se	77.917	3852	3.25e+009 cps
Br	78.918		cps
Se	81.917	3757	3.33e+009 cps
Sr	87.906		cps
Mo	96.906	3803	3.29e+009 cps
Ag	106.905	3410	3.67e+009 cps
Ag	108.905	3445	3.63e+009 cps
Cd	110.904	3441	3.64e+009 cps
Cd	113.904	3479	3.60e+009 cps
In	114.904	3466	3.61e+009 cps
Sn	117.902	3496	3.58e+009 cps
Sb	120.904	3494	3.58e+009 cps
Ba	134.906	3377	3.71e+009 cps
Tm	168.934	3257	3.84e+009 cps
Tl	204.975	3068	4.08e+009 cps
Pb	207.977	3056	4.10e+009 cps
Bi	208.980		cps
U	238.050	3095	4.04e+009 cps

Daily Performance Report - Elan 6000

Sample ID: DAILY SHARGRAVE
Sample Date/Time: Saturday, November 13, 2010 12:35:42
Sample Description:
Sample File: C:\elandata\Sample\0312224X.sam
Method File: C:\elandata\Method\000-DAILY_EPA.mth
Dataset File: c:\elandata\dataset\101113a1\DAILY SHARGRAVE.003
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Number of Replicates: 5
Dual Detector Mode: Dual

Summary

	Analyte	Mass	Net Intens. Mean	Net Intens. SD	Net Intens. RSD
	Mg	24	78256.533	449.143	0.574
	Rh	103	297552.205	2211.028	0.743
	Pb	208	163466.632	1286.667	0.787
⌈>	Ba	138	314039.388	1066.736	0.340
⌊	Ba++	69	0.033	0.000	1.000
⌈>	Ce	140	397561.778	2061.507	0.519
⌊	CeO	156	0.025	0.001	2.741
	Bkgd	220	8.857	4.449	50.234
	Li	7	16468.905	122.511	0.744
	Be	9	4932.195	80.378	1.630
	Co	59	167723.443	1420.246	0.847
	In	115	399410.504	2558.597	0.641
	Tl	205	234472.184	1356.508	0.579

Sample ID: Rinse 2X
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 12:44:09
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\Rinse 2X.004
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 6
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1753738.048	ug/L	1891902.892
>	6	Li-1			833163.381	ug/L	884054.534
	9	Be	-0.012051	66.332	4.000	ug/L	8.667
	44	Ca	9.664338	161.402	70138.779	ug/L	71088.538
	52	Cr	-0.099546	102.056	28367.849	ug/L	30980.567
	60	Ni	0.012954	106.704	200.283	ug/L	178.151
	65	Cu	0.008430	158.799	176.365	ug/L	164.583
	68	Zn	-1.035209	8.325	2415.339	ug/L	3635.183
	75	As	0.561214	38.197	16356.626	ug/L	15778.356
	82	Se	0.758460	215.865	1701.021	ug/L	1613.837
	97	Mo	-0.011963	72.767	91.334	ug/L	121.668
>	72	Ge-1			1647700.986	ug/L	1738145.100
	107	Ag	-0.006893	2.395	45.667	ug/L	117.334
	111	Cd	-0.011889	37.626	26.228	ug/L	55.691
	121	Sb	0.011062	134.475	508.687	ug/L	457.016
	135	Ba	-0.001852	546.545	99.667	ug/L	110.334
>	115	In-1			1476448.400	ug/L	1563065.172
	205	Tl	0.026381	124.464	2185.380	ug/L	1955.301
	208	Pb	0.002700	448.118	570.010	ug/L	569.343
>	169	Tm-1			914523.183	ug/L	981541.637
	50	Cr	0.155819	25.670	-382.049	ug/L	-436.982
	53	Cr	-13.261326	10.650	57141.442	ug/L	65607.203
	61	Ni	0.201001	1037.752	2255.120	ug/L	2374.908
	63	Cu	0.006927	157.761	129.670	ug/L	123.337
	67	Zn	-9.696976	22.558	3594.874	ug/L	4712.217
	66	Zn	-0.991149	16.259	822.482	ug/L	1424.780
	76	Se	34.111754	360.593	-230015.021	ug/L	-243599.526
	77	Se	-3.238408	168.147	17650.795	ug/L	19257.375
	78	Se	1.597295	159.538	17949.669	ug/L	17973.604
	79	Br	-135.630419	25.098	114752.438	ug/L	154974.476
>	72	Ge			1647700.986	ug/L	1738145.100
	108	Cd	0.025386	187.505	7.459	ug/L	3.890
	114	Cd	-0.010748	15.966	23.157	ug/L	83.401
	109	Ag	-0.006450	7.307	19.667	ug/L	43.000
>	115	In			1476448.400	ug/L	1563065.172

Report Date/Time: Saturday, November 13, 2010 13:29:30
Page 1
Sample ID: Rinse 2X

208 207.977	0.002536	447.140	292.340	ug/L	293.340
207 Pb	0.002840	492.701	131.335	ug/L	132.001
206 Pb	0.002896	417.833	146.335	ug/L	144.002
169 Tm			914523.183	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	94.243
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	94.797
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	94.459
Tl	205	
Pb	208	
Tm-1	169	93.172
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	94.797
Cd	108	
Cd	114	
Ag	109	
In	115	94.459
207.977	208	
Pb	207	
Pb	206	
Tm	169	93.172

Sample ID: Blank
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 12:48:33
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\Blank.005
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1891902.892	ug/L	
>	6	Li-1			884054.534	ug/L	
	9	Be			8.667	ug/L	
	44	Ca			71088.538	ug/L	
	52	Cr			30980.567	ug/L	
	60	Ni			178.151	ug/L	
	65	Cu			164.583	ug/L	
	68	Zn			3635.183	ug/L	
	75	As			15778.356	ug/L	
	82	Se			1618.486	ug/L	
	97	Mo			121.668	ug/L	
>	72	Ge-1			1738145.100	ug/L	
	107	Ag			117.334	ug/L	
	111	Cd			55.691	ug/L	
	121	Sb			457.016	ug/L	
	135	Ba			110.334	ug/L	
>	115	In-1			1563065.172	ug/L	
	205	Tl			1955.301	ug/L	
	208	Pb			569.343	ug/L	
>	169	Tm-1			981541.637	ug/L	
	50	Cr			-436.982	ug/L	
	53	Cr			65607.203	ug/L	
	61	Ni			2374.908	ug/L	
	63	Cu			123.337	ug/L	
	67	Zn			4712.217	ug/L	
	66	Zn			1424.780	ug/L	
	76	Se			-243599.526	ug/L	
	77	Se			19257.375	ug/L	
	78	Se			17973.604	ug/L	
	79	Br			154974.476	ug/L	
>	72	Ge			1738145.100	ug/L	
	108	Cd			3.890	ug/L	
	114	Cd			83.401	ug/L	
	109	Ag			43.000	ug/L	
>	115	In			1563065.172	ug/L	

	208 207.977	293.340	ug/L
	207 Pb	132.001	ug/L
	206 Pb	144.002	ug/L
>	169 Tm	981541.637	ug/L

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Sc	45	
>	Li-1	6	
	Be	9	
	Ca	44	
	Cr	52	
	Ni	60	
	Cu	65	
	Zn	68	
	As	75	
	Se	82	
	Mo	97	
>	Ge-1	72	
	Ag	107	
	Cd	111	
	Sb	121	
	Ba	135	
>	In-1	115	
	Tl	205	
	Pb	208	
>	Tm-1	169	
	Cr	50	
	Cr	53	
	Ni	61	
	Cu	63	
	Zn	67	
	Zn	66	
	Se	76	
	Se	77	
	Se	78	
	Br	79	
>	Ge	72	
	Cd	108	
	Cd	114	
	Ag	109	
>	In	115	
	207.977	208	
	Pb	207	
	Pb	206	
>	Tm	169	

Sample ID: Standard 1
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 12:52:51
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\Standard 1.006
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1910793.359	ug/L	1891902.892
>	6	Li-1			892309.224	ug/L	884054.534
	9	Be	100.000000	2.080	36361.255	ug/L	8.667
	44	Ca	5100.000000	1.339	1747939.717	ug/L	71088.538
	52	Cr	100.000000	1.337	1042245.451	ug/L	30980.567
	60	Ni	100.000000	1.602	271218.206	ug/L	178.151
	65	Cu	100.000000	1.472	277740.630	ug/L	164.583
	68	Zn	100.000000	1.320	108540.814	ug/L	3635.183
	75	As	100.000000	1.268	284847.009	ug/L	15778.356
	82	Se	100.000000	1.943	28251.910	ug/L	1618.486
	97	Mo	200.000000	1.316	409808.514	ug/L	121.668
>	72	Ge-1			1743306.035	ug/L	1738145.100
	107	Ag	50.000000	0.948	496060.350	ug/L	117.334
	111	Cd	100.000000	0.715	229013.947	ug/L	55.691
	121	Sb	50.000000	1.036	386476.721	ug/L	457.016
	135	Ba	100.000000	1.173	208623.349	ug/L	110.334
>	115	In-1			1547590.856	ug/L	1563065.172
	205	Tl	50.000000	2.279	792725.602	ug/L	1955.301
	208	Pb	100.000000	0.755	2120166.203	ug/L	569.343
>	169	Tm-1			972964.238	ug/L	981541.637
	50	Cr	100.000000	4.115	21188.045	ug/L	-436.982
	53	Cr	100.000000	5.037	105925.288	ug/L	65607.203
	61	Ni	100.000000	4.295	6746.337	ug/L	2374.908
	63	Cu	100.000000	2.233	212364.686	ug/L	123.337
	67	Zn	100.000000	3.554	14352.854	ug/L	4712.217
	66	Zn	100.000000	1.747	57333.888	ug/L	1424.780
	76	Se	100.000000	54.889	-240855.615	ug/L	-243599.526
	77	Se	100.000000	5.043	37486.150	ug/L	19257.375
	78	Se	100.000000	1.448	83887.477	ug/L	17973.604
	79	Br	100.000000	3.110	180190.948	ug/L	154974.476
>	72	Ge			1743306.035	ug/L	1738145.100
	108	Cd	100.000000	1.116	15996.673	ug/L	3.890
	114	Cd	100.000000	1.396	544503.946	ug/L	83.401
	109	Ag	50.000000	0.995	169890.992	ug/L	43.000
>	115	In			1547590.856	ug/L	1563065.172

208 207.977	100.000000	0.937	1085705.680	ug/L	293.340
207 Pb	100.000000	0.829	441140.568	ug/L	132.001
206 Pb	100.000000	0.489	593319.955	ug/L	144.002
169 Tm			972964.238	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	
Tl	205	
Pb	208	
Tm-1	169	
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	
Cd	108	
Cd	114	
Ag	109	
In	115	
207.977	208	
Pb	207	
Pb	206	
Tm	169	

Sample ID: ICV
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 12:56:53
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\ICV .007
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 3
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1928807.238	ug/L	1891902.892
>	6	Li-1			917832.958	ug/L	884054.534
	9	Be	80.421199	1.290	30089.989	ug/L	8.667
	44	Ca	851.982466	0.787	353535.020	ug/L	71088.538
	52	Cr	81.019093	0.666	855530.689	ug/L	30980.567
	60	Ni	81.556142	0.689	222591.433	ug/L	178.151
	65	Cu	81.241160	0.623	227055.955	ug/L	164.583
	68	Zn	82.563128	0.273	90802.492	ug/L	3635.183
	75	As	78.338177	0.528	227958.429	ug/L	15778.356
	82	Se	80.725639	1.394	23262.047	ug/L	1618.486
	97	Mo	80.062793	0.471	165127.357	ug/L	121.668
>	72	Ge-1			1753874.881	ug/L	1738145.100
	107	Ag	39.860133	0.606	401192.667	ug/L	117.334
	111	Cd	80.044235	0.204	185959.952	ug/L	55.691
	121	Sb	38.833721	0.491	304589.961	ug/L	457.016
	135	Ba	79.038155	0.822	167294.172	ug/L	110.334
>	115	In-1			1569807.845	ug/L	1563065.172
	205	Tl	41.752758	1.027	668775.821	ug/L	1955.301
	208	Pb	81.057977	1.001	1735460.305	ug/L	569.343
>	169	Tm-1			982516.909	ug/L	981541.637
	50	Cr	73.127807	3.883	15474.208	ug/L	-436.982
	53	Cr	81.017171	3.275	98914.397	ug/L	65607.203
	61	Ni	78.571689	1.187	5846.176	ug/L	2374.908
	63	Cu	81.012794	0.327	173122.491	ug/L	123.337
	67	Zn	86.737438	2.371	13157.656	ug/L	4712.217
	66	Zn	82.234555	0.982	47695.354	ug/L	1424.780
	76	Se	90.449230	21.961	-242639.789	ug/L	-243599.526
	77	Se	78.129687	1.027	33717.079	ug/L	19257.375
	78	Se	79.976108	1.267	71130.969	ug/L	17973.604
	79	Br	-290.894487	2.621	83923.143	ug/L	154974.476
>	72	Ge			1753874.881	ug/L	1738145.100
	108	Cd	78.299771	0.750	12705.948	ug/L	3.890
	114	Cd	80.091719	0.211	442412.606	ug/L	83.401
	109	Ag	40.060699	0.339	138083.262	ug/L	43.000
>	115	In			1569807.845	ug/L	1563065.172

Report Date/Time: Saturday, November 13, 2010 13:29:39
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Sample ID: ICV

208 207.977	83.079223	1.124	910845.796	ug/L	293.340
207 Pb	85.293895	0.818	379975.391	ug/L	132.001
206 Pb	74.209993	0.924	444639.118	ug/L	144.002
169 Tm			982516.909	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	103.821
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.905
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	100.431
Tl	205	
Pb	208	
Tm-1	169	100.099
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.905
Cd	108	
Cd	114	
Ag	109	
In	115	100.431
207.977	208	
Pb	207	
Pb	206	
Tm	169	100.099

Sample ID: ICB
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 13:01:01
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\ICB.008
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1908170.901	ug/L	1891902.892
>	6	Li-1			900678.605	ug/L	884054.534
	9	Be	-0.002262	117.925	8.000	ug/L	8.667
	44	Ca	2.797621	155.109	72191.616	ug/L	71088.538
	52	Cr	0.807666	3.151	39226.881	ug/L	30980.567
	60	Ni	0.003160	186.925	187.149	ug/L	178.151
	65	Cu	0.004460	78.508	177.418	ug/L	164.583
	68	Zn	0.173912	62.090	3826.923	ug/L	3635.183
	75	As	0.355602	92.979	16772.318	ug/L	15778.356
	82	Se	0.162976	667.582	1667.790	ug/L	1618.486
	97	Mo	0.545035	25.848	1238.792	ug/L	121.668
>	72	Ge-1			1742675.822	ug/L	1738145.100
	107	Ag	0.002150	50.418	139.335	ug/L	117.334
	111	Cd	-0.002798	158.459	49.368	ug/L	55.691
	121	Sb	0.050522	28.319	854.391	ug/L	457.016
	135	Ba	0.001357	663.386	113.668	ug/L	110.334
>	115	In-1			1568170.275	ug/L	1563065.172
	205	Tl	0.242423	19.033	5784.661	ug/L	1955.301
	208	Pb	0.003551	49.366	640.679	ug/L	569.343
>	169	Tm-1			974129.502	ug/L	981541.637
	50	Cr	-0.308992	20.926	-505.010	ug/L	-436.982
	53	Cr	16.836109	21.265	72526.919	ug/L	65607.203
	61	Ni	-1.159074	120.780	2330.194	ug/L	2374.908
	63	Cu	-0.001847	424.725	119.670	ug/L	123.337
	67	Zn	9.430374	15.547	5631.637	ug/L	4712.217
	66	Zn	-0.073651	102.400	1387.090	ug/L	1424.780
	76	Se	-45.237389	79.465	-245813.352	ug/L	-243599.526
	77	Se	7.171920	2.933	20610.338	ug/L	19257.375
	78	Se	-0.114663	396.743	17943.800	ug/L	17973.604
	79	Br	6.614777	116.991	157009.342	ug/L	154974.476
>	72	Ge			1742675.822	ug/L	1738145.100
	108	Cd	0.008125	480.739	5.212	ug/L	3.890
	114	Cd	0.002994	34.817	100.189	ug/L	83.401
	109	Ag	0.000925	55.883	46.334	ug/L	43.000
>	115	In			1568170.275	ug/L	1563065.172

208 207.977	0.003451	18.705	328.675	ug/L	293.340
207 Pb	0.002239	142.364	141.002	ug/L	132.001
206 Pb	0.004710	64.185	171.002	ug/L	144.002
169 Tm			974129.502	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	101.880
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.261
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	100.327
Tl	205	
Pb	208	
Tm-1	169	99.245
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.261
Cd	108	
Cd	114	
Ag	109	
In	115	100.327
207.977	208	
Pb	207	
Pb	206	
Tm	169	99.245

Sample ID: LLSTD1
Sample Description: LLSTD@10X
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 13:05:07
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\LLSTD1.009
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 83
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte		Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc				1954776.151	ug/L	1891902.892
>	6	Li-1				916816.409	ug/L	884054.534
	9	Be		1.010772	11.026	387.012	ug/L	8.667
	44	Ca		48.263732	1.110	88962.193	ug/L	71088.538
	52	Cr	X	1.547278	2.511	47681.309	ug/L	30980.567
	60	Ni		1.009260	5.359	2974.216	ug/L	178.151
	65	Cu		1.022458	3.386	3065.213	ug/L	164.583
	68	Zn		5.072075	3.186	9151.604	ug/L	3635.183
	75	As		0.863755	22.864	18523.135	ug/L	15778.356
	82	Se		1.287310	78.395	2006.398	ug/L	1618.486
	97	Mo		1.087475	1.323	2398.118	ug/L	121.668
>	72	Ge-1				1779211.156	ug/L	1738145.100
	107	Ag		0.480851	1.584	5014.308	ug/L	117.334
	111	Cd		0.957487	2.847	2306.483	ug/L	55.691
	121	Sb		0.479703	0.206	4265.429	ug/L	457.016
	135	Ba		0.947914	3.226	2140.694	ug/L	110.334
>	115	In-1				1588253.818	ug/L	1563065.172
	205	Tl		0.514196	0.726	10219.533	ug/L	1955.301
	208	Pb		0.992255	1.152	21914.771	ug/L	569.343
>	169	Tm-1				987339.986	ug/L	981541.637
	50	Cr		0.988236	38.170	-229.277	ug/L	-436.982
	53	Cr		14.516220	16.364	73103.249	ug/L	65607.203
	61	Ni		-1.365855	60.805	2370.236	ug/L	2374.908
	63	Cu		1.023415	3.667	2343.208	ug/L	123.337
	67	Zn		10.496994	10.225	5855.201	ug/L	4712.217
	66	Zn		4.783981	1.257	4188.189	ug/L	1424.780
	76	Se		-7.320703	53.337	-249614.462	ug/L	-243599.526
	77	Se		6.078551	0.871	20839.859	ug/L	19257.375
	78	Se	X	0.122193	60.506	18480.383	ug/L	17973.604
	79	Br		-8.314329	50.261	156534.881	ug/L	154974.476
>	72	Ge				1779211.156	ug/L	1738145.100
	108	Cd		0.932666	3.469	157.041	ug/L	3.890
	114	Cd		0.973651	2.007	5524.942	ug/L	83.401
	109	Ag		0.480097	3.735	1717.316	ug/L	43.000
>	115	In				1588253.818	ug/L	1563065.172

208 207.977	1.026447	1.875	11601.236	ug/L	293.340
207 Pb	1.034704	1.766	4762.782	ug/L	132.001
206 Pb	0.898127	0.644	5550.753	ug/L	144.002
169 Tm			987339.986	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	103.706
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	102.363
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	101.611
Tl	205	
Pb	208	
Tm-1	169	100.591
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	102.363
Cd	108	
Cd	114	
Ag	109	
In	115	101.611
207.977	208	
Pb	207	
Pb	206	
Tm	169	100.591

Sample ID: LLSTD2
Sample Description: LLSTD@5X
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 13:09:10
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\LLSTD2.010
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 84
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1938318.216	ug/L	1891902.892
>	6	Li-1			910482.738	ug/L	884054.534
	9	Be	1.929349	4.499	725.041	ug/L	8.667
	44	Ca	88.693235	3.432	101994.931	ug/L	71088.538
	52	Cr >	2.496457	2.698	57179.098	ug/L	30980.567
	60	Ni	1.943465	1.122	5529.972	ug/L	178.151
	65	Cu	2.008618	0.844	5828.704	ug/L	164.583
	68	Zn	9.890357	1.558	14235.821	ug/L	3635.183
	75	As	2.118746	4.894	21855.213	ug/L	15778.356
	82	Se	2.205712	56.876	2244.898	ug/L	1618.486
	97	Mo	2.014677	1.646	4314.129	ug/L	121.668
>	72	Ge-1			1769979.384	ug/L	1738145.100
	107	Ag	0.959064	0.656	9839.935	ug/L	117.334
	111	Cd	1.928705	0.239	4569.012	ug/L	55.691
	121	Sb	0.940324	0.289	7881.211	ug/L	457.016
	135	Ba	1.902675	2.915	4166.031	ug/L	110.334
>	115	In-1			1581421.276	ug/L	1563065.172
	205	Tl	0.951475	1.857	17103.288	ug/L	1955.301
	208	Pb	1.966352	0.294	42534.007	ug/L	569.343
>	169	Tm-1			979643.876	ug/L	981541.637
	50	Cr	2.924026	7.830	197.221	ug/L	-436.982
	53	Cr	11.817165	11.230	71623.808	ug/L	65607.203
	61	Ni	-2.639824	45.278	2301.499	ug/L	2374.908
	63	Cu	2.040966	2.992	4523.834	ug/L	123.337
	67	Zn	15.699531	3.931	6333.145	ug/L	4712.217
	66	Zn	9.509595	0.986	6848.971	ug/L	1424.780
	76	Se	-51.231606	40.300	-249867.869	ug/L	-243599.526
	77	Se	5.506033	37.440	20625.710	ug/L	19257.375
	78	Se	1.637409	17.553	19397.406	ug/L	17973.604
	79	Br	-5.297295	171.627	156478.703	ug/L	154974.476
>	72	Ge			1769979.384	ug/L	1738145.100
	108	Cd	1.842337	8.595	305.010	ug/L	3.890
	114	Cd	1.936760	1.010	10859.757	ug/L	83.401
	109	Ag	0.973913	1.353	3424.245	ug/L	43.000
>	115	In			1581421.276	ug/L	1563065.172

208 207.977	2.021337	0.161	22383.632	ug/L	293.340
207 Pb	2.057641	0.503	9268.745	ug/L	132.001
206 Pb	1.797864	0.851	10881.630	ug/L	144.002
169 Tm			979643.876	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	102.989
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	101.832
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	101.174
Tl	205	
Pb	208	
Tm-1	169	99.807
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.832
Cd	108	
Cd	114	
Ag	109	
In	115	101.174
207.977	208	
Pb	207	
Pb	206	
Tm	169	99.807

Sample ID: ICSA
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 13:13:15
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\ICSA .011
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 2
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1755191.722	ug/L	1891902.892
>	6	Li-1			869778.958	ug/L	884054.534
	9	Be	0.071828	4.512	34.000	ug/L	8.667
	44	Ca	99057.933525	0.293	30014305.208	ug/L	71088.538
	52	Cr	3.272704	45.305	59036.105	ug/L	30980.567
	60	Ni	0.907974	6.457	2427.942	ug/L	178.151
	65	Cu	-0.494076	16.442	-1109.644	ug/L	164.583
	68	Zn	-0.900493	5.374	2484.296	ug/L	3635.183
	75	As	1.036755	25.993	17118.563	ug/L	15778.356
	82	Se	-0.529789	303.676	1362.530	ug/L	1618.486
	97	Mo	2006.406083	0.507	3779957.604	ug/L	121.668
>	72	Ge-1			1603202.822	ug/L	1738145.100
	107	Ag	0.162483	2.517	1583.864	ug/L	117.334
	111	Cd	1.016075	18.081	2183.450	ug/L	55.691
	121	Sb	0.198868	2.412	1822.261	ug/L	457.016
	135	Ba	2.793439	1.360	5439.657	ug/L	110.334
>	115	In-1			1418615.757	ug/L	1563065.172
	205	Tl	0.162020	3.084	4072.637	ug/L	1955.301
	208	Pb	0.473937	1.702	9599.794	ug/L	569.343
>	169	Tm-1			880324.734	ug/L	981541.637
	50	Cr	168.742605	7.742	33165.876	ug/L	-436.982
	53	Cr	-19.294028	27.099	53390.993	ug/L	65607.203
	61	Ni	20.756204	15.249	3023.345	ug/L	2374.908
	63	Cu	3.016739	0.739	6002.249	ug/L	123.337
	67	Zn	12.228454	6.019	5429.144	ug/L	4712.217
	66	Zn	3.300339	2.922	3010.993	ug/L	1424.780
	76	Se	-233.111406	11.311	-232137.570	ug/L	-243599.526
	77	Se	-0.042976	9433.414	17754.001	ug/L	19257.375
	78	Se	2.694074	17.115	18209.575	ug/L	17973.604
	79	Br	21325.368927	0.957	4998804.582	ug/L	154974.476
>	72	Ge			1603202.822	ug/L	1738145.100
	108	Cd	54.389287	2.552	7977.422	ug/L	3.890
	114	Cd	3.647839	2.863	18282.352	ug/L	83.401
	109	Ag	0.123520	7.931	423.706	ug/L	43.000
>	115	In			1418615.757	ug/L	1563065.172

208 207.977	0.479959	1.528	4976.612	ug/L	293.340
207 Pb	0.492648	1.971	2084.008	ug/L	132.001
206 Pb	0.449007	3.614	2539.174	ug/L	144.002
169 Tm			880324.734	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	98.385
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	92.236
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	90.759
Tl	205	
Pb	208	
Tm-1	169	89.688
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	92.236
Cd	108	
Cd	114	
Ag	109	
In	115	90.759
207.977	208	
Pb	207	
Pb	206	
Tm	169	89.688

Sample ID: ICSAB
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 13:17:20
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\ICSAB.012
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 1
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1783790.399	ug/L	1891902.892
>	6	Li-1			901448.441	ug/L	884054.534
	9	Be	91.976796	0.828	33798.532	ug/L	8.667
	44	Ca	98874.366858	1.623	30360915.564	ug/L	71088.538
	52	Cr	101.224527	0.663	982975.069	ug/L	30980.567
	60	Ni	92.133310	1.018	232919.670	ug/L	178.151
	65	Cu	88.034582	0.223	227919.113	ug/L	164.583
	68	Zn	87.630634	0.197	89075.539	ug/L	3635.183
	75	As	101.159518	0.065	268407.650	ug/L	15778.356
	82	Se	103.130091	0.189	27110.968	ug/L	1618.486
	97	Mo	2094.075362	0.523	3998321.705	ug/L	121.668
>	72	Ge-1			1624817.433	ug/L	1738145.100
	107	Ag	45.477957	0.921	417507.847	ug/L	117.334
	111	Cd	95.281207	0.513	201911.147	ug/L	55.691
	121	Sb	49.942257	0.473	357203.020	ug/L	457.016
	135	Ba	101.702578	0.555	196327.152	ug/L	110.334
>	115	In-1			1431950.426	ug/L	1563065.172
	205	Tl	48.283780	1.447	702467.226	ug/L	1955.301
	208	Pb	96.718489	0.282	1881461.087	ug/L	569.343
>	169	Tm-1			892702.995	ug/L	981541.637
	50	Cr	186.387943	11.864	37172.557	ug/L	-436.982
	53	Cr	86.799886	2.683	93796.986	ug/L	65607.203
	61	Ni	111.885131	2.368	6771.409	ug/L	2374.908
	63	Cu	90.633756	0.361	179411.977	ug/L	123.337
	67	Zn	100.949924	2.505	13464.781	ug/L	4712.217
	66	Zn	93.269800	0.546	49935.328	ug/L	1424.780
	76	Se	-65.187056	15.096	-229829.502	ug/L	-243599.526
	77	Se	107.580776	2.749	36224.369	ug/L	19257.375
	78	Se	104.010388	1.357	80650.138	ug/L	17973.604
	79	Br	532.139699	11.733	267689.544	ug/L	154974.476
>	72	Ge			1624817.433	ug/L	1738145.100
	108	Cd	144.817766	1.141	21433.962	ug/L	3.890
	114	Cd	98.045093	0.894	493996.866	ug/L	83.401
	109	Ag	45.858270	1.069	144182.896	ug/L	43.000
>	115	In			1431950.426	ug/L	1563065.172

208	207.977	97.054776	0.381	966819.561	ug/L	293.340
207	Pb	96.928923	0.237	392337.567	ug/L	132.001
206	Pb	95.946675	0.530	522303.959	ug/L	144.002
169	Tm			892702.995	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	101.968
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	93.480
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	91.612
Tl	205	
Pb	208	
Tm-1	169	90.949
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	93.480
Cd	108	
Cd	114	
Ag	109	
In	115	91.612
207.977	208	
Pb	207	
Pb	206	
Tm	169	90.949

Sample ID: LRSTD1
Sample Description: LRSTD@10ppmPb5ppmBaCdCrAsSE100pPbAg
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 13:36:55
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\LRSTD1.013
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 85
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1889368.093	ug/L	1891902.892
>	6	Li-1			947981.550	ug/L	884054.534
	9	Be	0.184307	21.605	80.334	ug/L	8.667
	44	Ca	-23.229443	19.140	62582.908	ug/L	71088.538
	52	Cr	4863.769924	0.298	48365392.371	ug/L	30980.567
	60	Ni	0.069113	20.527	359.250	ug/L	178.151
	65	Cu	0.930950	1.980	2701.728	ug/L	164.583
	68	Zn	-163.424120	2.074	-164859.964	ug/L	3635.183
	75	As	4365.310304	0.425	11556977.977	ug/L	15778.356
	82	Se	4926.993491	0.976	1290951.364	ug/L	1618.486
	97	Mo	0.321890	7.757	767.380	ug/L	121.668
>	72	Ge-1			1713285.743	ug/L	1738145.100
	107	Ag	95.051203	0.485	945434.871	ug/L	117.334
	111	Cd	4772.625621	0.269	10956745.588	ug/L	55.691
	121	Sb	0.012270	6.623	548.690	ug/L	457.016
	135	Ba	4659.524194	0.712	9741569.959	ug/L	110.334
>	115	In-1			1551731.040	ug/L	1563065.172
	205	Tl	0.374496	1.627	7971.325	ug/L	1955.301
	208	Pb	10000.842642	0.988	214899272.590	ug/L	569.343
>	169	Tm-1			986475.292	ug/L	981541.637
	50	Cr	3560.024307	0.612	756325.597	ug/L	-436.982
	53	Cr	5232.804700	0.462	2128376.408	ug/L	65607.203
	61	Ni	-6.948784	23.929	2043.587	ug/L	2374.908
	63	Cu	0.120175	3.382	372.364	ug/L	123.337
	67	Zn	210.627521	0.717	24574.504	ug/L	4712.217
	66	Zn	1.607771	4.726	2287.484	ug/L	1424.780
	76	Se	8485.727743	0.820	49737.589	ug/L	-243599.526
	77	Se	5625.788972	0.693	1023745.479	ug/L	19257.375
	78	Se	4841.967626	0.328	3151862.957	ug/L	17973.604
	79	Br	11.170226	11.672	155479.683	ug/L	154974.476
>	72	Ge			1713285.743	ug/L	1738145.100
	108	Cd	4678.676725	0.855	750217.321	ug/L	3.890
	114	Cd	4700.801541	0.637	25660769.870	ug/L	83.401
	109	Ag	96.724210	0.934	329466.220	ug/L	43.000
>	115	In			1551731.040	ug/L	1563065.172

⌈	208 207.97	710271.532084	1.031	113024588.378	ug/L	293.340
|	207 Pb	10495.931385	1.374	46924746.034	ug/L	132.001
|	206 Pb	9137.422351	0.571	54949938.178	ug/L	144.002
⌊>	169 Tm			986475.292	ug/L	981541.637

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Sc	45	
⌈>	Li-1	6	107.231
⌊	Be	9	
⌈	Ca	44	
|	Cr	52	
|	Ni	60	
|	Cu	65	
|	Zn	68	
|	As	75	
|	Se	82	
|	Mo	97	
⌊>	Ge-1	72	98.570
⌈	Ag	107	
|	Cd	111	
|	Sb	121	
|	Ba	135	
⌊>	In-1	115	99.275
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	100.503
⌈	Cr	50	
|	Cr	53	
|	Ni	61	
|	Cu	63	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	98.570
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	99.275
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	100.503

Sample ID: LRSTD2
Sample Description: LRSTD@10ppmAs
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 13:47:04
Method File: C:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\LRSTD2.015
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 86
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1898469.996	ug/L	1891902.892
>	6	Li-1			972132.161	ug/L	884054.534
	9	Be	-0.009759	64.735	5.667	ug/L	8.667
	44	Ca	-32.952127	5.883	61254.744	ug/L	71088.538
	52	Cr	-0.638421	8.007	24937.780	ug/L	30980.567
	60	Ni	0.027828	10.642	257.415	ug/L	178.151
	65	Cu	0.008086	78.760	189.983	ug/L	164.583
	68	Zn	0.633943	23.270	4366.819	ug/L	3635.183
	75	As	9228.601115	0.865	25168025.516	ug/L	15778.356
	82	Se	0.413863	276.022	1756.248	ug/L	1618.486
	97	Mo	0.173504	4.734	483.685	ug/L	121.668
>	72	Ge-1			1766078.875	ug/L	1738145.100
	107	Ag	-0.003760	24.712	80.001	ug/L	117.334
	111	Cd	0.019274	41.864	100.639	ug/L	55.691
	121	Sb	-0.019266	5.674	308.007	ug/L	457.016
	135	Ba	0.049798	39.456	216.004	ug/L	110.334
>	115	In-1			1569452.323	ug/L	1563065.172
	205	Tl	-0.060439	5.148	1017.748	ug/L	1955.301
	208	Pb	0.197587	3.724	4924.404	ug/L	569.343
>	169	Tm-1			1008178.490	ug/L	981541.637
	50	Cr	0.144317	31.784	-412.412	ug/L	-436.982
	53	Cr	-14.838380	8.333	60629.094	ug/L	65607.203
	61	Ni	-7.684560	31.037	2073.614	ug/L	2374.908
	63	Cu	0.004952	111.046	136.004	ug/L	123.337
	67	Zn	10.078105	4.046	5770.985	ug/L	4712.217
	66	Zn	0.143087	64.338	1528.848	ug/L	1424.780
	76	Se	-18.402297	123.996	-248164.594	ug/L	-243599.526
	77	Se	-39.962313	1.619	12208.860	ug/L	19257.375
	78	Se	-1.312949	25.373	17385.739	ug/L	17973.604
	79	Br	-11.549351	18.848	154569.695	ug/L	154974.476
>	72	Ge			1766078.875	ug/L	1738145.100
	108	Cd	0.136435	8.928	26.039	ug/L	3.890
	114	Cd	0.036712	31.484	286.350	ug/L	83.401
	109	Ag	-0.003532	73.529	31.000	ug/L	43.000
>	115	In			1569452.323	ug/L	1563065.172

208 207.977	0.201228	4.248	2564.517	ug/L	293.340
207 Pb	0.206252	2.958	1078.091	ug/L	132.001
206 Pb	0.184484	4.217	1281.796	ug/L	144.002
169 Tm			1008178.490	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	109.963
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	101.607
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	100.409
Tl	205	
Pb	208	
Tm-1	169	102.714
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.607
Cd	108	
Cd	114	
Ag	109	
In	115	100.409
207.977	208	
Pb	207	
Pb	206	
Tm	169	102.714

Sample ID: CCV 1
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 15:19:32
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCV 1.025
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1972928.823	ug/L	1891902.892
>	6	Li-1			1037647.657	ug/L	884054.534
	9	Be	96.137756	0.493	40664.521	ug/L	8.667
	44	Ca	5156.426346	0.819	1830514.021	ug/L	71088.538
	52	Cr	101.181612	0.578	1092503.161	ug/L	30980.567
	60	Ni	97.093063	1.104	272887.721	ug/L	178.151
	65	Cu	98.049191	0.698	282226.810	ug/L	164.583
	68	Zn	100.950596	0.591	113519.730	ug/L	3635.183
	75	As	101.106451	0.144	298277.086	ug/L	15778.356
	82	Se	100.484360	1.442	29411.606	ug/L	1618.486
	97	Mo	198.969774	1.345	422465.826	ug/L	121.668
>	72	Ge-1			1806514.718	ug/L	1738145.100
	107	Ag	49.624716	0.499	513166.649	ug/L	117.334
	111	Cd	101.461584	0.825	242182.278	ug/L	55.691
	121	Sb	50.954139	0.533	410495.956	ug/L	457.016
	135	Ba	101.765972	0.772	221282.815	ug/L	110.334
>	115	In-1			1612990.012	ug/L	1563065.172
	205	Tl	51.245966	1.405	892195.310	ug/L	1955.301
	208	Pb	103.397704	0.882	2407392.215	ug/L	569.343
>	169	Tm-1			1068509.012	ug/L	981541.637
	50	Cr	103.678959	5.285	22787.996	ug/L	-436.982
	53	Cr	124.197837	4.217	119845.729	ug/L	65607.203
	61	Ni	96.482955	3.011	6832.594	ug/L	2374.908
	63	Cu	97.536360	0.440	214657.462	ug/L	123.337
	67	Zn	104.892238	1.516	15364.104	ug/L	4712.217
	66	Zn	100.429614	0.474	59667.167	ug/L	1424.780
	76	Se	110.158521	23.900	-249214.635	ug/L	-243599.526
	77	Se	110.837197	2.290	40892.124	ug/L	19257.375
	78	Se	99.630546	0.346	86680.640	ug/L	17973.604
	79	Br	164.803556	0.773	203353.339	ug/L	154974.476
>	72	Ge			1806514.718	ug/L	1738145.100
	108	Cd	100.729224	0.413	16795.438	ug/L	3.890
	114	Cd	101.720548	0.444	577313.275	ug/L	83.401
	109	Ag	49.781709	0.282	176300.691	ug/L	43.000
>	115	In			1612990.012	ug/L	1563065.172

208 207.977	103.418593	0.919	1233022.017	ug/L	293.340
207 Pb	104.143139	1.276	504516.095	ug/L	132.001
206 Pb	102.805253	0.803	669854.104	ug/L	144.002
169 Tm			1068509.012	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	117.374
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	103.933
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	103.194
Tl	205	
Pb	208	
Tm-1	169	108.860
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	103.933
Cd	108	
Cd	114	
Ag	109	
In	115	103.194
207.977	208	
Pb	207	
Pb	206	
Tm	169	108.860

Sample ID: CCB 1
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 15:23:40
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCB 1.026
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1930596.938	ug/L	1891902.892
>	6	Li-1			990818.117	ug/L	884054.534
	9	Be	-0.013316	11.370	4.333	ug/L	8.667
	44	Ca	-56.132451	7.104	53673.492	ug/L	71088.538
	52	Cr	1.009832	7.338	41930.043	ug/L	30980.567
	60	Ni	0.040717	3.168	293.570	ug/L	178.151
	65	Cu	0.009894	17.932	195.564	ug/L	164.583
	68	Zn	0.613550	7.306	4356.711	ug/L	3635.183
	75	As	1.436871	12.037	19999.128	ug/L	15778.356
	82	Se	-0.269326	311.966	1576.398	ug/L	1618.486
	97	Mo	0.807283	29.257	1803.601	ug/L	121.668
>	72	Ge-1			1770626.630	ug/L	1738145.100
	107	Ag	-0.001128	76.074	107.668	ug/L	117.334
	111	Cd	-0.010501	36.590	31.870	ug/L	55.691
	121	Sb	-0.024791	18.310	267.672	ug/L	457.016
	135	Ba	-0.002213	291.125	107.334	ug/L	110.334
>	115	In-1			1587338.541	ug/L	1563065.172
	205	Tl	0.378707	28.924	8425.078	ug/L	1955.301
	208	Pb	0.002366	56.162	653.346	ug/L	569.343
>	169	Tm-1			1034528.991	ug/L	981541.637
	50	Cr	-0.483632	10.475	-551.362	ug/L	-436.982
	53	Cr	34.120904	7.732	80741.041	ug/L	65607.203
	61	Ni	-1.565497	67.938	2349.881	ug/L	2374.908
	63	Cu	0.011152	61.406	149.672	ug/L	123.337
	67	Zn	15.293425	14.062	6295.714	ug/L	4712.217
	66	Zn	0.108865	74.955	1513.171	ug/L	1424.780
	76	Se	-38.994528	102.174	-249528.610	ug/L	-243599.526
	77	Se	4.358808	13.747	20421.913	ug/L	19257.375
	78	Se	-0.995366	36.563	17643.086	ug/L	17973.604
	79	Br	37.455479	28.504	167288.411	ug/L	154974.476
>	72	Ge			1770626.630	ug/L	1738145.100
	108	Cd	0.032744	141.479	9.347	ug/L	3.890
	114	Cd	-0.002916	35.848	68.394	ug/L	83.401
	109	Ag	-0.001236	220.282	39.334	ug/L	43.000
>	115	In			1587338.541	ug/L	1563065.172

208 207.977	0.001865	48.902	330.675	ug/L	293.340
207 Pb	0.000754	182.201	142.668	ug/L	132.001
206 Pb	0.004480	57.324	180.003	ug/L	144.002
169 Tm			1034528.991	ug/L	981541.637

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	112.077
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	101.869
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	101.553
Tl	205	
Pb	208	
Tm-1	169	105.398
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.869
Cd	108	
Cd	114	
Ag	109	
In	115	101.553
207.977	208	
Pb	207	
Pb	206	
Tm	169	105.398

Sample ID: BLK RECAL
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 15:23:40
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCB 1.026
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1930596.938	ug/L	
>	6	Li-1			990818.117	ug/L	
	9	Be			4.333	ug/L	
	44	Ca			53673.492	ug/L	
	52	Cr			41930.043	ug/L	
	60	Ni			293.570	ug/L	
	65	Cu			195.564	ug/L	
	68	Zn			4356.711	ug/L	
	75	As			19999.128	ug/L	
	82	Se			1576.398	ug/L	
	97	Mo			1803.601	ug/L	
>	72	Ge-1			1770626.630	ug/L	
	107	Ag			107.668	ug/L	
	111	Cd			31.870	ug/L	
	121	Sb			267.672	ug/L	
	135	Ba			107.334	ug/L	
>	115	In-1			1587338.541	ug/L	
	205	Tl			8425.078	ug/L	
	208	Pb			653.346	ug/L	
>	169	Tm-1			1034528.991	ug/L	
	50	Cr			-551.362	ug/L	
	53	Cr			80741.041	ug/L	
	61	Ni			2349.881	ug/L	
	63	Cu			149.672	ug/L	
	67	Zn			6295.714	ug/L	
	66	Zn			1513.171	ug/L	
	76	Se			-249528.610	ug/L	
	77	Se			20421.913	ug/L	
	78	Se			17643.086	ug/L	
	79	Br			167288.411	ug/L	
>	72	Ge			1770626.630	ug/L	
	108	Cd			9.347	ug/L	
	114	Cd			68.394	ug/L	
	109	Ag			39.334	ug/L	
>	115	In			1587338.541	ug/L	

⌈	208 207.977	330.675	ug/L
|	207 Pb	142.668	ug/L
|	206 Pb	180.003	ug/L
⌊>	169 Tm	1034528.991	ug/L

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Sc	45	
⌈>	Li-1	6	
⌊	Be	9	
⌈	Ca	44	
|	Cr	52	
|	Ni	60	
|	Cu	65	
|	Zn	68	
|	As	75	
|	Se	82	
|	Mo	97	
⌊>	Ge-1	72	
⌈	Ag	107	
|	Cd	111	
|	Sb	121	
|	Ba	135	
⌊>	In-1	115	
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	
⌈	Cr	50	
|	Cr	53	
|	Ni	61	
|	Cu	63	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	

Sample ID: STD1 RECAL
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 15:19:32
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCV 1.025
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1972928.823	ug/L	1930596.938
>	6	Li-1			1037647.657	ug/L	990818.117
	9	Be	100.000000	0.493	40664.521	ug/L	4.333
	44	Ca	5100.000000	0.810	1830514.021	ug/L	53673.492
	52	Cr	100.000000	0.584	1092503.161	ug/L	41930.043
	60	Ni	100.000000	1.105	272887.721	ug/L	293.570
	65	Cu	100.000000	0.698	282226.810	ug/L	195.564
	68	Zn	100.000000	0.595	113519.730	ug/L	4356.711
	75	As	100.000000	0.146	298277.086	ug/L	19999.128
	82	Se	100.000000	1.438	29411.606	ug/L	1576.398
	97	Mo	200.000000	1.350	422465.826	ug/L	1803.601
>	72	Ge-1			1806514.718	ug/L	1770626.630
	107	Ag	50.000000	0.499	513166.649	ug/L	107.668
	111	Cd	100.000000	0.825	242182.278	ug/L	31.870
	121	Sb	50.000000	0.533	410495.956	ug/L	267.672
	135	Ba	100.000000	0.772	221282.815	ug/L	107.334
>	115	In-1			1612990.012	ug/L	1587338.541
	205	Tl	50.000000	1.415	892195.310	ug/L	8425.078
	208	Pb	100.000000	0.882	2407392.215	ug/L	653.346
>	169	Tm-1			1068509.012	ug/L	1034528.991
	50	Cr	100.000000	5.260	22787.996	ug/L	-551.362
	53	Cr	100.000000	5.814	119845.729	ug/L	80741.041
	61	Ni	100.000000	2.963	6832.594	ug/L	2349.881
	63	Cu	100.000000	0.440	214657.462	ug/L	149.672
	67	Zn	100.000000	1.775	15364.104	ug/L	6295.714
	66	Zn	100.000000	0.474	59667.167	ug/L	1513.171
	76	Se	100.000000	17.651	-249214.635	ug/L	-249528.610
	77	Se	100.000000	2.383	40892.124	ug/L	20421.913
	78	Se	100.000000	0.343	86680.640	ug/L	17643.086
	79	Br	100.000000	1.000	203353.339	ug/L	167288.411
>	72	Ge			1806514.718	ug/L	1770626.630
	108	Cd	100.000000	0.413	16795.438	ug/L	9.347
	114	Cd	100.000000	0.444	577313.275	ug/L	68.394
	109	Ag	50.000000	0.282	176300.691	ug/L	39.334
>	115	In			1612990.012	ug/L	1587338.541

	208 207.977	100.000000	0.919	1233022.017	ug/L	330.675
	207 Pb	100.000000	1.276	504516.095	ug/L	142.668
	206 Pb	100.000000	0.803	669854.104	ug/L	180.003
>	169 Tm			1068509.012	ug/L	1034528.991

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Sc	45	
>	Li-1	6	
	Be	9	
	Ca	44	
	Cr	52	
	Ni	60	
	Cu	65	
	Zn	68	
	As	75	
	Se	82	
	Mo	97	
>	Ge-1	72	
	Ag	107	
	Cd	111	
	Sb	121	
	Ba	135	
>	In-1	115	
	Ti	205	
	Pb	208	
>	Tm-1	169	
	Cr	50	
	Cr	53	
	Ni	61	
	Cu	63	
	Zn	67	
	Zn	66	
	Se	76	
	Se	77	
	Se	78	
	Br	79	
>	Ge	72	
	Cd	108	
	Cd	114	
	Ag	109	
>	In	115	
	207.977	208	
	Pb	207	
	Pb	206	
>	Tm	169	

Sample ID: CCV 2
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 15:27:48
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCV 2.027
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1942080.238	ug/L	1930596.938
>	6	Li-1			1009051.143	ug/L	990818.117
	9	Be	98.286056	0.425	38867.348	ug/L	4.333
	44	Ca	4992.594298	0.358	1774455.877	ug/L	53673.492
	52	Cr	98.672780	0.430	1067268.183	ug/L	41930.043
	60	Ni	98.743892	0.179	266670.224	ug/L	293.570
	65	Cu	98.646411	0.372	275490.310	ug/L	195.564
	68	Zn	99.197262	0.238	111467.129	ug/L	4356.711
	75	As	98.622025	0.340	291374.801	ug/L	19999.128
	82	Se	98.341391	1.232	28648.170	ug/L	1576.398
	97	Mo	197.808143	1.111	413516.857	ug/L	1803.601
>	72	Ge-1			1787676.452	ug/L	1770626.630
	107	Ag	49.373120	0.925	496128.306	ug/L	107.668
	111	Cd	98.569038	0.955	233716.737	ug/L	31.870
	121	Sb	49.754668	0.461	399941.912	ug/L	267.672
	135	Ba	98.666319	1.058	213763.166	ug/L	107.334
>	115	In-1			1579228.473	ug/L	1587338.541
	205	Tl	49.461107	1.996	850608.117	ug/L	8425.078
	208	Pb	99.599968	0.731	2310657.698	ug/L	653.346
>	169	Tm-1			1029695.667	ug/L	1034528.991
	50	Cr	96.775656	4.998	21804.410	ug/L	-551.362
	53	Cr	92.908478	4.074	115960.948	ug/L	80741.041
	61	Ni	96.410922	1.340	6603.247	ug/L	2349.881
	63	Cu	98.938156	1.167	210174.919	ug/L	149.672
	67	Zn	101.683869	1.661	15352.015	ug/L	6295.714
	66	Zn	99.083112	0.720	58517.142	ug/L	1513.171
	76	Se	83.742873	15.909	-247480.348	ug/L	-249528.610
	77	Se	92.419541	2.225	38958.305	ug/L	20421.913
	78	Se	99.160360	0.936	85206.076	ug/L	17643.086
	79	Br	67.879333	8.064	190841.331	ug/L	167288.411
>	72	Ge			1787676.452	ug/L	1770626.630
	108	Cd	99.413930	0.481	16346.839	ug/L	9.347
	114	Cd	98.563339	0.482	557105.320	ug/L	68.394
	109	Ag	49.401196	1.052	170538.729	ug/L	39.334
>	115	In			1579228.473	ug/L	1587338.541

⌈	208 207.977	99.761057	0.980	1185391.315	ug/L	330.675
|	207 Pb	99.172724	0.620	482176.379	ug/L	142.668
|	206 Pb	99.625232	0.491	643090.003	ug/L	180.003
⌊>	169 Tm			1029695.667	ug/L	1034528.991

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Sc	45	
⌈>	Li-1	6	101.840
⌊	Be	9	
⌈	Ca	44	
|	Cr	52	
|	Ni	60	
|	Cu	65	
|	Zn	68	
|	As	75	
|	Se	82	
|	Mo	97	
⌊>	Ge-1	72	100.963
⌈	Ag	107	
|	Cd	111	
|	Sb	121	
|	Ba	135	
⌊>	In-1	115	99.489
⌈	Tl	205	
|	Pb	208	
⌊>	Tm-1	169	99.533
⌈	Cr	50	
|	Cr	53	
|	Ni	61	
|	Cu	63	
|	Zn	67	
|	Zn	66	
|	Se	76	
|	Se	77	
|	Se	78	
|	Br	79	
⌊>	Ge	72	100.963
⌈	Cd	108	
|	Cd	114	
|	Ag	109	
⌊>	In	115	99.489
⌈	207.977	208	
|	Pb	207	
|	Pb	206	
⌊>	Tm	169	99.533

Sample ID: CCB 2
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 15:31:57
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCB 2.028
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1944907.234	ug/L	1930596.938
>	6	Li-1			998900.086	ug/L	990818.117
	9	Be	0.008420	106.012	7.667	ug/L	4.333
	44	Ca	-0.584711	486.244	53494.258	ug/L	53673.492
	52	Cr	-0.387251	8.785	37962.570	ug/L	41930.043
	60	Ni	0.005082	271.205	307.109	ug/L	293.570
	65	Cu	0.003210	231.375	204.614	ug/L	195.564
	68	Zn	-0.123626	34.118	4226.412	ug/L	4356.711
	75	As	-0.164437	177.903	19555.843	ug/L	19999.128
	82	Se	0.102580	859.141	1605.860	ug/L	1576.398
	97	Mo	0.760938	74.216	3378.637	ug/L	1803.601
>	72	Ge-1			1771452.720	ug/L	1770626.630
	107	Ag	0.005181	35.022	159.669	ug/L	107.668
	111	Cd	0.010131	64.878	55.872	ug/L	31.870
	121	Sb	0.007926	71.851	331.009	ug/L	267.672
	135	Ba	0.006090	149.723	120.334	ug/L	107.334
>	115	In-1			1584769.329	ug/L	1587338.541
	205	Tl	0.379805	63.087	14832.419	ug/L	8425.078
	208	Pb	0.010465	50.853	892.357	ug/L	653.346
>	169	Tm-1			1029651.964	ug/L	1034528.991
	50	Cr	0.122611	36.786	-523.580	ug/L	-551.362
	53	Cr	-16.673468	11.736	74651.243	ug/L	80741.041
	61	Ni	-2.591951	63.949	2238.436	ug/L	2349.881
	63	Cu	0.009115	90.813	169.006	ug/L	149.672
	67	Zn	-3.964910	51.843	5950.115	ug/L	6295.714
	66	Zn	-0.087961	72.171	1463.805	ug/L	1513.171
	76	Se	6.296226	244.252	-249318.094	ug/L	-249528.610
	77	Se	-9.655100	14.109	18531.871	ug/L	20421.913
	78	Se	-0.282511	99.769	17459.930	ug/L	17643.086
	79	Br	-1.607558	498.897	166855.027	ug/L	167288.411
>	72	Ge			1771452.720	ug/L	1770626.630
	108	Cd	0.048326	76.349	17.285	ug/L	9.347
	114	Cd	0.012123	45.947	136.952	ug/L	68.394
	109	Ag	0.005992	64.502	60.001	ug/L	39.334
>	115	In			1584769.329	ug/L	1587338.541

208 207.977	0.008826	55.702	433.682	ug/L	330.675
207 Pb	0.011338	36.653	197.003	ug/L	142.668
206 Pb	0.012824	56.563	261.672	ug/L	180.003
169 Tm			1029651.964	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	100.816
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.047
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	99.838
Tl	205	
Pb	208	
Tm-1	169	99.529
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.047
Cd	108	
Cd	114	
Ag	109	
In	115	99.838
207.977	208	
Pb	207	
Pb	206	
Tm	169	99.529

Sample ID: LLSTD3
Sample Description: LLSTD@5ppbCr
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 15:36:03
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\LLSTD3.029
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 85
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1950517.396	ug/L	1930596.938
>	6	Li-1			1006832.303	ug/L	990818.117
	9	Be	0.005746	68.321	6.667	ug/L	4.333
	44	Ca	7.600005	30.673	57166.982	ug/L	53673.492
	52	Cr ✓	4.637286	0.891	91078.524	ug/L	41930.043
	60	Ni	0.129463	6.067	649.751	ug/L	293.570
	65	Cu	0.069586	2.142	394.128	ug/L	195.564
	68	Zn	-0.033536	141.305	4390.320	ug/L	4356.711
	75	As	-0.501084	51.828	18935.793	ug/L	19999.128
	82	Se	-0.004313	14029.264	1600.115	ug/L	1576.398
	97	Mo	-0.454387	7.829	881.061	ug/L	1803.601
>	72	Ge-1			1799011.774	ug/L	1770626.630
	107	Ag	-0.000097	778.108	107.001	ug/L	107.668
	111	Cd	0.026642	56.078	95.611	ug/L	31.870
	121	Sb	0.000728	180.730	274.339	ug/L	267.672
	135	Ba	0.009200	123.562	127.668	ug/L	107.334
>	115	In-1			1591795.757	ug/L	1587338.541
	205	Tl	-0.220189	8.589	4703.745	ug/L	8425.078
	208	Pb	0.011681	17.575	934.026	ug/L	653.346
>	169	Tm-1			1044320.223	ug/L	1034528.991
	50	Cr	3.575927	0.315	271.163	ug/L	-551.362
	53	Cr	-9.918100	7.931	78335.516	ug/L	80741.041
	61	Ni	-3.266339	24.908	2243.440	ug/L	2349.881
	63	Cu	0.086112	0.523	336.025	ug/L	149.672
	67	Zn	-4.926154	18.548	5958.134	ug/L	6295.714
	66	Zn	0.032525	311.421	1556.200	ug/L	1513.171
	76	Se	-21.691540	75.721	-254689.261	ug/L	-249528.610
	77	Se	-8.004944	15.512	19149.816	ug/L	20421.913
	78	Se	-1.013656	19.360	17232.160	ug/L	17643.086
	79	Br	-26.901869	6.637	161218.033	ug/L	167288.411
>	72	Ge			1799011.774	ug/L	1770626.630
	108	Cd	0.347907	18.418	67.014	ug/L	9.347
	114	Cd	-0.001370	88.352	60.797	ug/L	68.394
	109	Ag	-0.005208	16.490	21.333	ug/L	39.334
>	115	In			1591795.757	ug/L	1587338.541

208 207.977	0.011899	23.877	477.018	ug/L	330.675
207 Pb	0.012813	51.990	207.003	ug/L	142.668
206 Pb	0.010427	26.442	250.005	ug/L	180.003
169 Tm			1044320.223	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	101.616
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	101.603
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	100.281
Tl	205	
Pb	208	
Tm-1	169	100.946
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	101.603
Cd	108	
Cd	114	
Ag	109	
In	115	100.281
207.977	208	
Pb	207	
Pb	206	
Tm	169	100.946

Sample ID: CCV 3
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 16:05:12
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCV 3.035
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1924636.141	ug/L	1930596.938
>	6	Li-1			1032035.633	ug/L	990818.117
	9	Be	98.385210	3.891	39769.240	ug/L	4.333
	44	Ca	4870.062142	2.756	1730106.356	ug/L	53673.492
	52	Cr	95.476835	2.786	1032808.047	ug/L	41930.043
	60	Ni	94.797839	3.231	255694.383	ug/L	293.570
	65	Cu	95.150257	3.563	265370.435	ug/L	195.564
	68	Zn	97.560758	2.788	109564.238	ug/L	4356.711
	75	As	96.111504	3.297	284106.520	ug/L	19999.128
	82	Se	95.512559	3.632	27833.304	ug/L	1576.398
	97	Mo	190.690057	3.517	398184.894	ug/L	1803.601
>	72	Ge-1			1786228.665	ug/L	1770626.630
	107	Ag	48.066533	3.562	473255.894	ug/L	107.668
	111	Cd	97.179191	2.368	225820.476	ug/L	31.870
	121	Sb	49.405669	2.655	389177.841	ug/L	267.672
	135	Ba	96.627374	2.927	205147.742	ug/L	107.334
>	115	In-1			1548154.134	ug/L	1587338.541
	205	Tl	49.037197	3.388	833650.630	ug/L	8425.078
	208	Pb	99.106427	2.994	2272541.506	ug/L	653.346
>	169	Tm-1			1018160.114	ug/L	1034528.991
	50	Cr	95.521176	1.850	21487.863	ug/L	-551.362
	53	Cr	74.250995	7.584	108924.758	ug/L	80741.041
	61	Ni	92.500345	6.900	6421.729	ug/L	2349.881
	63	Cu	94.696336	2.632	200915.936	ug/L	149.672
	67	Zn	98.540479	6.194	15053.025	ug/L	6295.714
	66	Zn	97.054856	2.916	57277.793	ug/L	1513.171
	76	Se	38.807024	45.080	-249677.693	ug/L	-249528.610
	77	Se	76.550362	8.670	35762.895	ug/L	20421.913
	78	Se	95.824250	3.573	82836.132	ug/L	17643.086
	79	Br	32.168621	52.965	179071.933	ug/L	167288.411
>	72	Ge			1786228.665	ug/L	1770626.630
	108	Cd	97.358238	3.825	15685.690	ug/L	9.347
	114	Cd	97.790131	2.544	541671.273	ug/L	68.394
	109	Ag	48.235733	3.305	163169.131	ug/L	39.334
>	115	In			1548154.134	ug/L	1587338.541

208 207.977	99.460802	2.964	1168137.071	ug/L	330.675
207 Pb	98.705248	3.231	474319.106	ug/L	142.668
206 Pb	98.756249	2.904	630085.328	ug/L	180.003
169 Tm			1018160.114	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	104.160
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.881
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	97.531
Ti	205	
Pb	208	
Tm-1	169	98.418
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.881
Cd	108	
Cd	114	
Ag	109	
In	115	97.531
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.418

Sample ID: CCB 3
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 16:09:20
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCB 3.036
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1916476.570	ug/L	1930596.938
>	6	Li-1			1014143.599	ug/L	990818.117
	9	Be	0.019019	11.408	12.000	ug/L	4.333
	44	Ca	2.292884	15.119	54554.851	ug/L	53673.492
	52	Cr	-0.707460	5.285	34713.763	ug/L	41930.043
	60	Ni	-0.001565	172.598	289.920	ug/L	293.570
	65	Cu	0.007070	81.708	215.517	ug/L	195.564
	68	Zn	-0.154557	15.840	4199.116	ug/L	4356.711
	75	As	-0.366512	26.540	19035.336	ug/L	19999.128
	82	Se	0.134317	400.517	1615.730	ug/L	1576.398
	97	Mo	0.912976	67.908	3691.155	ug/L	1803.601
>	72	Ge-1			1773837.311	ug/L	1770626.630
	107	Ag	0.005390	69.413	159.002	ug/L	107.668
	111	Cd	0.008930	132.655	52.141	ug/L	31.870
	121	Sb	0.034270	19.447	534.356	ug/L	267.672
	135	Ba	0.003427	193.362	112.668	ug/L	107.334
>	115	In-1			1558764.412	ug/L	1587338.541
	205	Tl	0.447258	58.525	15853.425	ug/L	8425.078
	208	Pb	0.016739	41.948	1028.700	ug/L	653.346
>	169	Tm-1			1019607.131	ug/L	1034528.991
	50	Cr	0.271755	41.223	-490.093	ug/L	-551.362
	53	Cr	-31.132499	8.815	69437.971	ug/L	80741.041
	61	Ni	-5.699386	3.999	2105.975	ug/L	2349.881
	63	Cu	0.015401	98.194	182.341	ug/L	149.672
	67	Zn	-6.292209	26.766	5754.947	ug/L	6295.714
	66	Zn	-0.067289	90.762	1477.480	ug/L	1513.171
	76	Se	-12.914063	31.939	-250662.216	ug/L	-249528.610
	77	Se	-22.066995	1.945	16113.936	ug/L	20421.913
	78	Se	-1.181806	20.134	16878.290	ug/L	17643.086
	79	Br	-19.763820	29.608	161247.896	ug/L	167288.411
>	72	Ge			1773837.311	ug/L	1770626.630
	108	Cd	0.025194	146.357	13.249	ug/L	9.347
	114	Cd	0.012495	30.036	136.795	ug/L	68.394
	109	Ag	0.004811	18.434	55.001	ug/L	39.334
>	115	In			1558764.412	ug/L	1587338.541

208 207.977	0.018129	42.775	539.357	ug/L	330.675
207 Pb	0.016205	50.680	218.671	ug/L	142.668
206 Pb	0.014583	37.940	270.672	ug/L	180.003
169 Tm			1019607.131	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	102.354
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.181
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	98.200
Tl	205	
Pb	208	
Tm-1	169	98.558
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.181
Cd	108	
Cd	114	
Ag	109	
In	115	98.200
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.558

Sample ID: CCV 4
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 16:13:28
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCV 4.037
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1902999.033	ug/L	1930596.938
>	6	Li-1			1009797.947	ug/L	990818.117
	9	Be	99.872282	1.276	39520.676	ug/L	4.333
	44	Ca	4901.375081	0.604	1731348.845	ug/L	53673.492
	52	Cr	96.740008	0.461	1040191.351	ug/L	41930.043
	60	Ni	95.928502	0.357	257340.441	ug/L	293.570
	65	Cu	96.286742	0.378	267106.161	ug/L	195.564
	68	Zn	99.310034	1.108	110840.049	ug/L	4356.711
	75	As	96.940541	0.527	284829.815	ug/L	19999.128
	82	Se	96.102595	0.887	27845.518	ug/L	1576.398
	97	Mo	191.836214	0.652	398417.263	ug/L	1803.601
>	72	Ge-1			1775693.885	ug/L	1770626.630
	107	Ag	48.722910	1.139	474395.676	ug/L	107.668
	111	Cd	98.279326	0.838	225808.755	ug/L	31.870
	121	Sb	50.071732	0.584	390006.547	ug/L	267.672
	135	Ba	98.408051	0.500	206596.375	ug/L	107.334
>	115	In-1			1530280.677	ug/L	1587338.541
	205	Tl	49.727522	0.903	838882.070	ug/L	8425.078
	208	Pb	99.686976	0.185	2268551.393	ug/L	653.346
>	169	Tm-1			1010011.994	ug/L	1034528.991
	50	Cr	98.036409	1.173	21944.374	ug/L	-551.362
	53	Cr	69.922938	2.828	106716.378	ug/L	80741.041
	61	Ni	90.229697	5.915	6289.365	ug/L	2349.881
	63	Cu	95.621512	0.499	201765.916	ug/L	149.672
	67	Zn	96.441743	2.137	14788.295	ug/L	6295.714
	66	Zn	98.010153	0.922	57511.614	ug/L	1513.171
	76	Se	39.871814	27.659	-248137.301	ug/L	-249528.610
	77	Se	77.255141	0.796	35708.326	ug/L	20421.913
	78	Se	97.393934	0.722	83443.849	ug/L	17643.086
	79	Br	42.897077	11.681	181545.580	ug/L	167288.411
>	72	Ge			1775693.885	ug/L	1770626.630
	108	Cd	99.310422	1.306	15822.967	ug/L	9.347
	114	Cd	99.251843	0.601	543607.974	ug/L	68.394
	109	Ag	48.763968	1.401	163117.639	ug/L	39.334
>	115	In			1530280.677	ug/L	1587338.541

208 207.977	99.792106	0.448	1163148.931	ug/L	330.675
207 Pb	99.653866	0.371	475269.534	ug/L	142.668
206 Pb	99.518389	0.315	630132.929	ug/L	180.003
> 169 Tm			1010011.994	ug/L	1034528.991

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Sc	45	
>	Li-1	6	101.916
	Be	9	
	Ca	44	
	Cr	52	
	Ni	60	
	Cu	65	
	Zn	68	
	As	75	
	Se	82	
	Mo	97	
>	Ge-1	72	100.286
	Ag	107	
	Cd	111	
	Sb	121	
	Ba	135	
>	In-1	115	96.405
	Tl	205	
	Pb	208	
>	Tm-1	169	97.630
	Cr	50	
	Cr	53	
	Ni	61	
	Cu	63	
	Zn	67	
	Zn	66	
	Se	76	
	Se	77	
	Se	78	
	Br	79	
>	Ge	72	100.286
	Cd	108	
	Cd	114	
	Ag	109	
>	In	115	96.405
	207.977	208	
	Pb	207	
	Pb	206	
>	Tm	169	97.630

Sample ID: CCB 4
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 16:17:36
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCB 4.038
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1911706.471	ug/L	1930596.938
⌈>	6	Li-1			1015229.955	ug/L	990818.117
⌊	9	Be	0.005574	66.157	6.667	ug/L	4.333
⌈	44	Ca	6.720563	43.740	55867.186	ug/L	53673.492
	52	Cr	-0.764966	6.322	34000.601	ug/L	41930.043
	60	Ni	-0.009209	74.009	268.415	ug/L	293.570
	65	Cu	0.008393	31.337	218.355	ug/L	195.564
	68	Zn	-0.211889	14.781	4122.958	ug/L	4356.711
	75	As	-0.615251	20.652	18293.768	ug/L	19999.128
	82	Se	0.129887	987.697	1610.038	ug/L	1576.398
	97	Mo	0.225426	123.479	2262.085	ug/L	1803.601
⌊>	72	Ge-1			1767594.793	ug/L	1770626.630
⌈	107	Ag	0.002368	47.941	128.001	ug/L	107.668
	111	Cd	0.002166	129.234	36.030	ug/L	31.870
	121	Sb	0.014670	5.991	375.678	ug/L	267.672
	135	Ba	0.004527	139.056	114.001	ug/L	107.334
⌊>	115	In-1			1544444.001	ug/L	1587338.541
⌈	205	Tl	0.194005	56.698	11523.928	ug/L	8425.078
	208	Pb	0.006575	18.493	791.686	ug/L	653.346
⌊>	169	Tm-1			1015525.893	ug/L	1034528.991
⌈	50	Cr	0.107509	37.069	-525.817	ug/L	-551.362
	53	Cr	-28.573362	10.833	70127.979	ug/L	80741.041
	61	Ni	-2.978630	96.144	2217.084	ug/L	2349.881
	63	Cu	-0.002100	385.582	145.005	ug/L	149.672
	67	Zn	-4.097521	8.213	5926.383	ug/L	6295.714
	66	Zn	-0.134138	75.123	1434.119	ug/L	1513.171
	76	Se	-38.820396	61.457	-251136.464	ug/L	-249528.610
	77	Se	-22.819828	4.014	15908.574	ug/L	20421.913
	78	Se	-1.103481	15.424	16870.766	ug/L	17643.086
	79	Br	-27.090055	24.420	158332.295	ug/L	167288.411
⌊>	72	Ge			1767594.793	ug/L	1770626.630
⌈	108	Cd	0.003248	1717.292	9.607	ug/L	9.347
	114	Cd	0.002429	126.584	79.992	ug/L	68.394
	109	Ag	0.002191	8.413	45.667	ug/L	39.334
⌊>	115	In			1544444.001	ug/L	1587338.541

208 207.977	0.006695	16.800	403.013	ug/L	330.675
207 Pb	0.005702	61.052	167.336	ug/L	142.668
206 Pb	0.007011	20.284	221.337	ug/L	180.003
169 Tm			1015525.893	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	102.464
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	99.829
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	97.298
Tl	205	
Pb	208	
Tm-1	169	98.163
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	99.829
Cd	108	
Cd	114	
Ag	109	
In	115	97.298
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.163

Sample ID: L9PEMB
Sample Description: G0K080000-242 BLK
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:21:40
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9PEMB.039
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 21
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1908017.498	ug/L	1930596.938
>	6	Li-1			1024241.544	ug/L	990818.117
	9	Be	0.006334	173.948	7.000	ug/L	4.333
	44	Ca	1.773466	144.534	54371.994	ug/L	53673.492
	52	Cr	-0.739885	0.713	34377.272	ug/L	41930.043
	60	Ni	-0.046371	9.485	169.955	ug/L	293.570
	65	Cu	-0.013614	41.249	158.204	ug/L	195.564
	68	Zn	-2.367771	3.674	1828.550	ug/L	4356.711
	75	As	-0.684866	41.397	18164.719	ug/L	19999.128
	82	Se	-0.293880	317.991	1498.913	ug/L	1576.398
	97	Mo	-0.478717	9.042	818.053	ug/L	1803.601
>	72	Ge-1			1773692.532	ug/L	1770626.630
	107	Ag	-0.004100	31.631	64.667	ug/L	107.668
	111	Cd	-0.003959	55.004	21.878	ug/L	31.870
	121	Sb	0.003239	40.195	286.673	ug/L	267.672
	135	Ba	0.792319	3.407	1787.251	ug/L	107.334
>	115	In-1			1548689.643	ug/L	1587338.541
	205	Tl	-0.187431	11.058	5144.083	ug/L	8425.078
	208	Pb	-0.009269	8.149	431.339	ug/L	653.346
>	169	Tm-1			1020352.701	ug/L	1034528.991
	50	Cr	0.279762	34.748	-488.185	ug/L	-551.362
	53	Cr	-27.569945	7.751	70742.216	ug/L	80741.041
	61	Ni	-5.145189	30.604	2129.998	ug/L	2349.881
	63	Cu	-0.015953	43.059	116.336	ug/L	149.672
	67	Zn	-5.432579	14.750	5829.802	ug/L	6295.714
	66	Zn	-2.103574	1.534	315.355	ug/L	1513.171
	76	Se	-61.076600	32.337	-253181.987	ug/L	-249528.610
	77	Se	-20.139240	6.811	16492.283	ug/L	20421.913
	78	Se	-1.182343	26.297	16876.184	ug/L	17643.086
	79	Br	-346.684037	0.680	56353.818	ug/L	167288.411
>	72	Ge			1773692.532	ug/L	1770626.630
	108	Cd	-0.019893	93.573	5.915	ug/L	9.347
	114	Cd	-0.003595	53.514	46.830	ug/L	68.394
	109	Ag	-0.004252	48.001	24.000	ug/L	39.334
>	115	In			1548689.643	ug/L	1587338.541

208 207.977	-0.009442	0.858	215.004	ug/L	330.675
207 Pb	-0.010319	7.761	91.001	ug/L	142.668
206 Pb	-0.008159	25.625	125.335	ug/L	180.003
169 Tm			1020352.701	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	103.373
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.173
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	97.565
Tl	205	
Pb	208	
Tm-1	169	98.630
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.173
Cd	108	
Cd	114	
Ag	109	
In	115	97.565
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.630

Sample ID: L9PEMC
Sample Description: G0K080000-242 LCS
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:25:41
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9PEMC.040
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 102
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1888440.371	ug/L	1930596.938
>	6	Li-1			1033053.800	ug/L	990818.117
	9	Be	203.408789	1.266	82333.200	ug/L	4.333
	44	Ca	1097.001719	1.474	423118.830	ug/L	53673.492
	52	Cr	198.142646	0.888	2056536.653	ug/L	41930.043
	60	Ni	202.270134	0.960	534549.101	ug/L	293.570
	65	Cu	202.322748	0.854	553007.404	ug/L	195.564
	68	Zn	206.131421	0.773	222136.157	ug/L	4356.711
	75	As	198.120673	0.712	553149.672	ug/L	19999.128
	82	Se	193.971091	1.066	53811.874	ug/L	1576.398
	97	Mo	205.246517	1.215	420030.956	ug/L	1803.601
>	72	Ge-1			1750340.577	ug/L	1770626.630
	107	Ag	50.960156	0.590	498729.116	ug/L	107.668
	111	Cd	200.563492	0.049	463148.631	ug/L	31.870
	121	Sb	197.304317	0.138	1543889.345	ug/L	267.672
	135	Ba	203.792354	0.577	429913.043	ug/L	107.334
>	115	In-1			1538063.456	ug/L	1587338.541
	205	Tl	52.247884	1.858	886378.562	ug/L	8425.078
	208	Pb	204.719849	0.633	4686683.953	ug/L	653.346
>	169	Tm-1			1016225.656	ug/L	1034528.991
	50	Cr	186.307335	3.161	41596.931	ug/L	-551.362
	53	Cr	221.483770	2.848	160185.069	ug/L	80741.041
	61	Ni	198.082932	1.652	10833.767	ug/L	2349.881
	63	Cu	197.685051	1.159	410997.388	ug/L	149.672
	67	Zn	219.236100	0.509	25213.430	ug/L	6295.714
	66	Zn	202.572940	0.333	115573.123	ug/L	1513.171
	76	Se	185.276924	22.839	-237037.661	ug/L	-249528.610
	77	Se	192.564146	1.744	57598.896	ug/L	20421.913
	78	Se	198.542304	1.904	149547.101	ug/L	17643.086
	79	Br	-320.497270	2.494	63893.601	ug/L	167288.411
>	72	Ge			1750340.577	ug/L	1770626.630
	108	Cd	195.499461	1.322	31300.617	ug/L	9.347
	114	Cd	199.809792	0.385	1099897.590	ug/L	68.394
	109	Ag	50.906668	0.422	171162.470	ug/L	39.334
>	115	In			1538063.456	ug/L	1587338.541

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Sample ID: L9PEMC

208 207.977	208.234194	0.732	2441663.680	ug/L	330.675
207 Pb	223.525677	0.731	1072413.961	ug/L	142.668
206 Pb	184.086044	0.419	1172606.311	ug/L	180.003
169 Tm			1016225.656	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	104.263
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	98.854
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	96.896
Tl	205	
Pb	208	
Tm-1	169	98.231
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	98.854
Cd	108	
Cd	114	
Ag	109	
In	115	96.896
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.231

Sample ID: L9FW8S
Sample Description: G0K020530-1 MS
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:29:39
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9FW8S.041
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 103
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1882917.868	ug/L	1930596.938
>	6	Li-1			1019004.441	ug/L	990818.117
	9	Be	200.010572	0.202	79867.428	ug/L	4.333
	44	Ca	13030.805553	0.594	4461329.313	ug/L	53673.492
	52	Cr	192.524418	0.682	2004929.221	ug/L	41930.043
	60	Ni	193.650776	0.487	513166.986	ug/L	293.570
	65	Cu	196.450360	0.660	538439.596	ug/L	195.564
	68	Zn	205.983115	1.067	222593.531	ug/L	4356.711
	75	As	196.591802	0.627	550543.443	ug/L	19999.128
	82	Se	190.636896	0.758	53058.539	ug/L	1576.398
	97	Mo	201.750453	0.580	414053.906	ug/L	1803.601
>	72	Ge-1			1755092.725	ug/L	1770626.630
	107	Ag	48.968151	0.744	478194.319	ug/L	107.668
	111	Cd	194.047446	0.869	447126.975	ug/L	31.870
	121	Sb	193.252475	0.552	1508902.519	ug/L	267.672
	135	Ba	208.302606	0.491	438473.814	ug/L	107.334
>	115	In-1			1534737.014	ug/L	1587338.541
	205	Tl	51.997990	1.156	870455.908	ug/L	8425.078
	208	Pb	202.097192	0.622	4565031.214	ug/L	653.346
>	169	Tm-1			1002659.510	ug/L	1034528.991
	50	Cr	184.563013	2.062	41314.811	ug/L	-551.362
	53	Cr	218.559464	1.268	159567.725	ug/L	80741.041
	61	Ni	191.923925	2.056	10597.320	ug/L	2349.881
	63	Cu	192.879411	0.315	402110.761	ug/L	149.672
	67	Zn	224.688247	1.455	25755.119	ug/L	6295.714
	66	Zn	203.075064	0.575	116172.159	ug/L	1513.171
	76	Se	199.044340	2.376	-236949.955	ug/L	-249528.610
	77	Se	192.278771	1.710	57703.570	ug/L	20421.913
	78	Se	193.363604	0.798	146512.232	ug/L	17643.086
	79	Br	-268.424457	1.586	80607.191	ug/L	167288.411
>	72	Ge			1755092.725	ug/L	1770626.630
	108	Cd	188.663480	1.357	30139.970	ug/L	9.347
	114	Cd	194.468739	0.367	1068172.743	ug/L	68.394
	109	Ag	49.206733	1.065	165090.023	ug/L	39.334
>	115	In			1534737.014	ug/L	1587338.541

208 207.977	206.563171	0.678	2389846.152	ug/L	330.675
207 Pb	218.982329	0.692	1036598.915	ug/L	142.668
206 Pb	181.158254	1.027	1138586.148	ug/L	180.003
169 Tm			1002659.510	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	102.845
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	99.123
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	96.686
Tl	205	
Pb	208	
Tm-1	169	96.919
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	99.123
Cd	108	
Cd	114	
Ag	109	
In	115	96.686
207.977	208	
Pb	207	
Pb	206	
Tm	169	96.919

Sample ID: L9FW8D
Sample Description: G0K020530-1 SD
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:33:38
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9FW8D.042
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 104
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1875759.067	ug/L	1930596.938
>	6	Li-1			1013439.738	ug/L	990818.117
	9	Be	204.521730	0.463	81220.714	ug/L	4.333
	44	Ca	13108.024407	1.372	4505547.275	ug/L	53673.492
	52	Cr	194.608613	1.262	2034339.992	ug/L	41930.043
	60	Ni	197.131431	0.964	524499.251	ug/L	293.570
	65	Cu	200.715511	1.184	552346.189	ug/L	195.564
	68	Zn	207.869992	1.351	225495.749	ug/L	4356.711
	75	As	199.009498	1.292	559318.201	ug/L	19999.128
	82	Se	190.430228	1.029	53216.883	ug/L	1576.398
	97	Mo	204.177537	2.149	420670.716	ug/L	1803.601
>	72	Ge-1			1762306.112	ug/L	1770626.630
	107	Ag	49.783011	1.811	485840.206	ug/L	107.668
	111	Cd	197.074516	1.556	453819.880	ug/L	31.870
	121	Sb	196.899780	1.004	1536462.808	ug/L	267.672
	135	Ba	210.822486	1.575	443503.459	ug/L	107.334
>	115	In-1			1533900.499	ug/L	1587338.541
	205	Tl	53.193404	2.316	888448.815	ug/L	8425.078
	208	Pb	206.431762	1.409	4653723.077	ug/L	653.346
>	169	Tm-1			1000806.527	ug/L	1034528.991
	50	Cr	187.143055	1.528	42072.408	ug/L	-551.362
	53	Cr	217.585102	1.580	159876.722	ug/L	80741.041
	61	Ni	195.772796	2.898	10806.302	ug/L	2349.881
	63	Cu	196.303011	0.851	410917.205	ug/L	149.672
	67	Zn	227.542724	1.674	26108.107	ug/L	6295.714
	66	Zn	204.608428	1.024	117511.055	ug/L	1513.171
	76	Se	156.574849	4.521	-240147.174	ug/L	-249528.610
	77	Se	190.994853	1.173	57686.448	ug/L	20421.913
	78	Se	195.969235	1.601	148846.198	ug/L	17643.086
	79	Br	-280.560488	2.172	77056.585	ug/L	167288.411
>	72	Ge			1762306.112	ug/L	1770626.630
	108	Cd	193.399777	0.526	30879.442	ug/L	9.347
	114	Cd	198.120774	0.731	1087603.235	ug/L	68.394
	109	Ag	50.181828	0.980	168259.532	ug/L	39.334
>	115	In			1533900.499	ug/L	1587338.541

Report Date/Time: Saturday, November 13, 2010 16:35:28
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Sample ID: L9FW8D

208 207.977	209.851269	1.118	2423125.420	ug/L	330.675
207 Pb	225.150711	1.864	1063675.455	ug/L	142.668
206 Pb	186.037972	1.631	1166922.201	ug/L	180.003
169 Tm			1000806.527	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	102.283
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	99.530
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	96.633
Tl	205	
Pb	208	
Tm-1	169	96.740
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	99.530
Cd	108	
Cd	114	
Ag	109	
In	115	96.633
207.977	208	
Pb	207	
Pb	206	
Tm	169	96.740

Sample ID: L9FW8
Sample Description: G0K020530-1
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:37:38
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9FW8.043
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 30
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1909507.697	ug/L	1930596.938
>	6	Li-1			1009817.637	ug/L	990818.117
	9	Be	0.005690	68.228	6.667	ug/L	4.333
	44	Ca	12014.570833	0.780	4166033.719	ug/L	53673.492
	52	Cr	-0.525144	19.936	36630.838	ug/L	41930.043
	60	Ni	0.768787	1.709	2354.470	ug/L	293.570
	65	Cu	2.313273	2.340	6608.662	ug/L	195.564
	68	Zn	5.165551	0.863	9907.871	ug/L	4356.711
	75	As	0.938473	16.164	22620.922	ug/L	19999.128
	82	Se	0.072489	1405.050	1600.103	ug/L	1576.398
	97	Mo	0.339166	83.852	2508.845	ug/L	1803.601
>	72	Ge-1			1775796.081	ug/L	1770626.630
	107	Ag	-0.003004	42.065	75.334	ug/L	107.668
	111	Cd	0.076546	9.120	208.668	ug/L	31.870
	121	Sb	0.185649	3.822	1720.900	ug/L	267.672
	135	Ba	9.482126	0.881	20208.039	ug/L	107.334
>	115	In-1			1546105.246	ug/L	1587338.541
	205	Tl	0.382686	34.936	14800.802	ug/L	8425.078
	208	Pb	1.376893	0.853	32351.460	ug/L	653.346
>	169	Tm-1			1022323.928	ug/L	1034528.991
	50	Cr	0.757238	22.126	-379.208	ug/L	-551.362
	53	Cr	-25.908259	8.911	71434.993	ug/L	80741.041
	61	Ni	1.276678	80.088	2412.280	ug/L	2349.881
	63	Cu	2.255907	0.746	4906.959	ug/L	149.672
	67	Zn	7.903248	15.835	7008.458	ug/L	6295.714
	66	Zn	5.078706	4.050	4418.960	ug/L	1513.171
	76	Se	-43.509165	91.613	-252560.278	ug/L	-249528.610
	77	Se	-22.626830	4.125	16020.771	ug/L	20421.913
	78	Se	-1.163494	23.314	16908.596	ug/L	17643.086
	79	Br	-277.039831	1.301	78791.367	ug/L	167288.411
>	72	Ge			1775796.081	ug/L	1770626.630
	108	Cd	-0.601227	18.104	-87.658	ug/L	9.347
	114	Cd	0.076034	2.809	487.293	ug/L	68.394
	109	Ag	-0.003941	12.221	25.000	ug/L	39.334
>	115	In			1546105.246	ug/L	1587338.541

208 207.977	1.398041	0.955	16815.856	ug/L	330.675
207 Pb	1.394431	1.528	6870.040	ug/L	142.668
206 Pb	1.324753	1.559	8665.563	ug/L	180.003
169 Tm			1022323.928	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	101.918
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.292
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	97.402
Tl	205	
Pb	208	
Tm-1	169	98.820
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.292
Cd	108	
Cd	114	
Ag	109	
In	115	97.402
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.820

SHargrave

Sample ID: L9FW8P5
Sample Description: G0K020530-1 5X
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:41:38
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9FW8P5.044
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 31
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1902034.786	ug/L	1930596.938
>	6	Li-1			1007678.882	ug/L	990818.117
	9	Be	0.006562	76.385	7.000	ug/L	4.333
	44	Ca	2569.509794	0.610	936070.473	ug/L	53673.492
	52	Cr	-0.974365	2.797	32092.721	ug/L	41930.043
	60	Ni	0.147968	9.055	692.861	ug/L	293.570
	65	Cu	0.469326	4.159	1501.351	ug/L	195.564
	68	Zn	1.031962	14.895	5493.026	ug/L	4356.711
	75	As	-0.476382	25.665	18812.449	ug/L	19999.128
	82	Se	-0.067687	1694.989	1567.151	ug/L	1576.398
	97	Mo	-0.464625	5.512	851.057	ug/L	1803.601
>	72	Ge-1			1781101.795	ug/L	1770626.630
	107	Ag	-0.005260	5.807	53.667	ug/L	107.668
	111	Cd	0.014865	38.582	66.134	ug/L	31.870
	121	Sb	0.045168	5.389	622.030	ug/L	267.672
	135	Ba	1.917254	0.626	4211.393	ug/L	107.334
>	115	In-1			1561665.567	ug/L	1587338.541
	205	Tl	-0.120833	7.865	6266.752	ug/L	8425.078
	208	Pb	0.276566	1.868	6996.479	ug/L	653.346
>	169	Tm-1			1019690.609	ug/L	1034528.991
	50	Cr	0.537772	70.458	-431.320	ug/L	-551.362
	53	Cr	-32.345255	6.360	69276.893	ug/L	80741.041
	61	Ni	-2.010004	180.530	2276.143	ug/L	2349.881
	63	Cu	0.456922	4.795	1116.941	ug/L	149.672
	67	Zn	-1.081413	176.761	6238.558	ug/L	6295.714
	66	Zn	1.041082	11.112	2118.320	ug/L	1513.171
	76	Se	-58.305564	22.682	-254096.355	ug/L	-249528.610
	77	Se	-28.197018	2.034	14967.311	ug/L	20421.913
	78	Se	-1.315138	15.459	16856.787	ug/L	17643.086
	79	Br	-93.623152	3.252	138114.311	ug/L	167288.411
>	72	Ge			1781101.795	ug/L	1770626.630
	108	Cd	-0.150667	34.526	-15.241	ug/L	9.347
	114	Cd	0.014545	25.235	148.568	ug/L	68.394
	109	Ag	-0.005770	5.644	19.000	ug/L	39.334
>	115	In			1561665.567	ug/L	1587338.541

Report Date/Time: Saturday, November 13, 2010 16:43:29
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Sample ID: L9FW8P5

208 207.977	0.278864	2.526	3606.689	ug/L	330.675
207 Pb	0.285482	3.734	1514.847	ug/L	142.668
206 Pb	0.265623	1.746	1874.943	ug/L	180.003
169 Tm			1019690.609	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	101.702
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.592
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	98.383
Tl	205	
Pb	208	
Tm-1	169	98.566
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.592
Cd	108	
Cd	114	
Ag	109	
In	115	98.383
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.566

Sample ID: L9FW8Z
Sample Description: G0K020530-1 PS
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:45:39
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9FW8Z.045
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 32
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1864085.840	ug/L	1930596.938
>	6	Li-1			1021000.340	ug/L	990818.117
	9	Be	191.026410	1.330	76422.187	ug/L	4.333
	44	Ca	12810.599833	0.114	4384002.694	ug/L	53673.492
	52	Cr	184.837406	0.229	1925308.556	ug/L	41930.043
	60	Ni	186.589175	0.446	494146.856	ug/L	293.570
	65	Cu	190.341680	0.502	521360.192	ug/L	195.564
	68	Zn	197.686855	1.021	213673.696	ug/L	4356.711
	75	As	189.357123	0.760	530686.022	ug/L	19999.128
	82	Se	178.597031	1.116	49772.376	ug/L	1576.398
	97	Mo	190.772412	0.303	391368.395	ug/L	1803.601
>	72	Ge-1			1753968.561	ug/L	1770626.630
	107	Ag	47.573783	0.629	458497.671	ug/L	107.668
	111	Cd	187.621881	0.480	426649.212	ug/L	31.870
	121	Sb	185.124484	0.596	1426464.226	ug/L	267.672
	135	Ba	200.858238	0.486	417269.795	ug/L	107.334
>	115	In-1			1514601.981	ug/L	1587338.541
	205	Tl	52.168798	1.075	865276.400	ug/L	8425.078
	208	Pb	195.877393	0.669	4384127.672	ug/L	653.346
>	169	Tm-1			993533.009	ug/L	1034528.991
	50	Cr	175.147692	1.517	39156.871	ug/L	-551.362
	53	Cr	199.080238	0.614	152383.820	ug/L	80741.041
	61	Ni	187.275761	1.950	10391.040	ug/L	2349.881
	63	Cu	186.394254	1.178	388341.726	ug/L	149.672
	67	Zn	216.360454	1.009	25016.612	ug/L	6295.714
	66	Zn	194.838517	0.454	111451.858	ug/L	1513.171
	76	Se	183.409771	17.510	-237613.358	ug/L	-249528.610
	77	Se	172.523335	1.028	53820.524	ug/L	20421.913
	78	Se	185.793382	0.462	141373.403	ug/L	17643.086
	79	Br	-278.228170	1.083	77441.124	ug/L	167288.411
>	72	Ge			1753968.561	ug/L	1770626.630
	108	Cd	182.642106	0.600	28796.145	ug/L	9.347
	114	Cd	188.216680	0.686	1020283.435	ug/L	68.394
	109	Ag	47.687287	0.528	157896.636	ug/L	39.334
>	115	In			1514601.981	ug/L	1587338.541

Report Date/Time: Saturday, November 13, 2010 16:47:29
Page 1
Sample ID: L9FW8Z

208 207.977	198.957160	0.385	2280824.547	ug/L	330.675
207 Pb	213.216449	0.831	1000101.975	ug/L	142.668
206 Pb	177.148337	1.130	1103201.149	ug/L	180.003
169 Tm			993533.009	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	103.046
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	99.059
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	95.418
Tl	205	
Pb	208	
Tm-1	169	96.037
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	99.059
Cd	108	
Cd	114	
Ag	109	
In	115	95.418
207.977	208	
Pb	207	
Pb	206	
Tm	169	96.037

Sample ID: L9FXA
Sample Description: G0K020530-2
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:49:40
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9FXA.046
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 33
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1909434.648	ug/L	1930596.938
>	6	Li-1			1013577.314	ug/L	990818.117
	9	Be	0.009882	127.997	8.333	ug/L	4.333
	44	Ca	11974.287352	2.050	4144794.479	ug/L	53673.492
	52	Cr	-0.687149	3.261	34905.487	ug/L	41930.043
	60	Ni	0.747626	4.561	2293.515	ug/L	293.570
	65	Cu	2.251813	1.941	6426.945	ug/L	195.564
	68	Zn	6.670087	1.870	11500.863	ug/L	4356.711
	75	As	1.131665	16.484	23107.970	ug/L	19999.128
	82	Se	0.162284	500.791	1624.624	ug/L	1576.398
	97	Mo	0.135995	170.597	2086.354	ug/L	1803.601
>	72	Ge-1			1772874.958	ug/L	1770626.630
	107	Ag	-0.002718	19.733	78.334	ug/L	107.668
	111	Cd	0.077963	7.825	212.564	ug/L	31.870
	121	Sb	0.207150	8.058	1894.616	ug/L	267.672
	135	Ba	9.162674	1.621	19580.411	ug/L	107.334
>	115	In-1			1550335.956	ug/L	1587338.541
	205	Tl	-0.268870	5.136	3780.124	ug/L	8425.078
	208	Pb	1.349879	1.973	31750.499	ug/L	653.346
>	169	Tm-1			1023205.111	ug/L	1034528.991
	50	Cr	0.490874	215.878	-439.736	ug/L	-551.362
	53	Cr	-32.704945	11.364	68810.188	ug/L	80741.041
	61	Ni	-0.904806	199.336	2313.511	ug/L	2349.881
	63	Cu	2.214243	1.737	4810.419	ug/L	149.672
	67	Zn	6.039541	14.385	6832.923	ug/L	6295.714
	66	Zn	6.618739	5.058	5288.816	ug/L	1513.171
	76	Se	-51.344582	38.109	-252561.691	ug/L	-249528.610
	77	Se	-27.789480	6.732	14976.328	ug/L	20421.913
	78	Se	-1.083432	25.181	16933.738	ug/L	17643.086
	79	Br	-271.191525	2.777	80522.510	ug/L	167288.411
>	72	Ge			1772874.958	ug/L	1770626.630
	108	Cd	-0.574859	4.248	-83.573	ug/L	9.347
	114	Cd	0.072034	1.256	466.499	ug/L	68.394
	109	Ag	-0.003554	61.443	26.333	ug/L	39.334
>	115	In			1550335.956	ug/L	1587338.541

208 207.977	1.363618	2.708	16419.492	ug/L	330.675
207 Pb	1.383798	1.072	6823.990	ug/L	142.668
206 Pb	1.299040	1.395	8507.016	ug/L	180.003
169 Tm			1023205.111	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	102.297
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	100.127
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	97.669
Tl	205	
Pb	208	
Tm-1	169	98.905
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	100.127
Cd	108	
Cd	114	
Ag	109	
In	115	97.669
207.977	208	
Pb	207	
Pb	206	
Tm	169	98.905

Sample ID: L9FXC
Sample Description: G0K020530-3
Batch ID: 312242
Sample Date/Time: Saturday, November 13, 2010 16:53:41
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\L9FXC.047
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 34
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1896614.552	ug/L	1930596.938
>	6	Li-1			1004837.586	ug/L	990818.117
	9	Be	0.005710	140.152	6.667	ug/L	4.333
	44	Ca	5.517030	50.787	54882.315	ug/L	53673.492
	52	Cr	-1.051386	4.550	30738.068	ug/L	41930.043
	60	Ni	-0.013058	54.586	255.506	ug/L	293.570
	65	Cu	0.040963	29.219	305.496	ug/L	195.564
	68	Zn	3.772547	3.575	8288.783	ug/L	4356.711
	75	As	-0.450338	25.559	18545.672	ug/L	19999.128
	82	Se	0.280805	405.623	1636.695	ug/L	1576.398
	97	Mo	-0.538877	0.464	684.370	ug/L	1803.601
>	72	Ge-1			1749514.487	ug/L	1770626.630
	107	Ag	-0.005717	9.383	48.334	ug/L	107.668
	111	Cd	-0.001517	69.129	27.348	ug/L	31.870
	121	Sb	0.021258	13.674	425.681	ug/L	267.672
	135	Ba	0.118636	4.125	354.010	ug/L	107.334
>	115	In-1			1537531.511	ug/L	1587338.541
	205	Tl	-0.316569	0.405	2929.007	ug/L	8425.078
	208	Pb	-0.000497	217.215	624.678	ug/L	653.346
>	169	Tm-1			1007174.150	ug/L	1034528.991
	50	Cr	0.486082	10.454	-435.018	ug/L	-551.362
	53	Cr	-38.011088	10.792	65971.479	ug/L	80741.041
	61	Ni	-3.602734	16.278	2167.367	ug/L	2349.881
	63	Cu	0.033919	17.976	218.344	ug/L	149.672
	67	Zn	-0.241984	678.607	6198.778	ug/L	6295.714
	66	Zn	3.694566	1.139	3574.476	ug/L	1513.171
	76	Se	-27.224737	74.726	-247981.936	ug/L	-249528.610
	77	Se	-32.355066	4.545	13891.606	ug/L	20421.913
	78	Se	-0.773602	87.581	16912.529	ug/L	17643.086
	79	Br	-357.083461	1.732	52274.931	ug/L	167288.411
>	72	Ge			1749514.487	ug/L	1770626.630
	108	Cd	-0.024885	206.728	5.125	ug/L	9.347
	114	Cd	-0.001968	192.066	55.554	ug/L	68.394
	109	Ag	-0.005486	24.146	19.667	ug/L	39.334
>	115	In			1537531.511	ug/L	1587338.541

208 207.977	-0.000007	26975.151	321.675	ug/L	330.675
207 Pb	0.000645	335.283	142.002	ug/L	142.668
206 Pb	-0.002257	110.051	161.002	ug/L	180.003
169 Tm			1007174.150	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	101.415
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	98.808
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	96.862
Tl	205	
Pb	208	
Tm-1	169	97.356
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	98.808
Cd	108	
Cd	114	
Ag	109	
In	115	96.862
207.977	208	
Pb	207	
Pb	206	
Tm	169	97.356

Sample ID: CCV 5
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 16:57:48
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCV 5.048
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 4
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1888893.274	ug/L	1930596.938
>	6	Li-1			1010890.194	ug/L	990818.117
	9	Be	101.358010	0.741	40151.277	ug/L	4.333
	44	Ca	4947.336117	0.670	1732116.264	ug/L	53673.492
	52	Cr	95.320757	0.088	1016795.306	ug/L	41930.043
	60	Ni	94.931362	0.399	252486.157	ug/L	293.570
	65	Cu	96.717745	0.834	266017.232	ug/L	195.564
	68	Zn	99.604991	0.649	110210.961	ug/L	4356.711
	75	As	97.939159	0.596	285092.849	ug/L	19999.128
	82	Se	96.604352	1.570	27743.841	ug/L	1576.398
	97	Mo	193.423422	0.839	398242.606	ug/L	1803.601
>	72	Ge-1			1760534.702	ug/L	1770626.630
	107	Ag	49.068841	0.560	477274.571	ug/L	107.668
	111	Cd	98.332190	0.096	225690.442	ug/L	31.870
	121	Sb	50.346533	0.346	391717.219	ug/L	267.672
	135	Ba	98.693150	0.650	206967.620	ug/L	107.334
>	115	In-1			1528603.251	ug/L	1587338.541
	205	Tl	49.905514	0.798	837097.467	ug/L	8425.078
	208	Pb	100.996074	0.459	2285439.537	ug/L	653.346
>	169	Tm-1			1004350.066	ug/L	1034528.991
	50	Cr	96.594213	0.426	21429.327	ug/L	-551.362
	53	Cr	63.842628	5.020	103593.400	ug/L	80741.041
	61	Ni	91.039563	1.763	6270.640	ug/L	2349.881
	63	Cu	96.056443	0.898	200948.024	ug/L	149.672
	67	Zn	99.755567	1.148	14950.686	ug/L	6295.714
	66	Zn	98.338581	0.439	57207.822	ug/L	1513.171
	76	Se	71.491562	2.329	-244363.312	ug/L	-249528.610
	77	Se	67.669591	2.465	33532.750	ug/L	20421.913
	78	Se	98.279375	0.478	83323.992	ug/L	17643.086
	79	Br	27.098599	17.585	174953.126	ug/L	167288.411
>	72	Ge			1760534.702	ug/L	1770626.630
	108	Cd	98.271347	1.560	15642.799	ug/L	9.347
	114	Cd	98.987918	0.233	541583.235	ug/L	68.394
	109	Ag	49.139439	0.954	164211.293	ug/L	39.334
>	115	In			1528603.251	ug/L	1587338.541

	208 207.977	101.039624	0.481	1171072.842	ug/L	330.675
	207 Pb	100.761604	0.950	477845.701	ug/L	142.668
	206 Pb	101.092508	0.453	636520.994	ug/L	180.003
>	169 Tm			1004350.066	ug/L	1034528.991

Internal Standard Recoveries

	Analyte	Mass	Int Std % Recovery
	Sc	45	
>	Li-1	6	102.026
	Be	9	
	Ca	44	
	Cr	52	
	Ni	60	
	Cu	65	
	Zn	68	
	As	75	
	Se	82	
	Mo	97	
>	Ge-1	72	99.430
	Ag	107	
	Cd	111	
	Sb	121	
	Ba	135	
>	In-1	115	96.300
	Tl	205	
	Pb	208	
>	Tm-1	169	97.083
	Cr	50	
	Cr	53	
	Ni	61	
	Cu	63	
	Zn	67	
	Zn	66	
	Se	76	
	Se	77	
	Se	78	
	Br	79	
>	Ge	72	99.430
	Cd	108	
	Cd	114	
	Ag	109	
>	In	115	96.300
	207.977	208	
	Pb	207	
	Pb	206	
>	Tm	169	97.083

Sample ID: CCB 5
Sample Description:
Batch ID:
Sample Date/Time: Saturday, November 13, 2010 17:01:56
Method File: c:\elandata\Method\0312224.mth
Dataset File: c:\elandata\dataset\101113a1\CCB 5.049
Tuning File: c:\elandata\Tuning\default.tun
Optimization File: C:\elandata\Optimize\default.dac
Autosampler Position: 5
Number of Replicates: 3
Dual Detector Mode: Dual
Initial Sample Quantity (mg):
Sample Prep Volume (mL):
Aliquot Volume (mL):
Diluted To Volume (mL):

Sample Result Summary

	Mass	Analyte	Conc. Mean	Conc. RSD	Meas. Intens. Mean	Sample Unit	Blank Intensity
	45	Sc			1858782.484	ug/L	1930596.938
>	6	Li-1			1006297.283	ug/L	990818.117
	9	Be	0.023466	33.934	13.667	ug/L	4.333
	44	Ca	-1.374789	55.234	52260.046	ug/L	53673.492
	52	Cr	-1.208448	1.276	28973.475	ug/L	41930.043
	60	Ni	-0.002884	32.336	280.788	ug/L	293.570
	65	Cu	0.008017	199.897	213.937	ug/L	195.564
	68	Zn	-0.247930	11.594	4019.002	ug/L	4356.711
	75	As	-0.786918	22.973	17540.004	ug/L	19999.128
	82	Se	-0.033318	2964.752	1539.076	ug/L	1576.398
	97	Mo	0.778097	78.172	3348.962	ug/L	1803.601
>	72	Ge-1			1739209.649	ug/L	1770626.630
	107	Ag	0.005692	45.039	159.002	ug/L	107.668
	111	Cd	0.017412	78.026	70.555	ug/L	31.870
	121	Sb	0.019403	16.515	408.346	ug/L	267.672
	135	Ba	0.009207	91.392	122.668	ug/L	107.334
>	115	In-1			1528068.979	ug/L	1587338.541
	205	Tl	0.555630	49.809	17406.226	ug/L	8425.078
	208	Pb	0.016800	31.337	1014.031	ug/L	653.346
>	169	Tm-1			1003725.248	ug/L	1034528.991
	50	Cr	0.437652	16.042	-443.186	ug/L	-551.362
	53	Cr	-42.091969	5.155	64127.854	ug/L	80741.041
	61	Ni	-5.627617	4.396	2067.940	ug/L	2349.881
	63	Cu	0.011134	109.561	170.006	ug/L	149.672
	67	Zn	-7.816972	18.106	5511.009	ug/L	6295.714
	66	Zn	-0.102224	19.419	1429.116	ug/L	1513.171
	76	Se	-15.440320	226.000	-245899.819	ug/L	-249528.610
	77	Se	-32.497630	3.177	13785.111	ug/L	20421.913
	78	Se	-0.932675	23.601	16713.573	ug/L	17643.086
	79	Br	-24.957360	19.979	156470.189	ug/L	167288.411
>	72	Ge			1739209.649	ug/L	1770626.630
	108	Cd	0.016163	280.630	11.520	ug/L	9.347
	114	Cd	0.010889	22.321	125.362	ug/L	68.394
	109	Ag	0.007538	23.377	63.001	ug/L	39.334
>	115	In			1528068.979	ug/L	1587338.541

208 207.977	0.016866	33.905	516.355	ug/L	330.675
207 Pb	0.018686	33.071	227.004	ug/L	142.668
206 Pb	0.015256	28.347	270.672	ug/L	180.003
169 Tm			1003725.248	ug/L	1034528.991

Internal Standard Recoveries

Analyte	Mass	Int Std % Recovery
Sc	45	
Li-1	6	101.562
Be	9	
Ca	44	
Cr	52	
Ni	60	
Cu	65	
Zn	68	
As	75	
Se	82	
Mo	97	
Ge-1	72	98.226
Ag	107	
Cd	111	
Sb	121	
Ba	135	
In-1	115	96.266
Tl	205	
Pb	208	
Tm-1	169	97.022
Cr	50	
Cr	53	
Ni	61	
Cu	63	
Zn	67	
Zn	66	
Se	76	
Se	77	
Se	78	
Br	79	
Ge	72	98.226
Cd	108	
Cd	114	
Ag	109	
In	115	96.266
207.977	208	
Pb	207	
Pb	206	
Tm	169	97.022

TAL West Sac RUN SUMMARY

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/15/10 15:23:52

File ID: 101113A1 Analyst: ionesb

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
1	Rinse 2X				2.0	11/13/10 12:44		☐
2	Blank				1.0	11/13/10 12:48		☐
3	Standard1				1.0	11/13/10 12:52		☐
4	ICV				1.0	11/13/10 12:56		☐
5	ICB				1.0	11/13/10 13:01		☐
6	LLSTD1				1.0	11/13/10 13:05		☐
7	LLSTD2				1.0	11/13/10 13:09		☐
8	ICSA				1.0	11/13/10 13:13		☐
9	ICSAB				1.0	11/13/10 13:17		☐
10	LRSTD1				1.0	11/13/10 13:36		☐
11	Rinse				1.0	11/13/10 13:42		☐
12	LRSTD2				1.0	11/13/10 13:47		☐
13	Rinse				1.0	11/13/10 14:36		☐
14	CCV 1				1.0	11/13/10 15:19		☐
15	CCB 1				1.0	11/13/10 15:23		☐
18	CCV 2				1.0	11/13/10 15:27		☐
19	CCB 2				1.0	11/13/10 15:31		☐
20	LLSTD3				1.0	11/13/10 15:36		☐
21	L9PCQB	G0K080000	0312224	04	1.0	11/13/10 15:45		☐
22	L9PCQC	G0K080000	0312224	04	1.0	11/13/10 15:49		☐
23	L9DQC	G0K010425-1	0312224	04	1.0	11/13/10 15:53		☐
24	L9DQCP5	G0K010425	0312224		5.0	11/13/10 15:57		☐
25	L9DQCZ	G0K010425-1	0312224		1.0	11/13/10 16:01		☐
26	CCV 3				1.0	11/13/10 16:05		☐
27	CCB 3				1.0	11/13/10 16:09		☐
28	CCV 4				1.0	11/13/10 16:13		☐
29	CCB 4				1.0	11/13/10 16:17		☐
30	L9PEMB	G0K080000	0312242	04	1.0	11/13/10 16:21		☐
31	L9PEMC	G0K080000	0312242	04	1.0	11/13/10 16:25		☐
32	L9FW8S	G0K020530-1	0312242	04	1.0	11/13/10 16:29		☐
33	L9FW8D	G0K020530-1	0312242	04	1.0	11/13/10 16:33		☐
34	L9FW8	G0K020530-1	0312242	04	1.0	11/13/10 16:37		☐
35	L9FW8P5	G0K020530	0312242		5.0	11/13/10 16:41		☐
36	L9FW8Z	G0K020530-1	0312242		1.0	11/13/10 16:45		☐
37	L9FXA	G0K020530-2	0312242	04	1.0	11/13/10 16:49		☐
38	L9FXC	G0K020530-3	0312242	04	1.0	11/13/10 16:53		☐
39	CCV 5				1.0	11/13/10 16:57		☐
40	CCB 5				1.0	11/13/10 17:01		☐
41	CCV 6				1.0	11/13/10 17:06		☐
42	CCB 6				1.0	11/13/10 17:09		☐
43	CCV 7				1.0	11/13/10 17:12		☐
44	CCB 7				1.0	11/13/10 17:15		☐
45	L9LHGB	G0K050000	0309208	04	1.0	11/13/10 17:18		☐
46	L9LHGC	G0K050000	0309208	04	1.0	11/13/10 17:21		☐
47	L880QS	G0J280529-3	0309208	04	1.0	11/13/10 17:25		☐
48	L880QD	G0J280529-3	0309208	04	1.0	11/13/10 17:28		☐

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/15/10 15:23:52

File ID: 101113A1 **Analyst: ionesb**

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
49	L880Q	G0J280529-3	0309208	04	1.0	11/13/10 17:31		☐
50	L880QP5	G0J280529	0309208		5.0	11/13/10 17:34		☐
51	L880QZ	G0J280529-3	0309208		1.0	11/13/10 17:37		☐
52	L880P	G0J280529-2	0309208	04	1.0	11/13/10 17:40		☐
53	L880R	G0J280529-4	0309208	04	1.0	11/13/10 17:43		☐
54	CCV 8				1.0	11/13/10 17:46		☐
55	CCB 8				1.0	11/13/10 17:50		☐
56	CCV 9				1.0	11/13/10 17:53		☐
57	CCB 9				1.0	11/13/10 17:56		☐
58	L880T	G0J280529-5	0309208	04	1.0	11/13/10 17:59		☐
59	L880V	G0J280529-6	0309208	04	1.0	11/13/10 18:02		☐
60	L880W	G0J280529-7	0309208	04	1.0	11/13/10 18:05		☐
61	L880X	G0J280529-8	0309208	04	1.0	11/13/10 18:09		☐
62	L8801	G0J280529-9	0309208	04	1.0	11/13/10 18:12		☐
63	L8802	G0J280529-10	0309208	04	1.0	11/13/10 18:15		☐
64	L8804	G0J280529-11	0309208	04	1.0	11/13/10 18:18		☐
65	CCV 10				1.0	11/13/10 18:21		☐
66	CCB 10				1.0	11/13/10 18:24		☐
67	CCV 11				1.0	11/13/10 18:28		☐
68	CCB 11				1.0	11/13/10 18:31		☐
69	L9PD4B	G0K080000	0312236	04	1.0	11/13/10 18:34		☐
70	L9PD4C	G0K080000	0312236	04	1.0	11/13/10 18:37		☐
71	L9C4MS	G0J300458-1	0312236	04	1.0	11/13/10 18:40		☐
72	L9C4MD	G0J300458-1	0312236	04	1.0	11/13/10 18:43		☐
73	L9C4M	G0J300458-1	0312236	04	1.0	11/13/10 18:46		☐
74	L9C4MP5	G0J300458	0312236		5.0	11/13/10 18:49		☐
75	L9C4MZ	G0J300458-1	0312236		1.0	11/13/10 18:52		☐
76	L9C5D	G0J300458-2	0312236	04	1.0	11/13/10 18:55		☐
77	L9C5E	G0J300458-3	0312236	04	1.0	11/13/10 18:59		☐
78	CCV 12				1.0	11/13/10 19:02		☐
79	CCB 12				1.0	11/13/10 19:05		☐
82	CCV 13				1.0	11/13/10 19:08		☐
83	CCB 13				1.0	11/13/10 19:11		☐
84	L9PC2BF	G0K080000	0312227	00	1.0	11/13/10 19:14		☐
85	L9PC2CF	G0K080000	0312227	00	1.0	11/13/10 19:18		☐
86	L9C4MSF	G0J300458-1	0312227	00	1.0	11/13/10 19:21		☐
87	L9C4MDF	G0J300458-1	0312227	00	1.0	11/13/10 19:24		☐
88	L9C4MF	G0J300458-1	0312227	00	1.0	11/13/10 19:27		☐
89	L9C4MP5F	G0J300458	0312227		5.0	11/13/10 19:30		☐
90	L9C4MZF	G0J300458-1	0312227		1.0	11/13/10 19:33		☐
91	L9C5DF	G0J300458-2	0312227	00	1.0	11/13/10 19:36		☐
92	L9C5EF	G0J300458-3	0312227	00	1.0	11/13/10 19:39		☐
93	CCV 14				1.0	11/13/10 19:42		☐
94	CCB 14				1.0	11/13/10 19:46		☐
97	CCV 15				1.0	11/13/10 19:49		☐
98	CCB 15				1.0	11/13/10 19:51		☐

Method: 6020 (SOP: SAC-MT-001) Instrument: M01 Reported: 11/15/10 15:23:52

File ID: 101113A1 **Analyst:** ionesb

#	Sample ID	Lot No.	Batch		DF	Analyzed Date	Comment	Q
99	CCV 16				1.0	11/13/10 19:54		☐
100	CCB 16				1.0	11/13/10 19:57		☐
101	L9PE3BF	G0K080000	0312245	00	1.0	11/13/10 19:59		☐
102	L9PE3CF	G0K080000	0312245	00	1.0	11/13/10 20:02		☐
103	L9KEHSF	G0K040578-2	0312245	00	1.0	11/13/10 20:04		☐
104	L9KEHDF	G0K040578-2	0312245	00	1.0	11/13/10 20:07		☐
105	L9KEHF	G0K040578-2	0312245	00	1.0	11/13/10 20:10		☐
106	L9KEHP5F	G0K040578	0312245		5.0	11/13/10 20:12		☐
107	L9KEHZF	G0K040578-2	0312245		1.0	11/13/10 20:15		☐
108	L9KENF	G0K040578-3	0312245	00	1.0	11/13/10 20:17		☐
109	CCV 17				1.0	11/13/10 20:20		☐
110	CCB 17				1.0	11/13/10 20:23		☐
111	CCV 18				1.0	11/13/10 20:25		☐
112	CCB 18				1.0	11/13/10 20:28		☐
113	L9LFRBF	G0K050000	0309202	00	1.0	11/13/10 20:31		☐
114	L9LFRCF	G0K050000	0309202	00	1.0	11/13/10 20:33		☐
115	L9AM2SF	G0J290449-3	0309202	00	1.0	11/13/10 20:36		☐
116	L9AM2DF	G0J290449-3	0309202	00	1.0	11/13/10 20:38		☐
117	L9AM2F	G0J290449-3	0309202	00	1.0	11/13/10 20:41		☐
118	L9AM2P5F	G0J290449	0309202		5.0	11/13/10 20:44		☐
119	L9AM2ZF	G0J290449-3	0309202		1.0	11/13/10 20:46		☐
120	L9ANNF	G0J290449-4	0309202	00	1.0	11/13/10 20:49		☐
121	CCV 19				1.0	11/13/10 20:51		☐
122	CCB 19				1.0	11/13/10 20:54		☐
123	CCV 20				1.0	11/13/10 20:57		☐
124	CCB 20				1.0	11/13/10 20:59		☐
125	L9C17SF	G0J300442-2	0309202	00	1.0	11/13/10 21:02		☐
126	L9C17DF	G0J300442-2	0309202	00	1.0	11/13/10 21:05		☐
127	L9C17F	G0J300442-2	0309202	00	1.0	11/13/10 21:07		☐
128	L9FJXSF	G0K020501-3	0309202	00	1.0	11/13/10 21:10		☐
129	L9FJXDF	G0K020501-3	0309202	00	1.0	11/13/10 21:12		☐
130	L9FJXF	G0K020501-3	0309202	00	1.0	11/13/10 21:15		☐
131	CCV 21				1.0	11/13/10 21:17		☐
132	CCB 21				1.0	11/13/10 21:20		☐

TAL West Sac

INTERNAL STANDARD SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/15/10 15:23:52

File ID: 101113A1 Analyst: ionesb

#	Sample ID	Analyzed Date	Germanium	Indium	Lithium-6	Thulium	Q
1	Rinse 2X	11/13/10 12:44	94.8	94.5	94.2	93.2	☐
2	Blank	11/13/10 12:48	100.0	100.0	100.0	100.0	☑
3	Standard1	11/13/10 12:52	100.3	99.0	100.9	99.1	☑
4	ICV	11/13/10 12:56	100.9	100.4	103.8	100.1	☑
5	ICB	11/13/10 13:01	100.3	100.3	101.9	99.2	☑
6	LLSTD1	11/13/10 13:05	102.4	101.6	103.7	100.6	☑
7	LLSTD2	11/13/10 13:09	101.8	101.2	103.0	99.8	☑
8	ICSA	11/13/10 13:13	92.2	90.8	98.4	89.7	☑
9	ICSAB	11/13/10 13:17	93.5	91.6	102.0	90.9	☑
10	LRSTD1	11/13/10 13:36	98.6	99.3	107.2	100.5	☑
11	Rinse	11/13/10 13:42	101.5	101.1	110.7	104.7	☑
12	LRSTD2	11/13/10 13:47	101.6	100.4	110.0	102.7	☑
13	Rinse	11/13/10 14:36	100.6	103.0	110.2	105.1	☑
14	CCV 1	11/13/10 15:19	103.9	103.2	117.4	108.9	☑
15	CCB 1	11/13/10 15:23	101.9	101.6	112.1	105.4	☑
18	CCV 2	11/13/10 15:27	101.0	99.5	101.8	99.5	☑
19	CCB 2	11/13/10 15:31	100.0	99.8	100.8	99.5	☑
20	LLSTD3	11/13/10 15:36	101.6	100.3	101.6	100.9	☑
21	L9PCQB	11/13/10 15:45	100.5	99.2	103.8	99.7	☑
22	L9PCQC	11/13/10 15:49	99.6	97.8	104.4	98.6	☑
23	L9DQC	11/13/10 15:53	100.6	98.2	104.5	99.3	☑
24	L9DQCP5	11/13/10 15:57	99.7	98.0	102.6	98.9	☐
25	L9DQCZ	11/13/10 16:01	99.3	96.8	105.0	97.9	☑
26	CCV 3	11/13/10 16:05	100.9	97.5	104.2	98.4	☑
27	CCB 3	11/13/10 16:09	100.2	98.2	102.4	98.6	☑
28	CCV 4	11/13/10 16:13	100.3	96.4	101.9	97.6	☑
29	CCB 4	11/13/10 16:17	99.8	97.3	102.5	98.2	☑
30	L9PEMB	11/13/10 16:21	100.2	97.6	103.4	98.6	☑
31	L9PEMC	11/13/10 16:25	98.9	96.9	104.3	98.2	☑
32	L9FW8S	11/13/10 16:29	99.1	96.7	102.8	96.9	☑
33	L9FW8D	11/13/10 16:33	99.5	96.6	102.3	96.7	☑
34	L9FW8	11/13/10 16:37	100.3	97.4	101.9	98.8	☑
35	L9FW8P5	11/13/10 16:41	100.6	98.4	101.7	98.6	☐
36	L9FW8Z	11/13/10 16:45	99.1	95.4	103.0	96.0	☑
37	L9FXA	11/13/10 16:49	100.1	97.7	102.3	98.9	☑
38	L9FXC	11/13/10 16:53	98.8	96.9	101.4	97.4	☑
39	CCV 5	11/13/10 16:57	99.4	96.3	102.0	97.1	☑
40	CCB 5	11/13/10 17:01	98.2	96.3	101.6	97.0	☑
41	CCV 6	11/13/10 17:06	96.5	94.8		97.4	☑
42	CCB 6	11/13/10 17:09	96.9	96.9		98.9	☑
43	CCV 7	11/13/10 17:12	98.6	97.2		99.5	☑
44	CCB 7	11/13/10 17:15	97.7	97.4		99.0	☑
45	L9LHGB	11/13/10 17:18	97.8	97.8		99.6	☑
46	L9LHGC	11/13/10 17:21	97.1	96.5		98.4	☑
47	L880QS	11/13/10 17:25	96.2	94.2		96.0	☑
48	L880QD	11/13/10 17:28	95.7	93.3		95.7	☑

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/15/10 15:23:52

File ID: 101113A1 **Analyst: ionesb**

#	Sample ID	Analyzed Date	Germanium	Indium	Lithium-6	Thulium	Q
49	L880Q	11/13/10 17:31	95.3	93.9		96.6	☑
50	L880QP5	11/13/10 17:34	96.4	95.7		98.5	☐
51	L880QZ	11/13/10 17:37	93.6	91.6		94.4	☑
52	L880P	11/13/10 17:40	96.3	95.5		99.7	☑
53	L880R	11/13/10 17:43	94.6	93.3		96.5	☑
54	CCV 8	11/13/10 17:46	96.2	94.1		98.4	☑
55	CCB 8	11/13/10 17:50	95.1	95.0		97.5	☑
56	CCV 9	11/13/10 17:53	96.5	94.1		98.6	☑
57	CCB 9	11/13/10 17:56	95.4	93.8		97.4	☑
58	L880T	11/13/10 17:59	93.1	90.9		95.5	☑
59	L880V	11/13/10 18:02	93.9	92.5		97.1	☑
60	L880W	11/13/10 18:05	93.9	92.3		95.5	☑
61	L880X	11/13/10 18:09	92.6	90.2		95.5	☑
62	L8801	11/13/10 18:12	93.3	91.0		95.0	☑
63	L8802	11/13/10 18:15	93.1	90.2		95.9	☑
64	L8804	11/13/10 18:18	92.1	89.4		95.7	☑
65	CCV 10	11/13/10 18:21	94.3	91.2		96.1	☑
66	CCB 10	11/13/10 18:24	94.6	93.4		98.0	☑
67	CCV 11	11/13/10 18:28	93.9	91.3		95.3	☑
68	CCB 11	11/13/10 18:31	93.1	92.1		96.9	☑
69	L9PD4B	11/13/10 18:34	93.2	92.8		98.0	☑
70	L9PD4C	11/13/10 18:37	93.9	92.6		96.8	☑
71	L9C4MS	11/13/10 18:40	76.6	81.1		78.8	☑
72	L9C4MD	11/13/10 18:43	72.6	81.9		79.9	☑
73	L9C4M	11/13/10 18:46	98.7	113.3		116.8	☑
74	L9C4MP5	11/13/10 18:49	80.8	89.0		90.3	☐
75	L9C4MZ	11/13/10 18:52	68.7	82.3		80.4	☐
76	L9C5D	11/13/10 18:55	66.2	81.7		80.0	☐
77	L9C5E	11/13/10 18:59	73.3	87.2		87.6	☑
78	CCV 12	11/13/10 19:02	80.4	95.4		96.3	☑
79	CCB 12	11/13/10 19:05	81.6	97.6		97.3	☑
82	CCV 13	11/13/10 19:08	100.8	98.6		100.2	☑
83	CCB 13	11/13/10 19:11	103.7	102.7		102.0	☑
84	L9PC2BF	11/13/10 19:14	101.3	100.3		99.7	☑
85	L9PC2CF	11/13/10 19:18	100.8	99.1		98.8	☑
86	L9C4MSF	11/13/10 19:21	78.3	81.7		80.6	☑
87	L9C4MDF	11/13/10 19:24	75.2	80.8		80.4	☑
88	L9C4MF	11/13/10 19:27	73.8	79.9		79.4	☑
89	L9C4MP5F	11/13/10 19:30	83.2	88.2		89.3	☐
90	L9C4MZF	11/13/10 19:33	73.6	80.3		80.7	☑
91	L9C5DF	11/13/10 19:36	76.4	84.0		84.3	☑
92	L9C5EF	11/13/10 19:39	90.8	95.6		99.0	☑
93	CCV 14	11/13/10 19:42	99.8	107.0		109.9	☑
94	CCB 14	11/13/10 19:46	97.9	106.3		107.4	☑
97	CCV 15	11/13/10 19:49				96.4	☑
98	CCB 15	11/13/10 19:51				97.5	☑

Method: 6020 (SOP: SAC-MT-001) M01 (M01) Reported: 11/15/10 15:23:52

File ID: **101113A1** **Analyst: jonesb**

#	Sample ID	Analyzed Date	Germanium	Indium	Lithium-6	Thulium	Q
99	CCV 16	11/13/10 19:54				95.8	☑
100	CCB 16	11/13/10 19:57				97.4	☑
101	L9PE3BF	11/13/10 19:59				99.0	☑
102	L9PE3CF	11/13/10 20:02				95.9	☑
103	L9KEHSF	11/13/10 20:04				87.2	☑
104	L9KEHDF	11/13/10 20:07				82.4	☑
105	L9KEHF	11/13/10 20:10				83.9	☑
106	L9KEHP5F	11/13/10 20:12				92.3	☐
107	L9KEHZF	11/13/10 20:15				83.6	☑
108	L9KENF	11/13/10 20:17				87.4	☑
109	CCV 17	11/13/10 20:20				97.8	☑
110	CCB 17	11/13/10 20:23				97.7	☑
111	CCV 18	11/13/10 20:25				96.5	☑
112	CCB 18	11/13/10 20:28				96.0	☑
113	L9LFRBF	11/13/10 20:31				95.8	☑
114	L9LFRCF	11/13/10 20:33				94.0	☑
115	L9AM2SF	11/13/10 20:36				76.9	☑
116	L9AM2DF	11/13/10 20:38				85.2	☑
117	L9AM2F	11/13/10 20:41				81.3	☑
118	L9AM2P5F	11/13/10 20:44				91.5	☐
119	L9AM2ZF	11/13/10 20:46				82.5	☑
120	L9ANNF	11/13/10 20:49				87.8	☑
121	CCV 19	11/13/10 20:51				97.3	☑
122	CCB 19	11/13/10 20:54				96.3	☑
123	CCV 20	11/13/10 20:57				95.3	☑
124	CCB 20	11/13/10 20:59				95.9	☑
125	L9C17SF	11/13/10 21:02				73.8	☑
126	L9C17DF	11/13/10 21:05				77.8	☑
127	L9C17F	11/13/10 21:07				78.1	☑
128	L9FJXSF	11/13/10 21:10				106.2	☑
129	L9FJXDF	11/13/10 21:12				108.3	☑
130	L9FJXF	11/13/10 21:15				107.0	☑
131	CCV 21	11/13/10 21:17				117.6	☑
132	CCB 21	11/13/10 21:20				118.1	☑

TAL West Sac

CALIBRATION CHECK SUMMARY

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Method: 6020 **Instrument: M01** **Batch: 101113A1**

Sample ID	Type	File - Sequence	Analyzed Date	Q
ICV	ICV	101113A1, 4	11/13/2010 12:56:53	☐
ICB	ICB	101113A1, 5	11/13/2010 13:01:01	☐
ICSA	ICSA	101113A1, 8	11/13/2010 13:13:15	☐
ICSAB	ICSAB	101113A1, 9	11/13/2010 13:17:20	☐
CCV 1	CCV	101113A1, 14	11/13/2010 15:19:32	☐
CCB 1	CCB	101113A1, 15	11/13/2010 15:23:40	☐
CCV 2	CCV	101113A1, 18	11/13/2010 15:27:48	☐
CCB 2	CCB	101113A1, 19	11/13/2010 15:31:57	☐
CCV 3	CCV	101113A1, 26	11/13/2010 16:05:12	☐
CCB 3	CCB	101113A1, 27	11/13/2010 16:09:20	☐
CCV 4	CCV	101113A1, 28	11/13/2010 16:13:28	☐
CCB 4	CCB	101113A1, 29	11/13/2010 16:17:36	☐
CCV 5	CCV	101113A1, 39	11/13/2010 16:57:48	☐
CCB 5	CCB	101113A1, 40	11/13/2010 17:01:56	☐
CCV 6	CCV	101113A1, 41	11/13/2010 17:06:04	☐
CCB 6	CCB	101113A1, 42	11/13/2010 17:09:17	☐
CCV 7	CCV	101113A1, 43	11/13/2010 17:12:29	☐
CCB 7	CCB	101113A1, 44	11/13/2010 17:15:42	☐
CCV 8	CCV	101113A1, 54	11/13/2010 17:46:52	☐
CCB 8	CCB	101113A1, 55	11/13/2010 17:50:05	☐
CCV 9	CCV	101113A1, 56	11/13/2010 17:53:17	☐
CCB 9	CCB	101113A1, 57	11/13/2010 17:56:30	☐
CCV 10	CCV	101113A1, 65	11/13/2010 18:21:41	☐
CCB 10	CCB	101113A1, 66	11/13/2010 18:24:54	☐
CCV 11	CCV	101113A1, 67	11/13/2010 18:28:07	☐
CCB 11	CCB	101113A1, 68	11/13/2010 18:31:19	☐
CCV 12	CCV	101113A1, 78	11/13/2010 19:02:11	☐
CCB 12	CCB	101113A1, 79	11/13/2010 19:05:24	☐
CCV 13	CCV	101113A1, 82	11/13/2010 19:08:36	☐
CCB 13	CCB	101113A1, 83	11/13/2010 19:11:49	☐
CCV 14	CCV	101113A1, 93	11/13/2010 19:42:49	☐
CCB 14	CCB	101113A1, 94	11/13/2010 19:46:01	☐
CCV 15	CCV	101113A1, 97	11/13/2010 19:49:13	☐
CCB 15	CCB	101113A1, 98	11/13/2010 19:51:53	☐
CCV 16	CCV	101113A1, 99	11/13/2010 19:54:33	☐
CCB 16	CCB	101113A1, 100	11/13/2010 19:57:13	☐
CCV 17	CCV	101113A1, 109	11/13/2010 20:20:30	☐
CCB 17	CCB	101113A1, 110	11/13/2010 20:23:10	☐
CCV 18	CCV	101113A1, 111	11/13/2010 20:25:50	☐
CCB 18	CCB	101113A1, 112	11/13/2010 20:28:30	☐
CCV 19	CCV	101113A1, 121	11/13/2010 20:51:53	☐
CCB 19	CCB	101113A1, 122	11/13/2010 20:54:33	☐
CCV 20	CCV	101113A1, 123	11/13/2010 20:57:13	☐
CCB 20	CCB	101113A1, 124	11/13/2010 20:59:53	☐
CCV 21	CCV	101113A1, 131	11/13/2010 21:17:59	☐
CCB 21	CCB	101113A1, 132	11/13/2010 21:20:39	☐

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **ICV (ICV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 4 Method 6020_
Acquired: 11/13/2010 12:56:53 M01
Calibrated: 11/13/2010 12:48:33 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-41-7	Beryllium	9	30090	80.421	80.000	101	
7440-47-3	Chromium	52	855531	81.019	80.000	101	
7440-02-0	Nickel	60	222591	81.556	80.000	102	
7440-50-8	Copper	65	227056	81.241	80.000	102	
7440-66-6	Zinc	68	90802	82.563	80.000	103	
7440-38-2	Arsenic	75	227958	78.338	80.000	97.9	
7782-49-2	Selenium	78	71131	79.976	80.000	100	
7782-49-2	Selenium	82	23262	80.726	80.000	101	
7439-98-7	Molybdenum	97	165127	80.063	80.000	100	
7440-22-4	Silver	107	401193	39.860	40.000	99.7	
7440-43-9	Cadmium	111	185960	80.044	80.000	100	
7440-43-9	Cadmium	114	442413	80.092	80.000	100	
7440-36-0	Antimony	121	304590	38.834	40.000	97.1	
7440-39-3	Barium	135	167294	79.038	80.000	98.8	
7440-28-0	Thallium	205	668776	41.753	40.000	104	
7439-92-1	Lead	208	1735460	81.058	80.000	101	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	917833		☑
7440-56-4	Germanium	72	1753875		☑
7440-74-6	Indium	115	1569808		☑
7440-30-4	Thulium	169	982517		☑

Reviewed by: Date:

TAL West Sac

BLANK REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **ICB** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 5 Method 6020_
Acquired: 11/13/2010 13:01:01 M01
Calibrated: 11/13/2010 12:48:33 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-41-7	Beryllium	9	8	-0.00226	1.0	0.078	0.0	
7440-47-3	Chromium	52	39227	0.80767	2.0	0.92	0.0	
7440-02-0	Nickel	60	187	0.00316	2.0	0.098	0.0	
7440-50-8	Copper	65	177	0.00446				
7440-66-6	Zinc	68	3827	0.17391	5.0	1.0	0.0	
7440-38-2	Arsenic	75	16772	0.35560	2.0	0.50	0.0	
7782-49-2	Selenium	78	17944	-0.11466	2.0	1.7	0.0	
7782-49-2	Selenium	82	1668	0.16298	2.0	1.7	0.0	
7439-98-7	Molybdenum	97	1239	0.54504				
7440-22-4	Silver	107	139	0.00215	1.0	0.030	0.0	
7440-43-9	Cadmium	111	49	-0.00280	1.0	0.074	0.0	
7440-43-9	Cadmium	114	100	0.00299	1.0	0.074	0.0	
7440-36-0	Antimony	121	854	0.05052	2.0	0.036	0.0	
7440-39-3	Barium	135	114	0.00136	1.0	0.96	0.0	
7440-28-0	Thallium	205	5785	0.24242	1.0	0.34	0.0	
7439-92-1	Lead	208	641	0.00355	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	900679		☑
7440-56-4	Germanium	72	1742676		☑
7440-74-6	Indium	115	1568170		☑
7440-30-4	Thulium	169	974130		☑

Reviewed by: Date:

TAL West Sac

CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **ICSA** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 8 Method 6020_
Acquired: 11/13/2010 13:13:15 M01
Calibrated: 11/13/2010 12:48:33 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-41-7	Beryllium	9	34	0.07183		*	☑
7440-47-3	Chromium	52	59036	3.2727		*	
7440-02-0	Nickel	60	2428	0.90797		*	☑
7440-50-8	Copper	65	-1110	-0.49408		*	
7440-66-6	Zinc	68	2484	-0.90049		*	☑
7440-38-2	Arsenic	75	17119	1.0368		*	☑
7782-49-2	Selenium	78	18210	2.6941		*	
7782-49-2	Selenium	82	1363	-0.52979		*	☑
7439-98-7	Molybdenum	97	3779958	2006.4	2000.0	100	☐
7440-22-4	Silver	107	1584	0.16248		*	☑
7440-43-9	Cadmium	111	2183	1.0161		*	☑
7440-43-9	Cadmium	114	18282	3.6478		*	
7440-36-0	Antimony	121	1822	0.19887		*	☑
7440-39-3	Barium	135	5440	2.7934		*	
7440-28-0	Thallium	205	4073	0.16202		*	☑
7439-92-1	Lead	208	9600	0.47394		*	☑

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	869779		☑
7440-56-4	Germanium	72	1603203		☑
7440-74-6	Indium	115	1418616		☑
7440-30-4	Thulium	169	880325		☑

Reviewed by: Date:

TAL West Sac

CALIBRATION REPORT

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **ICSAB** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 9 Method 6020_
Acquired: 11/13/2010 13:17:20 M01
Calibrated: 11/13/2010 12:48:33 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-41-7	Beryllium	9	33799	91.977	100.00	92.0	☑
7440-47-3	Chromium	52	982975	101.22	100.00	101	☑
7440-02-0	Nickel	60	232920	92.133	100.00	92.1	☑
7440-50-8	Copper	65	227919	88.035	100.00	88.0	☑
7440-66-6	Zinc	68	89076	87.631	100.00	87.6	☑
7440-38-2	Arsenic	75	268408	101.16	100.00	101	☑
7782-49-2	Selenium	78	80650	104.01	100.00	104	☑
7782-49-2	Selenium	82	27111	103.13	100.00	103	☑
7439-98-7	Molybdenum	97	3998322	2094.1	2100.0	99.7	☑
7440-22-4	Silver	107	417508	45.478	50.000	91.0	☑
7440-43-9	Cadmium	111	201911	95.281	100.00	95.3	☑
7440-43-9	Cadmium	114	493997	98.045	100.00	98.0	☑
7440-36-0	Antimony	121	357203	49.942	50.000	99.9	☑
7440-39-3	Barium	135	196327	101.70	100.00	102	☑
7440-28-0	Thallium	205	702467	48.284	50.000	96.6	☑
7439-92-1	Lead	208	1881461	96.718	100.00	96.7	☑

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	901448		☑
7440-56-4	Germanium	72	1624817		☑
7440-74-6	Indium	115	1431950		☑
7440-30-4	Thulium	169	892703		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 1 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 14 Method 6020_
Acquired: 11/13/2010 15:19:32 M01
Calibrated: 11/13/2010 12:48:33 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-41-7	Beryllium	9	40665	96.138	100.00	96.1	
7440-47-3	Chromium	52	1092503	101.18	100.00	101	
7440-02-0	Nickel	60	272888	97.093	100.00	97.1	
7440-50-8	Copper	65	282227	98.049	100.00	98.0	
7440-66-6	Zinc	68	113520	100.95	100.00	101	
7440-38-2	Arsenic	75	298277	101.11	100.00	101	
7782-49-2	Selenium	78	86681	99.631	100.00	99.6	
7782-49-2	Selenium	82	29412	100.48	100.00	100	
7439-98-7	Molybdenum	97	422466	198.97	200.00	99.5	
7440-22-4	Silver	107	513167	49.625	50.000	99.2	
7440-43-9	Cadmium	111	242182	101.46	100.00	101	
7440-43-9	Cadmium	114	577313	101.72	100.00	102	
7440-36-0	Antimony	121	410496	50.954	50.000	102	
7440-39-3	Barium	135	221283	101.77	100.00	102	
7440-28-0	Thallium	205	892195	51.246	50.000	102	
7439-92-1	Lead	208	2407392	103.40	100.00	103	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1037648		☑
7440-56-4	Germanium	72	1806515		☑
7440-74-6	Indium	115	1612990		☑
7440-30-4	Thulium	169	1068509		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 1** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 15 Method 6020_
Acquired: 11/13/2010 15:23:40 M01
Calibrated: 11/13/2010 15:19:32 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-41-7	Beryllium	9	4	-0.01332	1.0	0.078	0.0	
7440-47-3	Chromium	52	41930	1.0098	2.0	0.92	0.0	
7440-02-0	Nickel	60	294	0.04072	2.0	0.098	0.0	
7440-50-8	Copper	65	196	0.00989				
7440-66-6	Zinc	68	4357	0.61355	5.0	1.0	0.0	
7440-38-2	Arsenic	75	19999	1.4369	2.0	0.50	0.0	
7782-49-2	Selenium	78	17643	-0.99537	2.0	1.7	0.0	
7782-49-2	Selenium	82	1576	-0.26933	2.0	1.7	0.0	
7439-98-7	Molybdenum	97	1804	0.80728				
7440-22-4	Silver	107	108	-0.00113	1.0	0.030	0.0	
7440-43-9	Cadmium	111	32	-0.01050	1.0	0.074	0.0	
7440-43-9	Cadmium	114	68	-0.00292	1.0	0.074	0.0	
7440-36-0	Antimony	121	268	-0.02479	2.0	0.036	0.0	
7440-39-3	Barium	135	107	-0.00221	1.0	0.96	0.0	
7440-28-0	Thallium	205	8425	0.37871	1.0	0.34	0.0	
7439-92-1	Lead	208	653	0.00237	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	990818		☑
7440-56-4	Germanium	72	1770627		☑
7440-74-6	Indium	115	1587339		☑
7440-30-4	Thulium	169	1034529		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 2 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 18 Method 6020_
Acquired: 11/13/2010 15:27:48 M01
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-41-7	Beryllium	9	38867	98.286	100.00	98.3	
7440-47-3	Chromium	52	1067268	98.673	100.00	98.7	
7440-02-0	Nickel	60	266670	98.744	100.00	98.7	
7440-50-8	Copper	65	275490	98.646	100.00	98.6	
7440-66-6	Zinc	68	111467	99.197	100.00	99.2	
7440-38-2	Arsenic	75	291375	98.622	100.00	98.6	
7782-49-2	Selenium	78	85206	99.160	100.00	99.2	
7782-49-2	Selenium	82	28648	98.341	100.00	98.3	
7439-98-7	Molybdenum	97	413517	197.81	200.00	98.9	
7440-22-4	Silver	107	496128	49.373	50.000	98.7	
7440-43-9	Cadmium	111	233717	98.569	100.00	98.6	
7440-43-9	Cadmium	114	557105	98.563	100.00	98.6	
7440-36-0	Antimony	121	399942	49.755	50.000	99.5	
7440-39-3	Barium	135	213763	98.666	100.00	98.7	
7440-28-0	Thallium	205	850608	49.461	50.000	98.9	
7439-92-1	Lead	208	2310658	99.600	100.00	99.6	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1009051		☑
7440-56-4	Germanium	72	1787676		☑
7440-74-6	Indium	115	1579228		☑
7440-30-4	Thulium	169	1029696		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 2** Mult: 1.00 Dilf: 1.00 Divs: 1.000

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 19 Method 6020_
Acquired: 11/13/2010 15:31:57 M01
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-41-7	Beryllium	9	8	0.00842	1.0	0.078	0.0	
7440-47-3	Chromium	52	37963	-0.38725	2.0	0.92	0.0	
7440-02-0	Nickel	60	307	0.00508	2.0	0.098	0.0	
7440-50-8	Copper	65	205	0.00321				
7440-66-6	Zinc	68	4226	-0.12363	5.0	1.0	0.0	
7440-38-2	Arsenic	75	19556	-0.16444	2.0	0.50	0.0	
7782-49-2	Selenium	78	17460	-0.28251	2.0	1.7	0.0	
7782-49-2	Selenium	82	1606	0.10258	2.0	1.7	0.0	
7439-98-7	Molybdenum	97	3379	0.76094				
7440-22-4	Silver	107	160	0.00518	1.0	0.030	0.0	
7440-43-9	Cadmium	111	56	0.01013	1.0	0.074	0.0	
7440-43-9	Cadmium	114	137	0.01212	1.0	0.074	0.0	
7440-36-0	Antimony	121	331	0.00793	2.0	0.036	0.0	
7440-39-3	Barium	135	120	0.00609	1.0	0.96	0.0	
7440-28-0	Thallium	205	14832	0.37981	1.0	0.34	0.0	
7439-92-1	Lead	208	892	0.01047	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	998900		☑
7440-56-4	Germanium	72	1771453		☑
7440-74-6	Indium	115	1584769		☑
7440-30-4	Thulium	169	1029652		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 3 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 26 Method 6020_
Acquired: 11/13/2010 16:05:12 M01
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-41-7	Beryllium	9	39769	98.385	100.00	98.4	
7440-47-3	Chromium	52	1032808	95.477	100.00	95.5	
7440-02-0	Nickel	60	255694	94.798	100.00	94.8	
7440-50-8	Copper	65	265370	95.150	100.00	95.2	
7440-66-6	Zinc	68	109564	97.561	100.00	97.6	
7440-38-2	Arsenic	75	284107	96.112	100.00	96.1	
7782-49-2	Selenium	78	82836	95.824	100.00	95.8	
7782-49-2	Selenium	82	27833	95.513	100.00	95.5	
7439-98-7	Molybdenum	97	398185	190.69	200.00	95.3	
7440-22-4	Silver	107	473256	48.067	50.000	96.1	
7440-43-9	Cadmium	111	225820	97.179	100.00	97.2	
7440-43-9	Cadmium	114	541671	97.790	100.00	97.8	
7440-36-0	Antimony	121	389178	49.406	50.000	98.8	
7440-39-3	Barium	135	205148	96.627	100.00	96.6	
7440-28-0	Thallium	205	833651	49.037	50.000	98.1	
7439-92-1	Lead	208	2272542	99.106	100.00	99.1	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1032036		☑
7440-56-4	Germanium	72	1786229		☑
7440-74-6	Indium	115	1548154		☑
7440-30-4	Thulium	169	1018160		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 3** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 27 Method 6020_
Acquired: 11/13/2010 16:09:20 M01
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-41-7	Beryllium	9	12	0.01902	1.0	0.078	0.0	
7440-47-3	Chromium	52	34714	-0.70746	2.0	0.92	0.0	
7440-02-0	Nickel	60	290	-0.00157	2.0	0.098	0.0	
7440-50-8	Copper	65	216	0.00707				
7440-66-6	Zinc	68	4199	-0.15456	5.0	1.0	0.0	
7440-38-2	Arsenic	75	19035	-0.36651	2.0	0.50	0.0	
7782-49-2	Selenium	78	16878	-1.1818	2.0	1.7	0.0	
7782-49-2	Selenium	82	1616	0.13432	2.0	1.7	0.0	
7439-98-7	Molybdenum	97	3691	0.91298				
7440-22-4	Silver	107	159	0.00539	1.0	0.030	0.0	
7440-43-9	Cadmium	111	52	0.00893	1.0	0.074	0.0	
7440-43-9	Cadmium	114	137	0.01249	1.0	0.074	0.0	
7440-36-0	Antimony	121	534	0.03427	2.0	0.036	0.0	
7440-39-3	Barium	135	113	0.00343	1.0	0.96	0.0	
7440-28-0	Thallium	205	15853	0.44726	1.0	0.34	0.0	
7439-92-1	Lead	208	1029	0.01674	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1014144		☑
7440-56-4	Germanium	72	1773837		☑
7440-74-6	Indium	115	1558764		☑
7440-30-4	Thulium	169	1019607		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 4 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 28 Method 6020_
Acquired: 11/13/2010 16:13:28 M01
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-41-7	Beryllium	9	39521	99.872	100.00	99.9	
7440-47-3	Chromium	52	1040191	96.740	100.00	96.7	
7440-02-0	Nickel	60	257340	95.929	100.00	95.9	
7440-50-8	Copper	65	267106	96.287	100.00	96.3	
7440-66-6	Zinc	68	110840	99.310	100.00	99.3	
7440-38-2	Arsenic	75	284830	96.941	100.00	96.9	
7782-49-2	Selenium	78	83444	97.394	100.00	97.4	
7782-49-2	Selenium	82	27846	96.103	100.00	96.1	
7439-98-7	Molybdenum	97	398417	191.84	200.00	95.9	
7440-22-4	Silver	107	474396	48.723	50.000	97.4	
7440-43-9	Cadmium	111	225809	98.279	100.00	98.3	
7440-43-9	Cadmium	114	543608	99.252	100.00	99.3	
7440-36-0	Antimony	121	390007	50.072	50.000	100	
7440-39-3	Barium	135	206596	98.408	100.00	98.4	
7440-28-0	Thallium	205	838882	49.728	50.000	99.5	
7439-92-1	Lead	208	2268551	99.687	100.00	99.7	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1009798		☑
7440-56-4	Germanium	72	1775694		☑
7440-74-6	Indium	115	1530281		☑
7440-30-4	Thulium	169	1010012		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 4** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 29 Method 6020_
Acquired: 11/13/2010 16:17:36 M01
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-41-7	Beryllium	9	7	0.00557	1.0	0.078	0.0	
7440-47-3	Chromium	52	34001	-0.76497	2.0	0.92	0.0	
7440-02-0	Nickel	60	268	-0.00921	2.0	0.098	0.0	
7440-50-8	Copper	65	218	0.00839				
7440-66-6	Zinc	68	4123	-0.21189	5.0	1.0	0.0	
7440-38-2	Arsenic	75	18294	-0.61525	2.0	0.50	0.0	
7782-49-2	Selenium	78	16871	-1.1035	2.0	1.7	0.0	
7782-49-2	Selenium	82	1610	0.12989	2.0	1.7	0.0	
7439-98-7	Molybdenum	97	2262	0.22543				
7440-22-4	Silver	107	128	0.00237	1.0	0.030	0.0	
7440-43-9	Cadmium	111	36	0.00217	1.0	0.074	0.0	
7440-43-9	Cadmium	114	80	0.00243	1.0	0.074	0.0	
7440-36-0	Antimony	121	376	0.01467	2.0	0.036	0.0	
7440-39-3	Barium	135	114	0.00453	1.0	0.96	0.0	
7440-28-0	Thallium	205	11524	0.19401	1.0	0.34	0.0	
7439-92-1	Lead	208	792	0.00658	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1015230		☑
7440-56-4	Germanium	72	1767595		☑
7440-74-6	Indium	115	1544444		☑
7440-30-4	Thulium	169	1015526		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCV 5 (CCV)** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 39 Method 6020_
Acquired: 11/13/2010 16:57:48 M01
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Found	True	%R	Q
7440-41-7	Beryllium	9	40151	101.36	100.00	101	
7440-47-3	Chromium	52	1016795	95.321	100.00	95.3	
7440-02-0	Nickel	60	252486	94.931	100.00	94.9	
7440-50-8	Copper	65	266017	96.718	100.00	96.7	
7440-66-6	Zinc	68	110211	99.605	100.00	99.6	
7440-38-2	Arsenic	75	285093	97.939	100.00	97.9	
7782-49-2	Selenium	78	83324	98.279	100.00	98.3	
7782-49-2	Selenium	82	27744	96.604	100.00	96.6	
7439-98-7	Molybdenum	97	398243	193.42	200.00	96.7	
7440-22-4	Silver	107	477275	49.069	50.000	98.1	
7440-43-9	Cadmium	111	225690	98.332	100.00	98.3	
7440-43-9	Cadmium	114	541583	98.988	100.00	99.0	
7440-36-0	Antimony	121	391717	50.347	50.000	101	
7440-39-3	Barium	135	206968	98.693	100.00	98.7	
7440-28-0	Thallium	205	837097	49.906	50.000	99.8	
7439-92-1	Lead	208	2285440	101.00	100.00	101	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1010890		☑
7440-56-4	Germanium	72	1760535		☑
7440-74-6	Indium	115	1528603		☑
7440-30-4	Thulium	169	1004350		☑

Reviewed by: Date:

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:24:37

Department: 120 (Metals) Source: MetEdit

Sample: **CCB 5** Mult: **1.00** Dilf: **1.00** Divs: **1.000**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 40 Method 6020_
Acquired: 11/13/2010 17:01:56 M01
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	RL	MDL	%RSD	Q
7440-41-7	Beryllium	9	14	0.02347	1.0	0.078	0.0	
7440-47-3	Chromium	52	28973	-1.2084	2.0	0.92	0.0	
7440-02-0	Nickel	60	281	-0.00288	2.0	0.098	0.0	
7440-50-8	Copper	65	214	0.00802				
7440-66-6	Zinc	68	4019	-0.24793	5.0	1.0	0.0	
7440-38-2	Arsenic	75	17540	-0.78692	2.0	0.50	0.0	
7782-49-2	Selenium	78	16714	-0.93268	2.0	1.7	0.0	
7782-49-2	Selenium	82	1539	-0.03332	2.0	1.7	0.0	
7439-98-7	Molybdenum	97	3349	0.77810				
7440-22-4	Silver	107	159	0.00569	1.0	0.030	0.0	
7440-43-9	Cadmium	111	71	0.01741	1.0	0.074	0.0	
7440-43-9	Cadmium	114	125	0.01089	1.0	0.074	0.0	
7440-36-0	Antimony	121	408	0.01940	2.0	0.036	0.0	
7440-39-3	Barium	135	123	0.00921	1.0	0.96	0.0	
7440-28-0	Thallium	205	17406	0.55563	1.0	0.34	0.0	
7439-92-1	Lead	208	1014	0.01680	1.0	0.066	0.0	

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1006297		☑
7440-56-4	Germanium	72	1739210		☑
7440-74-6	Indium	115	1528069		☑
7440-30-4	Thulium	169	1003725		☑

Reviewed by: Date:

TAL West Sac

SERIAL DILUTION

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:27:34

Department: 120 (Metals) Source: MetEdit

Sample: **L9FW8P5** Serial Dilution: **5.00** Sample Dilution: **1.00**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 35 Method 6020_
Acquired: 11/13/2010 16:41:38 M01 Matrix: AQUEOUS
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Dilution	Sample	%Diff.	MDL	Flag	Q
7440-41-7	Beryllium	9	7	0.03281	0.00569	477		*	
7440-47-3	Chromium	52	32093	-4.8718	-0.52514		1.5	NC	☑
7440-02-0	Nickel	60	693	0.73984	0.76879	3.77		*	
7440-50-8	Copper	65	1501	2.3466	2.3133	1.44		*	
7440-66-6	Zinc	68	5493	5.1598	5.1656	0.111		*	
7440-38-2	Arsenic	75	18812	-2.3819	0.93847	354	1.0	NC	☑
7782-49-2	Selenium	78	16857	-6.5757	-1.1635		1.0	NC	☑
7782-49-2	Selenium	82	1567	-0.33843	0.07249	567	1.0	NC	☑
7439-98-7	Molybdenum	97	851	-2.3231	0.33917	785		*	
7440-22-4	Silver	107	54	-0.02630	-0.00300		0.30	NC	☑
7440-43-9	Cadmium	111	66	0.07433	0.07655	2.90	0.50	NC	☑
7440-43-9	Cadmium	114	149	0.07272	0.07603	4.35	0.50	NC	☑
7440-36-0	Antimony	121	622	0.22584	0.18565	21.6		*	
7440-39-3	Barium	135	4211	9.5863	9.4821	1.10	0.50	NC	☑
7440-28-0	Thallium	205	6267	-0.60416	0.38269	258		*	
7439-92-1	Lead	208	6996	1.3828	1.3769	0.431	0.60	NC	☑

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1007679		☑
7440-56-4	Germanium	72	1781102		☐
7440-74-6	Indium	115	1561666		☐
7440-30-4	Thulium	169	1019691		☐

*** Analyte not requested for this batch, no MDL**

NC : Serial dilution concentration < 100 X MDL

E : Difference greater than Limit (10%)

Reviewed by: Date:

TAL West Sac

SAMPLE SPIKE

Method: 6020 (SOP: SAC-MT-001) M01 Reported: 11/15/10 15:27:44

Department: 120 (Metals) Source: MetEdit

Sample: **L9FW8Z** Spike Dilution: **1.00** Sample Dilution: **1.00**

Instrument: **ICPMS M01** Channel 261
File: 101113A1 # 36 Method 6020_
Acquired: 11/13/2010 16:45:39 M01 Matrix: AQUEOUS
Calibrated: 11/13/2010 15:23:40 Units: ug/L

CASN	Analyte Name	M/S	Area	Amount	Sample	%Rec.	Spike	Flag	Q
7440-41-7	Beryllium	9	76422	191.03	0.00569	95.5	200		☑
7440-47-3	Chromium	52	1925309	184.84	-0.52514	92.4	200		☑
7440-02-0	Nickel	60	494147	186.59	0.76879	92.9	200		☑
7440-50-8	Copper	65	521360	190.34	2.3133	94.0	200		☑
7440-66-6	Zinc	68	213674	197.69	5.1656	96.3	200		☑
7440-38-2	Arsenic	75	530686	189.36	0.93847	94.2	200		☑
7782-49-2	Selenium	78	141373	185.79	-1.1635	92.9	200		☑
7782-49-2	Selenium	82	49772	178.60	0.07249	89.3	200		☑
7439-98-7	Molybdenum	97	391368	190.77	0.33917	95.2	200		☑
7440-22-4	Silver	107	458498	47.574	-0.00300	95.1	50.0		☑
7440-43-9	Cadmium	111	426649	187.62	0.07655	93.8	200		☑
7440-43-9	Cadmium	114	1020283	188.22	0.07603	94.1	200		☑
7440-36-0	Antimony	121	1426464	185.12	0.18565	92.5	200		☑
7440-39-3	Barium	135	417270	200.86	9.4821	95.7	200		☑
7440-28-0	Thallium	205	865276	52.169	0.38269	104	50.0		☑
7439-92-1	Lead	208	4384128	195.88	1.3769	97.3	200		☑

CASN	ISTD Name	M/S	Area	Amount	Q
LITHIUM6	Lithium-6	6	1021000		☑
7440-56-4	Germanium	72	1753969		☑
7440-74-6	Indium	115	1514602		☑
7440-30-4	Thulium	169	993533		☑

Reviewed by: Date:

Mercury

G0J280529, G0K010484, G0K010425, G0J290569, G0K020530

TAL West Sac G0J300458, G0K060482, G0J280597, G0J280603, G0J280605

RUN SUMMARY

Method: CVHG - Mercury (Mercury by Cold Vapor AA) Instrument: STL3 (H03) Reported: 11/10/10 14:49:58

Sequence: 09NOV10A Date: 11/09/10 17:36 Analyst: phomsophat ICV: _____ CAL/CCV: _____

#	Sample ID	Lot No.	Batch	Matrix	Raw	DF	Result	Units	%R	Analyzed Date	Comment	Q
1	Std01Rep1				0.00	1.0	0.00	ppb		11/09/10 17:36		☐
2	Std02Rep1	= 0.200			0.00	1.0	0.00	ppb		11/09/10 17:38		☐
3	Std03Rep1	= 0.500			0.00	1.0	0.00	ppb		11/09/10 17:40		☐
4	Std04Rep1	= 1.00			0.00	1.0	0.00	ppb		11/09/10 17:41		☐
5	Std05Rep1	= 5.00			0.00	1.0	0.00	ppb		11/09/10 17:43		☐
6	Std06Rep1	= 10.0			0.00	1.0	0.00	ppb		11/09/10 17:45		☐
7	ICV	= 2.00			2.09	1.0	2.09	ppb	104.5%	11/09/10 17:47		☐
8	ICB				-0.02	1.0	-0.02	ppb		11/09/10 17:49		☐
9	L9N05BF	G0K080000	0312130		-0.01	1.0	-0.02	ppb		11/09/10 17:51		☐
10	L9N05CF	G0K080000 = 1.00	0312130		1.06	1.0	1.06	ppb	106.0%	11/09/10 17:54		☐
11	L9N08BF	G0K080000	0312131		-0.02	1.0	-0.02	ppb		11/09/10 17:56		☐
12	L9N08CF	G0K080000 = 1.00	0312131		1.05	1.0	1.05	ppb	105.0%	11/09/10 17:58		☐
13	L9P8MB	G0K090000	0313131		-0.01	1.0	-0.01	ppb		11/09/10 17:59		☐
14	L9P8MC	G0K090000 = 1.00	0313131		1.05	1.0	1.05	ppb	105.0%	11/09/10 18:01		☐
15	L9P8TB	G0K090000	0313132		-0.04	1.0	-0.04	ppb		11/09/10 18:03		☐
16	L9P8TC	G0K090000 = 1.00	0313132		1.03	1.0	1.03	ppb	103.0%	11/09/10 18:05		☐
17	L9P87B	G0K090000	0313136		-0.00	1.0	-0.01	ppb		11/09/10 18:06		☐
18	L9P87C	G0K090000 = 1.00	0313136		1.02	1.0	1.02	ppb	102.0%	11/09/10 18:08		☐
19	CCV-1	= 5.00			5.04	1.0	5.04	ppb	100.8%	11/09/10 18:10		☐
20	CCB-1				-0.03	1.0	-0.03	ppb		11/09/10 18:12		☐
21	L9NLQ	G0K060482-3	0313136	AQUEOUS	0.02	1.0	0.02	ppb		11/09/10 18:14		☐
22	L9NLR	G0K060482-4	0313136	AQUEOUS	0.06	1.0	0.06	ppb		11/09/10 18:16		☐
23	L9NLT	G0K060482-5	0313136	AQUEOUS	0.05	1.0	0.05	ppb		11/09/10 18:17		☐
24	L9NLTP5	G0K060482	0313136	AQUEOUS	-0.04	5.0	-0.04	ppb		11/09/10 18:19		☐
25	L9NLTS	G0K060482-5 = 1.00	0313136	AQUEOUS	1.11	1.0	1.11	ppb		11/09/10 18:21		☐
26	L9NLTD	G0K060482-5 = 1.00	0313136	AQUEOUS	1.09	1.0	1.09	ppb		11/09/10 18:23		☐
27	CCV-1	= 5.00			4.91	1.0	4.91	ppb	98.2%	11/09/10 18:24		☐
28	CCB-1				-0.04	1.0	-0.04	ppb		11/09/10 18:26		☐
29	L9P89B	G0K090000	0313137		-0.02	1.0	-0.02	ppb		11/09/10 18:28		☐
30	L9P89C	G0K090000 = 1.00	0313137		0.97	1.0	0.97	ppb	97.2%	11/09/10 18:30	Page 1 of 3	☐
31	L9QA6B	G0K090000	0313185		-0.02	1.0	-0.02	ppb		11/09/10 18:32		☐
32	L9QA6C	G0K090000 = 1.00	0313185		0.98	1.0	0.98	ppb	98.1%	11/09/10 18:34		☐
33	L89P0F	G0J280597-1	0312130	AQUEOUS	-0.03	1.0	-0.03	ppb		11/09/10 18:35		☐
34	L89P0FP5	G0J280597	0312130	AQUEOUS	-0.03	5.0	-0.03	ppb		11/09/10 18:37		☐

TAL West Sac

RUN SUMMARY

Method: CVHG - Mercury (Mercury by Cold Vapor AA) Instrument: STL3 (H03) Reported: 11/10/10 14:49:58

Sequence: 09NOV10A Date: 11/09/10 17:36 Analyst: phomsophat ICV: _____ CAL/CCV: _____

#	Sample ID	Lot No.	Batch	Matrix	Raw	DF	Result	Units	%R	Analyzed Date	Comment	Q
35	L89P0SF	G0J280597-1 = 1.00	0312130	AQUEOUS	0.76	1.0	0.76	ppb		11/09/10 18:39		☐
36	L89P0DF	G0J280597-1 = 1.00	0312130	AQUEOUS	0.71	1.0	0.71	ppb		11/09/10 18:41		☐
37	L89P1F	G0J280597-2	0312130	AQUEOUS	-0.04	1.0	-0.04	ppb		11/09/10 18:42		☐
38	L89P3F	G0J280597-3	0312130	AQUEOUS	-0.01	1.0	-0.02	ppb		11/09/10 18:44		☐
39	CCV-1	= 5.00			5.05	1.0	5.05	ppb	101.0%	11/09/10 18:46		☐
40	CCB-1				-0.05	1.0	-0.05	ppb		11/09/10 18:47		☐
41	L89VGF	G0J280603-1	0312130	AQUEOUS	-0.01	1.0	-0.01	ppb		11/09/10 18:49		☐
42	L89VRF	G0J280603-2	0312130	AQUEOUS	0.01	1.0	0.01	ppb		11/09/10 18:51		☐
43	L89VTF	G0J280603-3	0312130	AQUEOUS	-0.01	1.0	-0.02	ppb		11/09/10 18:53		☐
44	L89VVF	G0J280603-4	0312130	AQUEOUS	-0.02	1.0	-0.02	ppb		11/09/10 18:55		☐
45	L89WAF	G0J280603-12	0312130	AQUEOUS	0.00	1.0	0.00	ppb		11/09/10 18:56		☐
46	L9CLJF	G0J290605-5	0312130	AQUEOUS	-0.05	1.0	-0.05	ppb		11/09/10 18:58		☐
47	L9C4MF	G0J300458-1	0312131	AQUEOUS	8.29	1.0	8.29	ppb		11/09/10 19:00		☐
48	L9C5DF	G0J300458-2	0312131	AQUEOUS	8.40	1.0	8.40	ppb		11/09/10 19:02		☐
49	L9C5EF	G0J300458-3	0312131	AQUEOUS	0.30	1.0	0.30	ppb		11/09/10 19:04		☐
50	L9EEQF	G0K010484-8	0312130	AQUEOUS	0.01	1.0	0.01	ppb		11/09/10 19:05		☐
51	CCV-1	= 5.00			4.86	1.0	4.86	ppb	97.2%	11/09/10 19:07		☐
52	CCB-1				-0.09	1.0	-0.09	ppb		11/09/10 19:09		☐
53	L9NLNF	G0K060482-1	0312131	AQUEOUS	0.00	1.0	0.00	ppb		11/09/10 19:11		☐
54	L9NLPF	G0K060482-2	0312131	AQUEOUS	-0.02	1.0	-0.02	ppb		11/09/10 19:13		☐
55	L9NLQF	G0K060482-3	0312131	AQUEOUS	-0.03	1.0	-0.03	ppb		11/09/10 19:15		☐
56	L9NLRF	G0K060482-4	0312131	AQUEOUS	0.16	1.0	0.16	ppb		11/09/10 19:16		☐
57	L9NLTF	G0K060482-5	0312131	AQUEOUS	0.02	1.0	0.02	ppb		11/09/10 19:18		☐
58	L9NLTFP5	G0K060482	0312131	AQUEOUS	0.01	5.0	0.01	ppb		11/09/10 19:20		☐
59	L9NLTSF	G0K060482-5 = 1.00	0312131	AQUEOUS	1.10	1.0	1.10	ppb		11/09/10 19:22		☐
60	L9NLTDF	G0K060482-5 = 1.00	0312131	AQUEOUS	1.11	1.0	1.11	ppb		11/09/10 19:24		☐
61	L880P	G0J280529-2	0313131	AQUEOUS	-0.00	1.0	-0.00	ppb		11/09/10 19:26		☐
62	L880Q	G0J280529-3	0313131	AQUEOUS	-0.02	1.0	-0.02	ppb		11/09/10 19:28		☐
63	CCV-1	= 5.00			4.99	1.0	4.99	ppb	99.8%	11/09/10 19:29	Page 2 of 3	☐
64	CCB-1				-0.06	1.0	-0.06	ppb		11/09/10 19:31		☐
65	L880QP5	G0J280529	0313131	AQUEOUS	-0.02	5.0	-0.02	ppb		11/09/10 19:33		☐
66	L880QS	G0J280529-3 = 1.00	0313131	AQUEOUS	1.08	1.0	1.08	ppb		11/09/10 19:35		☐
67	L880QD	G0J280529-3 = 1.00	0313131	AQUEOUS	0.95	1.0	0.95	ppb		11/09/10 19:37		☐
68	L880R	G0J280529-4	0313131	AQUEOUS	-0.01	1.0	-0.01	ppb		11/09/10 19:39		☐

TAL West Sac

RUN SUMMARY

Method: CVHG - Mercury (Mercury by Cold Vapor AA) Instrument: STL3 (H03) Reported: 11/10/10 14:49:58

Sequence: 09NOV10A Date: 11/09/10 17:36 Analyst: phomsophat ICV: _____ CAL/CCV: _____

#	Sample ID	Lot No.	Batch	Matrix	Raw	DF	Result	Units	%R	Analyzed Date	Comment	Q
69	L880T	G0J280529-5	0313131	AQUEOUS	0.00	1.0	0.00	ppb		11/09/10 19:40		☐
70	L880V	G0J280529-6	0313131	AQUEOUS	-0.05	1.0	-0.06	ppb		11/09/10 19:42		☐
71	L880W	G0J280529-7	0313131	AQUEOUS	0.01	1.0	0.01	ppb		11/09/10 19:44		☐
72	L880X	G0J280529-8	0313131	AQUEOUS	-0.01	1.0	-0.01	ppb		11/09/10 19:45		☐
73	L8801	G0J280529-9	0313131	AQUEOUS	-0.01	1.0	-0.01	ppb		11/09/10 19:47		☐
74	L8802	G0J280529-10	0313131	AQUEOUS	-0.02	1.0	-0.02	ppb		11/09/10 19:50		☐
75	CCV-1	= 5.00			5.17	1.0	5.17	ppb	103.4%	11/09/10 19:52		☐
76	CCB-1				-0.05	1.0	-0.05	ppb		11/09/10 19:54		☐
77	L8804	G0J280529-11	0313131	AQUEOUS	-0.01	1.0	-0.01	ppb		11/09/10 19:56		☐
78	L9CE6	G0J290569-3	0313132	AQUEOUS	0.28	1.0	0.28	ppb		11/09/10 19:57		☐
79	L9CE6P5	G0J290569	0313132	AQUEOUS	0.01	5.0	0.02	ppb		11/09/10 19:59		☐
80	L9CE6S	G0J290569-3 = 1.00	0313132	AQUEOUS	0.99	1.0	0.99	ppb		11/09/10 20:01		☐
81	L9CE6D	G0J290569-3 = 1.00	0313132	AQUEOUS	1.02	1.0	1.02	ppb		11/09/10 20:02		☐
82	L9C4M	G0J300458-1	0313136	AQUEOUS	7.21	1.0	7.21	ppb		11/09/10 20:04		☐
83	L9C5D	G0J300458-2	0313136	AQUEOUS	8.28	1.0	8.28	ppb		11/09/10 20:06		☐
84	L9C5E	G0J300458-3	0313136	AQUEOUS	0.26	1.0	0.26	ppb		11/09/10 20:08		☐
85	L9DQC	G0K010425-1	0313185	AQUEOUS	0.03	1.0	0.03	ppb		11/09/10 20:10		☐
86	L9DQCP5	G0K010425	0313185	AQUEOUS	-0.02	5.0	-0.02	ppb		11/09/10 20:13		☐
87	CCV-2	= 5.00			5.08	1.0	5.08	ppb	101.6%	11/09/10 20:15		☐
88	CCB-2				-0.07	1.0	-0.07	ppb		11/09/10 20:17		☐
89	L9DQCS	G0K010425-1 = 1.00	0313185	AQUEOUS	1.03	1.0	1.03	ppb		11/09/10 20:18		☐
90	L9DQCD	G0K010425-1 = 1.00	0313185	AQUEOUS	1.05	1.0	1.05	ppb		11/09/10 20:22		☐
91	L9FW8	G0K020530-1	0313137	AQUEOUS	-0.02	1.0	-0.02	ppb		11/09/10 20:24		☐
92	L9FW8P5	G0K020530	0313137	AQUEOUS	-0.01	5.0	-0.01	ppb		11/09/10 20:26		☐
93	L9FW8S	G0K020530-1 = 1.00	0313137	AQUEOUS	1.05	1.0	1.05	ppb		11/09/10 20:28		☐
94	L9FW8D	G0K020530-1 = 1.00	0313137	AQUEOUS	1.05	1.0	1.05	ppb		11/09/10 20:30		☐
95	L9FXA	G0K020530-2	0313137	AQUEOUS	-0.01	1.0	-0.01	ppb		11/09/10 20:31		☐
96	L9FXC	G0K020530-3	0313137	AQUEOUS	-0.04	1.0	-0.04	ppb		11/09/10 20:33	Page 3 of 3	☐
97	L9NLN	G0K060482-1	0313136	AQUEOUS	-0.01	1.0	-0.01	ppb		11/09/10 20:35		☐
98	L9NLP	G0K060482-2	0313136	AQUEOUS	-0.01	1.0	-0.01	ppb		11/09/10 20:37		☐
99	CCV-2	= 5.00			5.12	1.0	5.12	ppb	102.4%	11/09/10 20:38		☐
100	CCB-2				-0.05	1.0	-0.05	ppb		11/09/10 20:40		☐

TAL West Sac

CALIBRATION CHECK SUMMARY

Method: CVHG - Mercury (Mercury by Cold Vapor AA) | Instrument: STL3 (H03) | Reported: 11/10/10 14:50:47

Sequence: 09NOV10A **Date:** 11/09/10 17:47 **Analyst:** phomsophat **ICV:** _____ **CAL/CCV:** _____

#	Sample ID	Lot No.	Batch	Matrix	Raw	DF	Result	Units	%R	Analyzed Date	Comment	Q
7	ICV	= 2.00			2.09	1.0	2.09	ppb	104.5%	11/09/10 17:47		☐
8	ICB				-0.02	1.0	-0.02	ppb		11/09/10 17:49		☐
19	CCV-1	= 5.00			5.04	1.0	5.04	ppb	100.8%	11/09/10 18:10		☐
20	CCB-1				-0.03	1.0	-0.03	ppb		11/09/10 18:12		☐
27	CCV-1	= 5.00			4.91	1.0	4.91	ppb	98.2%	11/09/10 18:24		☐
28	CCB-1				-0.04	1.0	-0.04	ppb		11/09/10 18:26		☐
39	CCV-1	= 5.00			5.05	1.0	5.05	ppb	101.0%	11/09/10 18:46		☐
40	CCB-1				-0.05	1.0	-0.05	ppb		11/09/10 18:47		☐
51	CCV-1	= 5.00			4.86	1.0	4.86	ppb	97.2%	11/09/10 19:07		☐
52	CCB-1				-0.09	1.0	-0.09	ppb		11/09/10 19:09		☐
63	CCV-1	= 5.00			4.99	1.0	4.99	ppb	99.8%	11/09/10 19:29		☐
64	CCB-1				-0.06	1.0	-0.06	ppb		11/09/10 19:31		☐
75	CCV-1	= 5.00			5.17	1.0	5.17	ppb	103.4%	11/09/10 19:52		☐
76	CCB-1				-0.05	1.0	-0.05	ppb		11/09/10 19:54		☐
87	CCV-2	= 5.00			5.08	1.0	5.08	ppb	101.6%	11/09/10 20:15		☐
88	CCB-2				-0.07	1.0	-0.07	ppb		11/09/10 20:17		☐
99	CCV-2	= 5.00			5.12	1.0	5.12	ppb	102.4%	11/09/10 20:38		☐
100	CCB-2				-0.05	1.0	-0.05	ppb		11/09/10 20:40		☐

Page 1 of 1

TAL West Sac

SERIAL DILUTION

Method: CVHG (Mercury by Cold Vapor AA) STL3 Reported: 11/10/10 14:55:21

Department: 120 (Metals) Source: MetEdit

Sample: **L9FW8P5** Serial Dilution: **5.00** Sample Dilution: **1.00**

Instrument: **Leeman HYDRA AA** Channel 270
File: 09NOV10A # 92 Method CVHG_
Acquired: 11/09/2010 20:26:15 STL3 Matrix: AQUEOUS
Calibrated: 11/09/2010 17:36:30 Units: ppb

CASN	Analyte Name	Area	Dilution	Sample	%Diff.	MDL	Flag	Q
7439-97-6	***Mercury***	***89***	***-0.05000***	***-0.01800***		***0.10***	***NC***	☑

**** Analyte not requested for this batch, no MDL***

NC : Serial dilution concentration < 25 X MDL

E : Difference greater than Limit (20%)

Reviewed by: Date:

File Utility Help

RN RN

Protocol STL3 Dataset/Proto 09NOV10A/STL3

Protocol | Line info | Cal Curve | Report | Ctrl Chart | Viewer

Reset

Calib Coeffs

New Cal

Update Coeffs

Spike Coeffs

A

B 3.84523e-4

C -4.41899e-2 ☑ Calibrated

Rho .999932 ☑ Accepted

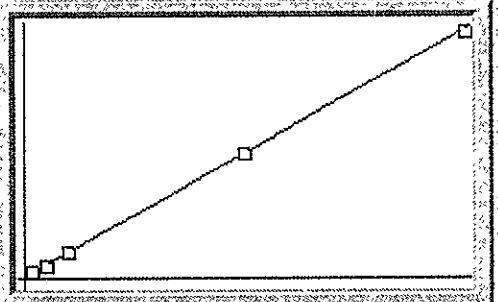
Type Linear Accept

Include S1 Rep 1☑ 2☐ 3☐ 4☐ 5☐

µAbs. 26018

Accepted

New



09-Nov-10 17:46 Conc. 10.0

S.	Conc.	Calc.	Dev.	Mean	SD or %RSD	Rep 1	Rep 2	Rep 3
01	.00000	-.058	-.058	-38	1	-37		
02	.20000	.198	-.002	631	0%	631		
03	.50000	.502	.002	1421	0%	1420		
04	1.0000	1.03	.026	2783	0%	2783		
05	5.0000	5.07	.072	13306	0%	13305		
06	10.000	9.96	-.040	26018	0%	26018		

Ready CAP NUM

CHEMIST INITIAL: TP
DATE OF RUN: 11/09/10
INSTRUMENT ID.: H03
TYPE OF ANALYSIS: Hg
CALIBRATION STD.: 3638-15
ICV STD.: 3638-15-16
CCV STD.: 3638-15-15

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Standard: 1 Rep: 1				Seq: 1	17:36:30 09 Nov 10	HG		
Hg	.000	ppb	-37					
*** Standard: 2 Rep: 1				Seq: 2	17:38:22 09 Nov 10	HG		
Hg	.200	ppb	631					
*** Standard: 3 Rep: 1				Seq: 3	17:40:01 09 Nov 10	HG		
Hg	.500	ppb	1420					
*** Standard: 4 Rep: 1				Seq: 4	17:41:43 09 Nov 10	HG		
Hg	1.00	ppb	2783					
*** Standard: 5 Rep: 1				Seq: 5	17:43:52 09 Nov 10	HG		
Hg	5.00	ppb	13305					
*** Standard: 6 Rep: 1				Seq: 6	17:45:42 09 Nov 10	HG		
Hg	10.0	ppb	26018					

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Standard: 1 Rep: 1 Seq: 1 17:36:30 09 Nov 10 HG

Hg .000 ppb -37

*** Standard: 2 Rep: 1 Seq: 2 17:38:22 09 Nov 10 HG

Hg .200 ppb 631

*** Standard: 3 Rep: 1 Seq: 3 17:40:01 09 Nov 10 HG

Hg .500 ppb 1420

*** Standard: 4 Rep: 1 Seq: 4 17:41:43 09 Nov 10 HG

Hg 1.00 ppb 2783

*** Standard: 5 Rep: 1 Seq: 5 17:43:52 09 Nov 10 HG

Hg 5.00 ppb 13305

*** Standard: 6 Rep: 1 Seq: 6 17:45:42 09 Nov 10 HG

Hg 10.0 ppb 26018

*** Sample ID: ICV Seq: 7 17:47:43 09 Nov 10 HG

Hg 2.09 ppb 5546

*** Sample ID: ICB Seq: 8 17:49:55 09 Nov 10 HG

Hg -.018 ppb 67

*** Sample ID: L9N05BF Seq: 9 17:51:57 09 Nov 10 HG
G0K080000-130

Hg -.015 ppb 76

*** Sample ID: L9N05CF Seq: 10 17:54:18 09 Nov 10 HG
G0K080000-130

Hg 1.06 ppb 2860

*** Sample ID: L9N08BF Seq: 11 17:56:11 09 Nov 10 HG
G0K080000-131

Hg -.023 ppb 54

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-----------------------------------------------------------------------------

*** Sample ID: L9N08CF                Seq:  12     17:58:04 09 Nov 10   HG
                           G0K080000-131
Hg    1.05    ppb      2858
                                                                          =
=============================================================================
*** Sample ID: L9P8MB                 Seq:  13     17:59:44 09 Nov 10   HG
                           G0K090000-131
Hg   -.006    ppb      99
                                                                          =
=============================================================================
*** Sample ID: L9P8MC                 Seq:  14     18:01:24 09 Nov 10   HG
                           G0K090000-131
Hg    1.05    ppb      2836
                                                                          =
=============================================================================
*** Sample ID: L9P8TB                 Seq:  15     18:03:05 09 Nov 10   HG
                           G0K090000-132
Hg   -.036    ppb      22
                                                                          =
=============================================================================
*** Sample ID: L9P8TC                 Seq:  16     18:05:16 09 Nov 10   HG
                           G0K090000-132
Hg    1.03    ppb      2797
                                                                          =
=============================================================================
*** Sample ID: L9P87B                 Seq:  17     18:06:58 09 Nov 10   HG
                           G0K090000-136
Hg   -.005    ppb      103
                                                                          =
=============================================================================
*** Sample ID: L9P87C                 Seq:  18     18:08:36 09 Nov 10   HG
                           G0K090000-136
Hg    1.02    ppb      2760
                                                                          =
=============================================================================
*** Sample ID: CCV-|                  Seq:  19     18:10:14 09 Nov 10   HG

Hg    5.04    ppb      13225
                                                                          =
=============================================================================
*** Sample ID: CCB-|                  Seq:  20     18:12:25 09 Nov 10   HG

Hg   -.028    ppb      41
                                                                          =
=============================================================================
*** Sample ID: L9NLQ                  Seq:  21     18:14:19 09 Nov 10   HG
                           G0K060482-3
Hg    .017    ppb      159
                                                                          =
=============================================================================
```

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-----------------------------------------------------------------------------

*** Sample ID: L9NLR                    Seq:  22     18:16:03 09 Nov 10   HG
                            G0K060482-4
Hg    .056    ppb      261
                                                                          =
==============================================================================
*** Sample ID: L9NLT                    Seq:  23     18:17:42 09 Nov 10   HG
                            G0K060482-5
Hg    .050    ppb      245
                                                                          =
==============================================================================
*** Sample ID: L9NLTP5                  Seq:  24     18:19:35 09 Nov 10   HG
                            G0K060482-5
Hg   -.035    ppb      24
                                                                          =
==============================================================================
*** Sample ID: L9NLTS                   Seq:  25     18:21:26 09 Nov 10   HG
                            G0K060482-5
Hg    1.11    ppb      3014
                                                                          =
==============================================================================
*** Sample ID: L9NLTD                   Seq:  26     18:23:05 09 Nov 10   HG
                            G0K060482-5
Hg    1.09    ppb      2961
                                                                          =
==============================================================================
*** Sample ID: CCV-1                    Seq:  27     18:24:48 09 Nov 10   HG

Hg    4.91    ppb      12881
                                                                          =
==============================================================================
*** Sample ID: CCB-1                    Seq:  28     18:26:51 09 Nov 10   HG

Hg   -.039    ppb      14
                                                                          =
==============================================================================
*** Sample ID: L9P89B                   Seq:  29     18:28:50 09 Nov 10   HG
                            G0K090000-137
Hg   -.020    ppb      62
                                                                          =
==============================================================================
*** Sample ID: L9P89C                   Seq:  30     18:30:32 09 Nov 10   HG
                            G0K090000-137
Hg    .972    ppb      2644
                                                                          =
==============================================================================
*** Sample ID: L9QA6B                   Seq:  31     18:32:23 09 Nov 10   HG
                            G0K090000-185
Hg   -.022    ppb      58
                                                                          =
==============================================================================
```

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-------------------------------------------------------------------------------

*** Sample ID: L9QA6C                Seq:  32     18:34:02 09 Nov 10   HG
                           G0K090000-185
Hg    .981    ppb      2667
                                                                              =
===============================================================================
*** Sample ID: L89P0F                Seq:  33     18:35:46 09 Nov 10   HG
                           G0J280597-1
Hg   -.030    ppb      36
                                                                              =
===============================================================================
*** Sample ID: L89P0FP5              Seq:  34     18:37:28 09 Nov 10   HG
                           G0J280597-1
Hg   -.030    ppb      36
                                                                              =
===============================================================================
*** Sample ID: L89P0SF               Seq:  35     18:39:13 09 Nov 10   HG
                           G0J280597-1
Hg    .761    ppb      2095
                                                                              =
===============================================================================
*** Sample ID: L89P0DF               Seq:  36     18:41:01 09 Nov 10   HG
                           G0J280597-1
Hg    .709    ppb      1959
                                                                              =
===============================================================================
*** Sample ID: L89P1F                Seq:  37     18:42:42 09 Nov 10   HG
                           G0J280597-2
Hg   -.044    ppb      0
                                                                              =
===============================================================================
*** Sample ID: L89P3F                Seq:  38     18:44:24 09 Nov 10   HG
                           G0J280597-3
Hg   -.015    ppb      76
                                                                              =
===============================================================================
*** Sample ID: CCV                   Seq:  39     18:46:03 09 Nov 10   HG

Hg    5.05    ppb      13255
                                                                              =
===============================================================================
*** Sample ID: CCB                   Seq:  40     18:47:45 09 Nov 10   HG

Hg   -.051    ppb      -17
                                                                              =
===============================================================================
*** Sample ID: L89VGF                Seq:  41     18:49:24 09 Nov 10   HG
                           G0J280603-1
Hg   -.007    ppb      98
                                                                              =
===============================================================================
```

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-----------------------------------------------------------------------------

*** Sample ID: L89VRF                Seq:  42     18:51:23 09 Nov 10   HG
                           G0J280603-2
Hg    .010    ppb      141
                                                                          =
==============================================================================
*** Sample ID: L89VTF                Seq:  43     18:53:27 09 Nov 10   HG
                           G0J280603-3
Hg   -.015    ppb      77
                                                                          =
==============================================================================
*** Sample ID: L89VVF                Seq:  44     18:55:08 09 Nov 10   HG
                           G0J280603-4
Hg   -.020    ppb      63
                                                                          =
==============================================================================
*** Sample ID: L89WAF                Seq:  45     18:56:58 09 Nov 10   HG
                           G0J280603-12
Hg    .003    ppb      123
                                                                          =
==============================================================================
*** Sample ID: L9CLJF                Seq:  46     18:58:41 09 Nov 10   HG
                           G0J290605-5
Hg   -.045    ppb      -1
                                                                          =
==============================================================================
*** Sample ID: L9C4MF                Seq:  47     19:00:22 09 Nov 10   HG
                           G0J300458-1
Hg    8.29    ppb      21681
                                                                          =
==============================================================================
*** Sample ID: L9C5DF                Seq:  48     19:02:03 09 Nov 10   HG
                           G0J300458-2
Hg    8.40    ppb      21950
                                                                          =
==============================================================================
*** Sample ID: L9C5EF                Seq:  49     19:04:06 09 Nov 10   HG
                           G0J300458-3
Hg    .301    ppb      897
                                                                          =
==============================================================================
*** Sample ID: L9EEQF                Seq:  50     19:05:59 09 Nov 10   HG
                           G0K010484-8
Hg    .012    ppb      146
                                                                          =
==============================================================================
*** Sample ID: CCV-1                 Seq:  51     19:07:50 09 Nov 10   HG

Hg    4.86    ppb      12766
                                                                          =
==============================================================================
```

Protocol: STL3

POST-RUN REPORT

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-------------------------------------------------------------------------------

*** Sample ID: CCB-1                Seq:  52     19:09:30 09 Nov 10   HG

Hg   -.088    ppb      -115
                                                                              =
===============================================================================
*** Sample ID: L9NLNF               Seq:  53     19:11:30 09 Nov 10   HG
                           G0K060482-1
Hg    .000    ppb      115
                                                                              =
===============================================================================
*** Sample ID: L9NLPF               Seq:  54     19:13:23 09 Nov 10   HG
                           G0K060482-2
Hg   -.024    ppb      53
                                                                              =
===============================================================================
*** Sample ID: L9NLQF               Seq:  55     19:15:14 09 Nov 10   HG
                           G0K060482-3
Hg   -.025    ppb      49
                                                                              =
===============================================================================
*** Sample ID: L9NLRF               Seq:  56     19:16:57 09 Nov 10   HG
                           G0K060482-4
Hg    .162    ppb      537
                                                                              =
===============================================================================
*** Sample ID: L9NLTF               Seq:  57     19:18:49 09 Nov 10   HG
                           G0K060482-5
Hg    .020    ppb      168
                                                                              =
===============================================================================
*** Sample ID: L9NLTFP5             Seq:  58     19:20:43 09 Nov 10   HG
                           G0K060482-5
Hg    .013    ppb      150
                                                                              =
===============================================================================
*** Sample ID: L9NLTSF              Seq:  59     19:22:33 09 Nov 10   HG
                           G0K060482-5
Hg    1.10    ppb      2972
                                                                              =
===============================================================================
*** Sample ID: L9NLTDF              Seq:  60     19:24:42 09 Nov 10   HG
                           G0K060482-5
Hg    1.11    ppb      2998
                                                                              =
===============================================================================
*** Sample ID: L880P                Seq:  61     19:26:23 09 Nov 10   HG
                           G0J280529-2
Hg   -.003    ppb      107
                                                                              =
===============================================================================
```

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-----------------------------------------------------------------------------

*** Sample ID: L880Q                  Seq:  62     19:28:05 09 Nov 10   HG
                            G0J280529-3
Hg   -.021    ppb      61
                                                                          =
=============================================================================
*** Sample ID: CCV                    Seq:  63     19:29:44 09 Nov 10   HG

Hg    4.99    ppb      13087
                                                                          =
=============================================================================
*** Sample ID: CCB                    Seq:  64     19:31:29 09 Nov 10   HG

Hg   -.063    ppb      -49
                                                                          =
=============================================================================
*** Sample ID: L880QP5                Seq:  65     19:33:11 09 Nov 10   HG
                            G0J280529-3
Hg   -.021    ppb      61
                                                                          =
=============================================================================
*** Sample ID: L880QS                 Seq:  66     19:35:01 09 Nov 10   HG
                            G0J280529-3
Hg    1.08    ppb      2912
                                                                          =
=============================================================================
*** Sample ID: L880QD                 Seq:  67     19:37:05 09 Nov 10   HG
                            G0J280529-3
Hg    .951    ppb      2588
                                                                          =
=============================================================================
*** Sample ID: L880R                  Seq:  68     19:39:06 09 Nov 10   HG
                            G0J280529-4
Hg   -.014    ppb      78
                                                                          =
=============================================================================
*** Sample ID: L880T                  Seq:  69     19:40:46 09 Nov 10   HG
                            G0J280529-5
Hg    .003    ppb      123
                                                                          =
=============================================================================
*** Sample ID: L880V                  Seq:  70     19:42:30 09 Nov 10   HG
                            G0J280529-6
Hg   -.055    ppb      -27
                                                                          =
=============================================================================
*** Sample ID: L880W                  Seq:  71     19:44:12 09 Nov 10   HG
                            G0J280529-7
Hg    .010    ppb      141
                                                                          =
=============================================================================
```

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-------------------------------------------------------------------------------

*** Sample ID: L880X                    Seq:  72     19:45:52 09 Nov 10   HG
                            G0J280529-8
Hg   -.014    ppb      78
                                                                            =
===============================================================================
*** Sample ID: L8801                    Seq:  73     19:47:55 09 Nov 10   HG
                            G0J280529-9
Hg   -.006    ppb      100
                                                                            =
===============================================================================
*** Sample ID: L8802                    Seq:  74     19:50:25 09 Nov 10   HG
                            G0J280529-10
Hg   -.024    ppb      52
                                                                            =
===============================================================================
*** Sample ID: CCV-1                    Seq:  75     19:52:18 09 Nov 10   HG

Hg    5.17    ppb      13569
                                                                            =
===============================================================================
*** Sample ID: CCB-1                    Seq:  76     19:54:07 09 Nov 10   HG

Hg   -.051    ppb      -17
                                                                            =
===============================================================================
*** Sample ID: L8804                    Seq:  77     19:56:01 09 Nov 10   HG
                            G0J280529-11
Hg   -.006    ppb      100
                                                                            =
===============================================================================
*** Sample ID: L9CE6                    Seq:  78     19:57:46 09 Nov 10   HG
                            G0J290569-3
Hg    .277    ppb      834
                                                                            =
===============================================================================
*** Sample ID: L9CE6P5                  Seq:  79     19:59:29 09 Nov 10   HG
                            G0J290569-3
Hg    .015    ppb      153
                                                                            =
===============================================================================
*** Sample ID: L9CE6S                   Seq:  80     20:01:10 09 Nov 10   HG
                            G0J290569-3
Hg    .988    ppb      2685
                                                                            =
===============================================================================
*** Sample ID: L9CE6D                   Seq:  81     20:02:56 09 Nov 10   HG
                            G0J290569-3
Hg    1.02    ppb      2757
                                                                            =
===============================================================================
```

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: L9C4M Seq: 82 20:04:37 09 Nov 10 HG
G0J300458-1
Hg 7.21 ppb 18856

*** Sample ID: L9C5D Seq: 83 20:06:22 09 Nov 10 HG
G0J300458-2
Hg 8.28 ppb 21640

*** Sample ID: L9C5E Seq: 84 20:08:57 09 Nov 10 HG
G0J300458-3
Hg .263 ppb 799

*** Sample ID: L9DQC Seq: 85 20:10:38 09 Nov 10 HG
G0K010425-1
Hg .025 ppb 180

*** Sample ID: L9DQCP5 Seq: 86 20:13:09 09 Nov 10 HG
G0K010425-1
Hg -.022 ppb 57

*** Sample ID: CCV-2 Seq: 87 20:15:15 09 Nov 10 HG
Hg 5.08 ppb 13320

*** Sample ID: CCB-2 Seq: 88 20:17:01 09 Nov 10 HG
Hg -.068 ppb -63

*** Sample ID: L9DQCS Seq: 89 20:18:42 09 Nov 10 HG
G0K010425-1
Hg 1.03 ppb 2788

*** Sample ID: L9DQCD Seq: 90 20:22:18 09 Nov 10 HG
G0K010425-1
Hg 1.05 ppb 2850

*** Sample ID: L9FW8 Seq: 91 20:24:30 09 Nov 10 HG
G0K020530-1
Hg -.018 ppb 68

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-------------------------------------------------------------------------------

*** Sample ID: L9FW8P5                Seq:  92     20:26:15 09 Nov 10   HG
                            G0K020530-1
Hg   -.010    ppb      89
                                                                          =
===============================================================================
*** Sample ID: L9FW8S                 Seq:  93     20:28:19 09 Nov 10   HG
                            G0K020530-1
Hg    1.05    ppb      2841
                                                                          =
===============================================================================
*** Sample ID: L9FW8D                 Seq:  94     20:30:01 09 Nov 10   HG
                            G0K020530-1
Hg    1.05    ppb      2848
                                                                          =
===============================================================================
*** Sample ID: L9FXA                  Seq:  95     20:31:45 09 Nov 10   HG
                            G0K020530-2
Hg   -.009    ppb      91
                                                                          =
===============================================================================
*** Sample ID: L9FXC                  Seq:  96     20:33:45 09 Nov 10   HG
                            G0K020530-3
Hg   -.037    ppb      19
                                                                          =
===============================================================================
*** Sample ID: L9NLN                  Seq:  97     20:35:26 09 Nov 10   HG
                            G0K060482-1
Hg   -.013    ppb      82
                                                                          =
===============================================================================
*** Sample ID: L9NLP                  Seq:  98     20:37:06 09 Nov 10   HG
                            G0K060482-2
Hg   -.008    ppb      95
                                                                          =
===============================================================================
*** Sample ID: CCV-2                  Seq:  99     20:38:49 09 Nov 10   HG

Hg    5.12    ppb      13420
                                                                          =
===============================================================================
*** Sample ID: CCB-2                  Seq:  100    20:40:36 09 Nov 10   HG

Hg   -.046    ppb      -6
                                                                          =
```

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica West Sacramento
Hg Data Review Checklist

Run Date: 11/09/10 Analyst: TP Instrument H03

Prep Batches Run: 0312130, 0312131, 0313131, 0313132, 0313136, 0313137, 0313185

Circle Methods Used: ~~7470A / 245.1~~ 7471 / 245.5

A. Calibration/Instrument Run QC	Yes	No	N/A	2ndLevel
1. Instrument calibrated per manufacturer's instructions and at SOP specified levels?	✓			✓
2. ICV/CCV analyzed at appropriate frequency and within control limits?	✓			✓
3. ICB/CCB analyzed at appropriate frequency and within ± RL?	✓			✓
B. Sample Results				
1. Were samples with concentrations > the high calibration standard diluted and reanalyzed?			✓	✓
2. All reported results bracketed by in control QC?	✓			✓
3. Sample analyses done within holding time?	✓			✓
C. Preparation/Matrix QC				
1. LCS done per prep batch and within QC limits?	✓			✓
2. Method blank done per prep batch and < RL?	✓			✓
3. MS run at required frequency and within limits?		✓		✓
4. MSD or DU run at required frequency and RPD within SOP limits?		✓		✓
D. Other				
1. Are all nonconformances documented appropriately?	✓			✓
2. Current IDL/MDL data on file?	✓			✓
3. Calculations and transcriptions checked for error?	✓			✓
4. All client / project specific requirements met?	✓			✓
5. Date of analysis verified as correct?	✓			✓

Analyst: TP Date: ~~11/09/10~~ 11/10/10 TP 11/10/10

Comments:

2nd Level Reviewer: MIZ Date: 11/11/10

Comments:

q:\forms\checklists\qa-506_hg_review new.doc

QA-506 Hg Review
KS 12/10/07

G0J290569, G0J260587, G0K020530
G0K080481, G0J280447, G0J300481, G0J290609, ~~G0J290609~~, 11/15/10
G0K060474, G0K020557, G0K040449, G0K050467, G0J260451

TAL West Sac RUN SUMMARY

Method: CVHG - Mercury (Mercury by Cold Vapor AA) | Instrument: STL3 (H03) | Reported: 11/15/10 10:17:09

Sequence: 10NOV10A **Date:** 11/10/10 18:59 **Analyst:** phomsophat **ICV:** _____ **CAL/CCV:** _____

#	Sample ID	Lot No.	Batch	Matrix	Raw	DF	Result	Units	%R	Analyzed Date	Comment	Q
1	Std01Rep1				0.00	1.0	0.00	ppb		11/10/10 18:59		☐
2	Std02Rep1	= 0.200			0.00	1.0	0.00	ppb		11/10/10 19:01		☐
3	Std03Rep1	= 0.500			0.00	1.0	0.00	ppb		11/10/10 19:03		☐
4	Std04Rep1	= 1.00			0.00	1.0	0.00	ppb		11/10/10 19:04		☐
5	Std05Rep1	= 5.00			0.00	1.0	0.00	ppb		11/10/10 19:06		☐
6	Std06Rep1	= 10.0			0.00	1.0	0.00	ppb		11/10/10 19:08		☐
7	ICV	= 2.00			2.14	1.0	2.14	ppb	107.0%	11/10/10 19:10		☐
8	ICB				-0.02	1.0	-0.02	ppb		11/10/10 19:12		☐
9	L9T0TB	G0K100000	0314330		-0.01	1.0	-1.25	ppb		11/10/10 19:13		☐
10	L9T0TC	G0K100000 = 83.3	0314330		1.01	1.0	84.17	ppb	101.0%	11/10/10 19:17		☐
11	L9T0TL	G0K100000 = 83.3	0314330		1.04	1.0	86.67	ppb	104.0%	11/10/10 19:19		☐
12	L9NM1B	G0K070000	0311036		0.00	1.0	0.25	ppb		11/10/10 19:21		☐
13	L9NM1C	G0K070000 = 83.3	0311036		1.04	1.0	86.67	ppb	104.0%	11/10/10 19:23		☐
14	L9VGDB	G0K100000	0314382		0.03	1.0	2.17	ppb		11/10/10 19:25		☐
15	L9VGDC	G0K100000 = 83.3	0314382		1.06	1.0	88.33	ppb	106.0%	11/10/10 19:27		☐
16	L9P7WB	G0K090000	0313105		0.01	1.0	1.00	ppb		11/10/10 19:28		☐
17	L9P7WC	G0K090000 = 83.3	0313105		1.05	1.0	87.50	ppb	105.0%	11/10/10 19:30		☐
18	L9RPDB	G0K100000	0314146		0.00	1.0	0.33	ppb		11/10/10 19:32		☐
19	CCV-1	= 5.00			5.15	1.0	5.15	ppb	103.0%	11/10/10 19:33		☐
20	CCB -1				-0.00	1.0	-0.00	ppb		11/10/10 19:36		☐
21	L9NJV	G0K060474-3	0314330	SOLID	0.57	1.0	45.89	ppb		11/10/10 19:38		☐
22	L9P12	G0K080481-1	0314146	SOLID	0.05	1.0	4.20	ppb		11/10/10 19:39		☐
23	CCV -1	= 5.00			5.08	1.0	5.08	ppb	101.6%	11/10/10 19:41		☐
24	CCB -1				-0.04	1.0	-0.04	ppb		11/10/10 19:43		☐
25	L9RPDC	G0K100000 = 83.3	0314146		1.03	1.0	85.83	ppb	103.0%	11/10/10 19:45		☐
26	L9P70B	G0K090000	0313106		-0.02	1.0	-1.50	ppb		11/10/10 19:46		☐
27	L9P70C	G0K090000 = 83.3	0313106		1.00	1.0	83.33	ppb	100.0%	11/10/10 19:49		☐
28	L84EX	G0J260451-1	0311036	SOLID	2.86	1.0	238.33	ppb		11/10/10 19:50		☐
29	L84E9	G0J260451-2	0311036	SOLID	3.81	1.0	328.45	ppb		11/10/10 19:52		☐
30	L84FA	G0J260451-3	0311036	SOLID	3.99	1.0	350.00	ppb		11/10/10 19:54	Page 1 of 3	☐
31	L84FD	G0J260451-4	0311036	SOLID	2.94	1.0	257.89	ppb		11/10/10 19:56		☐
32	L84FDP5	G0J260451	0311036	SOLID	0.57	5.0	50.35	ppb		11/10/10 19:57		☐
33	L84FDS	G0J260451-4 = 86.2	0311036	SOLID	5.26	1.0	453.45	ppb		11/10/10 19:59		☐
34	L84FDD	G0J260451-4 = 78.1	0311036	SOLID	6.31	1.0	492.97	ppb		11/10/10 20:01		☐

TAL West Sac

RUN SUMMARY

Method: CVHG - Mercury (Mercury by Cold Vapor AA) Instrument: STL3 (H03) Reported: 11/15/10 10:17:09

Sequence: 10NOV10A Date: 11/10/10 18:59 Analyst: phomsophat ICV: _____ CAL/CCV: _____

#	Sample ID	Lot No.	Batch	Matrix	Raw	DF	Result	Units	%R	Analyzed Date	Comment	Q
35	CCV	= 5.00			4.85	1.0	4.85	ppb	97.0%	11/10/10 20:04		☐
36	CCB				-0.12	1.0	-0.12	ppb		11/10/10 20:05		☐
37	L84FF	G0J260451-5	0311036	SOLID	2.80	1.0	245.61	ppb		11/10/10 20:07		☐
38	L84FL	G0J260451-7	0311036	SOLID	1.74	1.0	140.32	ppb		11/10/10 20:09		☐
39	L84FN	G0J260451-8	0311036	SOLID	3.54	1.0	276.56	ppb		11/10/10 20:11		☐
40	L84FQ	G0J260451-9	0311036	SOLID	3.98	1.0	326.23	ppb		11/10/10 20:12		☐
41	L84FR	G0J260451-10	0311036	SOLID	3.16	1.0	250.79	ppb		11/10/10 20:14		☐
42	L84FT	G0J260451-11	0311036	SOLID	2.55	1.0	219.83	ppb		11/10/10 20:16		☐
43	L84FV	G0J260451-12	0311036	SOLID	5.45	1.0	425.78	ppb		11/10/10 20:18		☐
44	L84FW	G0J260451-13	0311036	SOLID	5.77	1.0	457.94	ppb		11/10/10 20:20		☐
45	L88A0	G0J280447-22	0314382	SOLID	1.63	1.0	135.83	ppb		11/10/10 20:22		☐
46	L88A0P5	G0J280447	0314382	SOLID	0.26	5.0	21.67	ppb		11/10/10 20:24		☐
47	CCV-1	= 5.00			4.97	1.0	4.97	ppb	99.4%	11/10/10 20:25		☐
48	CCB-1				-0.09	1.0	-0.09	ppb		11/10/10 20:27		☐
49	L88A0S	G0J280447-22 = 86.2	0314382	SOLID	4.23	1.0	364.66	ppb		11/10/10 20:29		☐
50	L88A0D	G0J280447-22 = 87.7	0314382	SOLID	4.76	1.0	417.54	ppb		11/10/10 20:30		☐
51	L85K1	G0J260587-24	0313105	SOLID	0.19	1.0	16.25	ppb		11/10/10 20:32		☐
52	L9CEM	G0J290569-1	0313105	SOLID	1.03	1.0	90.35	ppb		11/10/10 20:34		☐
53	L9CEMP5	G0J290569	0313105	SOLID	0.20	5.0	17.28	ppb		11/10/10 20:36		☐
54	L9CEMS	G0J290569-1 = 89.3	0313105	SOLID	3.30	1.0	294.64	ppb		11/10/10 20:38		☐
55	L9CEMD	G0J290569-1 = 87.7	0313105	SOLID	3.30	1.0	289.47	ppb		11/10/10 20:40		☐
56	L9CE5	G0J290569-2	0313105	SOLID	0.16	1.0	13.08	ppb		11/10/10 20:41		☐
57	L9CNW	G0J290609-2	0314146	SOLID	0.16	1.0	12.78	ppb		11/10/10 20:43		☐
58	L9CNWP5	G0J290609	0314146	SOLID	-0.01	5.0	-0.56	ppb		11/10/10 20:45		☐
59	CCV-1	= 5.00			4.93	1.0	4.93	ppb	98.6%	11/10/10 20:47		☐
60	CCB-1				-0.02	1.0	-0.02	ppb		11/10/10 20:49		☐
61	L9CNWS	G0J290609-2 = 80.6	0314146	SOLID	3.04	1.0	245.16	ppb		11/10/10 20:50		☐
62	L9CNWD	G0J290609-2 = 83.3	0314146	SOLID	2.97	1.0	247.50	ppb		11/10/10 20:52		☐
63	L9CNX	G0J290609-3	0314146	SOLID	0.16	1.0	13.50	ppb		11/10/10 20:54		☐
64	L9C76	G0J300481-1	0314146	SOLID	0.28	1.0	25.45	ppb		11/10/10 20:56		☐
65	L9FXD	G0K020530-4	0313106	SOLID	0.34	1.0	29.39	ppb		11/10/10 20:58	Page 2 of 3	☐
66	L9FXE	G0K020530-5	0313106	SOLID	0.36	1.0	28.57	ppb		11/10/10 20:59		☐
67	L9FXF	G0K020530-6	0313106	SOLID	0.86	1.0	67.86	ppb		11/10/10 21:01		☐
68	L9FXG	G0K020530-7	0313106	SOLID	0.22	1.0	19.07	ppb		11/10/10 21:03		☐

TAL West Sac

RUN SUMMARY

Method: CVHG - Mercury (Mercury by Cold Vapor AA) Instrument: STL3 (H03) Reported: 11/15/10 10:17:09

Sequence: 10NOV10A Date: 11/10/10 18:59 Analyst: phomsophat ICV: _____ CAL/CCV: _____

#	Sample ID	Lot No.	Batch	Matrix	Raw	DF	Result	Units	%R	Analyzed Date	Comment	Q
69	L9FXH	G0K020530-8	0313106	SOLID	0.25	1.0	21.29	ppb		11/10/10 21:05		☐
70	L9FXJ	G0K020530-9	0313106	SOLID	0.09	1.0	7.54	ppb		11/10/10 21:07		☐
71	CCV-1	= 5.00			5.08	1.0	5.08	ppb	101.6%	11/10/10 21:09		☐
72	CCB-1				0.04	1.0	0.04	ppb		11/10/10 21:10		☐
73	L9FXL	G0K020530-10	0313106	SOLID	0.26	1.0	22.86	ppb		11/10/10 21:12		☐
74	L9FXM	G0K020530-11	0313106	SOLID	0.20	1.0	16.13	ppb		11/10/10 21:14		☐
75	L9FXN	G0K020530-12	0313106	SOLID	0.10	1.0	8.00	ppb		11/10/10 21:16		☐
76	L9FXNP5	G0K020530	0313106	SOLID	-0.02	5.0	-1.83	ppb		11/10/10 21:17		☐
77	L9FXNS	G0K020530-12 = 80.6	0313106	SOLID	2.96	1.0	238.71	ppb		11/10/10 21:21		☐
78	L9FXND	G0K020530-12 = 79.3	0313106	SOLID	2.83	1.0	224.60	ppb		11/10/10 21:23		☐
79	L9FXQ	G0K020530-13	0313106	SOLID	1.91	1.0	149.22	ppb		11/10/10 21:25		☐
80	L9FXW	G0K020530-14	0313106	SOLID	0.07	1.0	6.32	ppb		11/10/10 21:27		☐
81	L9F5R	G0K020557-1	0314330	SOLID	0.33	1.0	27.50	ppb		11/10/10 21:29		☐
82	L9F5V	G0K020557-3	0314330	SOLID	0.26	1.0	23.13	ppb		11/10/10 21:30		☐
83	CCV-1	= 5.00			5.02	1.0	5.02	ppb	100.4%	11/10/10 21:32		☐
84	CCB-1				0.01	1.0	0.01	ppb		11/10/10 21:34		☐
85	L9F5X	G0K020557-5	0314330	SOLID	0.36	1.0	29.27	ppb		11/10/10 21:36		☐
86	L9F51	G0K020557-7	0314330	SOLID	0.35	1.0	28.31	ppb		11/10/10 21:38		☐
87	L9F53	G0K020557-9	0314330	SOLID	0.29	1.0	22.86	ppb		11/10/10 21:41		☐
88	L9JPM	G0K040449-1	0314330	SOLID	0.30	1.0	25.17	ppb		11/10/10 21:42		☐
89	L9JP0	G0K040449-3	0314330	SOLID	0.27	1.0	22.02	ppb		11/10/10 21:44		☐
90	L9L5F	G0K050467-1	0314330	SOLID	0.29	1.0	25.80	ppb		11/10/10 21:46		☐
91	L9L5K	G0K050467-3	0314330	SOLID	0.33	1.0	26.69	ppb		11/10/10 21:48		☐
92	L9L5M	G0K050467-5	0314330	SOLID	0.34	1.0	26.31	ppb		11/10/10 21:50		☐
93	L9L5V	G0K050467-7	0314330	SOLID	0.30	1.0	23.52	ppb		11/10/10 21:52		☐
94	L9NJR	G0K060474-1	0314330	SOLID	0.42	1.0	35.51	ppb		11/10/10 21:54		☐
95	CCV-1	= 5.00			5.03	1.0	5.03	ppb	100.6%	11/10/10 21:55		☐
96	CCB-1				-0.04	1.0	-0.04	ppb		11/10/10 21:57		☐

Page 3 of 3

TAL West Sac

CALIBRATION CHECK SUMMARY

Method: CVHG - Mercury (Mercury by Cold Vapor AA) Instrument: STL3 (H03) Reported: 11/15/10 10:17:18

Sequence: 10NOV10A **Date:** 11/10/10 19:10 **Analyst:** phomsophat **ICV:** _____ **CAL/CCV:** _____

#	Sample ID	Lot No.	Batch	Matrix	Raw	DF	Result	Units	%R	Analyzed Date	Comment	Q
7	ICV	= 2.00			2.14	1.0	2.14	ppb	107.0%	11/10/10 19:10		☐
8	ICB				-0.02	1.0	-0.02	ppb		11/10/10 19:12		☐
19	CCV -1	= 5.00			5.15	1.0	5.15	ppb	103.0%	11/10/10 19:33		☐
20	CCB -1				-0.00	1.0	-0.00	ppb		11/10/10 19:36		☐
23	CCV -1	= 5.00			5.08	1.0	5.08	ppb	101.6%	11/10/10 19:41		☐
24	CCB -1				-0.04	1.0	-0.04	ppb		11/10/10 19:43		☐
35	CCV -1	= 5.00			4.85	1.0	4.85	ppb	97.0%	11/10/10 20:04		☐
36	CCB -1				-0.12	1.0	-0.12	ppb		11/10/10 20:05		☐
47	CCV -1	= 5.00			4.97	1.0	4.97	ppb	99.4%	11/10/10 20:25		☐
48	CCB -1				-0.09	1.0	-0.09	ppb		11/10/10 20:27		☐
59	CCV -1	= 5.00			4.93	1.0	4.93	ppb	98.6%	11/10/10 20:47		☐
60	CCB -1				-0.02	1.0	-0.02	ppb		11/10/10 20:49		☐
71	CCV -1	= 5.00			5.08	1.0	5.08	ppb	101.6%	11/10/10 21:09		☐
72	CCB -1				0.04	1.0	0.04	ppb		11/10/10 21:10		☐
83	CCV -1	= 5.00			5.02	1.0	5.02	ppb	100.4%	11/10/10 21:32		☐
84	CCB -1				0.01	1.0	0.01	ppb		11/10/10 21:34		☐
95	CCV -1	= 5.00			5.03	1.0	5.03	ppb	100.6%	11/10/10 21:55		☐
96	CCB -1				-0.04	1.0	-0.04	ppb		11/10/10 21:57		☐

Page 1 of

WinHg Database 1.5

File Utility Help

Protocol STL3 Dataset/Proto 10NOV10A/STL3

Protocol | Line info | Cal Curve | Report | Ctrl Chart | Viewer

Reset

Calib Coeffs

New Cal

Update Coeffs

Spike Coeffs

A

B 2.85801e-4

C 6.24701e-2

Rho .999756

Type Linear

Calibrated

Accepted

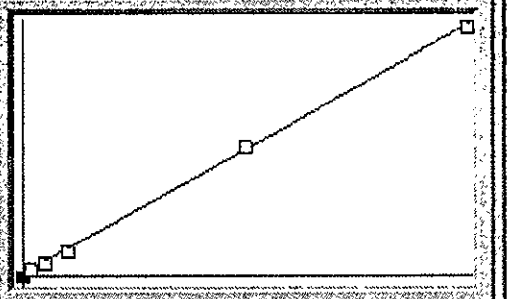
Accept

µAbs.

37550

Accepted

New



Include S1 Rep 1 2 3 4 5

10-Nov-10 19:09 Conc. 10.0

S	Conc.	Calc.	Dev.	Mean	SD or %RSD	Rep 1	Rep 2	Rep 3
01	.00000	-.019	-.019	165	1	164		
02	.20000	.218	.018	1057	0%	1056		
03	.50000	.457	-.043	1954	0%	1954		
04	1.0000	.958	-.042	3840	0%	3839		
05	5.0000	5.17	.167	19676	0%	19676		
06	10.000	9.92	-.082	37551	0%	37550		

Ready CAP NUM

CHEMIST INITIAL: TP
DATE OF RUN: 11/16/10
INSTRUMENT ID.: TP
TYPE OF ANALYSIS: Hg
CALIBRATION STD.: 3638-15-18
ICV STD.: 3638-15-17
CCV STD.: 3638-15-18

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Standard: 1 Rep: 1				Seq: 1	18:59:54 10 Nov 10	HG		
Hg	.000	ppb	164					
*** Standard: 2 Rep: 1				Seq: 2	19:01:34 10 Nov 10	HG		
Hg	.200	ppb	1056					
*** Standard: 3 Rep: 1				Seq: 3	19:03:13 10 Nov 10	HG		
Hg	.500	ppb	1954					
*** Standard: 4 Rep: 1				Seq: 4	19:04:52 10 Nov 10	HG		
Hg	1.00	ppb	3839					
*** Standard: 5 Rep: 1				Seq: 5	19:06:31 10 Nov 10	HG		
Hg	5.00	ppb	19676					
*** Standard: 6 Rep: 1				Seq: 6	19:08:10 10 Nov 10	HG		
Hg	10.0	ppb	37550					

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Standard: 1 Rep: 1 Seq: 1 18:59:54 10 Nov 10 HG

Hg .000 ppb 164

*** Standard: 2 Rep: 1 Seq: 2 19:01:34 10 Nov 10 HG

Hg .200 ppb 1056

*** Standard: 3 Rep: 1 Seq: 3 19:03:13 10 Nov 10 HG

Hg .500 ppb 1954

*** Standard: 4 Rep: 1 Seq: 4 19:04:52 10 Nov 10 HG

Hg 1.00 ppb 3839

*** Standard: 5 Rep: 1 Seq: 5 19:06:31 10 Nov 10 HG

Hg 5.00 ppb 19676

*** Standard: 6 Rep: 1 Seq: 6 19:08:10 10 Nov 10 HG

Hg 10.0 ppb 37550

*** Sample ID: ICV Seq: 7 19:10:40 10 Nov 10 HG

Hg 2.14 ppb 8281

*** Sample ID: ICB Seq: 8 19:12:20 10 Nov 10 HG

Hg -.022 ppb 153

*** Sample ID: L9T0TB Seq: 9 19:13:58 10 Nov 10 HG
G0K100000-330

Hg -.015 ppb 178

*** Sample ID: L9T0TC Seq: 10 19:17:09 10 Nov 10 HG
G0K100000-330

Hg 1.01 ppb 4039

*** Sample ID: L9T0TL Seq: 11 19:19:13 10 Nov 10 HG
G0K100000-330

Hg 1.04 ppb 4157

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: L9NM1B Seq: 12 19:21:11 10 Nov 10 HG
G0K070000-36

Hg	.003	ppb	248

*** Sample ID: L9NM1C Seq: 13 19:23:22 10 Nov 10 HG
G0K070000-36

Hg	1.04	ppb	4142

*** Sample ID: L9VGDB Seq: 14 19:25:02 10 Nov 10 HG
G0K100000-382

Hg	.026	ppb	334

*** Sample ID: L9VGDC Seq: 15 19:27:01 10 Nov 10 HG
G0K100000-382

Hg	1.06	ppb	4212

*** Sample ID: L9P7WB Seq: 16 19:28:51 10 Nov 10 HG
G0K090000-105

Hg	.012	ppb	279

*** Sample ID: L9P7WC Seq: 17 19:30:34 10 Nov 10 HG
G0K090000-105

Hg	1.05	ppb	4175

*** Sample ID: L9RPDB Seq: 18 19:32:14 10 Nov 10 HG
G0K100000-146

Hg	.004	ppb	250

*** Sample ID: CCV-1 Seq: 19 19:33:56 10 Nov 10 HG

Hg	5.15	ppb	19610

*** Sample ID: CCB-1 Seq: 20 19:36:21 10 Nov 10 HG

Hg	-.005	ppb	218

*** Sample ID: L9NJV Seq: 21 19:38:01 10 Nov 10 HG
G0K060474-3

Hg	.569	ppb	2374

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: L9P12 Seq: 22 19:39:42 10 Nov 10 HG
G0K080481-1

Hg	.047	ppb	411

*** Sample ID: CCV-1 Seq: 23 19:41:51 10 Nov 10 HG

Hg	5.08	ppb	19337

*** Sample ID: CCB-1 Seq: 24 19:43:31 10 Nov 10 HG

Hg	-.043	ppb	73

*** Sample ID: L9RPDC Seq: 25 19:45:09 10 Nov 10 HG
G0K100000-146

Hg	1.03	ppb	4103

*** Sample ID: L9P70B Seq: 26 19:46:50 10 Nov 10 HG
G0K090000-106

Hg	-.018	ppb	168

*** Sample ID: L9P70C Seq: 27 19:49:04 10 Nov 10 HG
G0K090000-106

Hg	1.00	ppb	4005

*** Sample ID: L84EX Seq: 28 19:50:42 10 Nov 10 HG
G0J260451-1

Hg	2.86	ppb	10977

*** Sample ID: L84E9 Seq: 29 19:52:34 10 Nov 10 HG
G0J260451-2

Hg	3.81	ppb	14561

*** Sample ID: L84FA Seq: 30 19:54:15 10 Nov 10 HG
G0J260451-3

Hg	3.99	ppb	15250

*** Sample ID: L84FD Seq: 31 19:56:00 10 Nov 10 HG
G0J260451-4

Hg	2.94	ppb	11282

```
Line    Conc.  Units     SD/RSD      1        2        3        4        5
-----------------------------------------------------------------------------

*** Sample ID: L84FDP5                Seq:  32     19:57:42 10 Nov 10   HG
                            G0J260451-4
Hg     .574    ppb      2394
                                                                          =
==============================================================================
*** Sample ID: L84FDS                 Seq:  33     19:59:21 10 Nov 10   HG
                            G0J260451-4
Hg    5.26    ppb      20041
                                                                          =
==============================================================================
*** Sample ID: L84FDD                 Seq:  34     20:01:13 10 Nov 10   HG
                            G0J260451-4
Hg    6.31    ppb      23976
                                                                          =
==============================================================================
*** Sample ID: CCV-1                  Seq:  35     20:04:04 10 Nov 10   HG

Hg    4.85    ppb      18464
                                                                          =
==============================================================================
*** Sample ID: CCB-1                  Seq:  36     20:05:45 10 Nov 10   HG

Hg   -.116    ppb      -200
                                                                          =
==============================================================================
*** Sample ID: L84FF                  Seq:  37     20:07:27 10 Nov 10   HG
                            G0J260451-5
Hg    2.80    ppb      10779
                                                                          =
==============================================================================
*** Sample ID: L84FL                  Seq:  38     20:09:18 10 Nov 10   HG
                            G0J260451-7
Hg    1.74    ppb      6790
                                                                          =
==============================================================================
*** Sample ID: L84FN                  Seq:  39     20:11:02 10 Nov 10   HG
                            G0J260451-8
Hg    3.54    ppb      13562
                                                                          =
==============================================================================
*** Sample ID: L84FQ                  Seq:  40     20:12:45 10 Nov 10   HG
                            G0J260451-9
Hg    3.98    ppb      15213
                                                                          =
==============================================================================
*** Sample ID: L84FR                  Seq:  41     20:14:26 10 Nov 10   HG
                            G0J260451-10
Hg    3.16    ppb      12139
                                                                          =
==============================================================================
```

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: L84FT Seq: 42 20:16:21 10 Nov 10 HG
G0J260451-11

Hg	2.55	ppb	9813					

*** Sample ID: L84FV Seq: 43 20:18:02 10 Nov 10 HG
G0J260451-12

Hg	5.45	ppb	20727					

*** Sample ID: L84FW Seq: 44 20:20:07 10 Nov 10 HG
G0J260451-13

Hg	5.77	ppb	21953					

*** Sample ID: L88A0 Seq: 45 20:22:00 10 Nov 10 HG
G0J280447-22

Hg	1.63	ppb	6369					

*** Sample ID: L88A0P5 Seq: 46 20:24:10 10 Nov 10 HG
G0J280447-22

Hg	.260	ppb	1214					

*** Sample ID: CCV-1 Seq: 47 20:25:52 10 Nov 10 HG

Hg	4.97	ppb	18935					

*** Sample ID: CCB-1 Seq: 48 20:27:34 10 Nov 10 HG

Hg	-.093	ppb	-115					

*** Sample ID: L88A0S Seq: 49 20:29:12 10 Nov 10 HG
G0J280447-22

Hg	4.23	ppb	16140					

*** Sample ID: L88A0D Seq: 50 20:30:53 10 Nov 10 HG
G0J280447-22

Hg	4.76	ppb	18146					

*** Sample ID: L85K1 Seq: 51 20:32:44 10 Nov 10 HG
G0J260587-24

Hg	.195	ppb	969					

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: L9CEM Seq: 52 20:34:27 10 Nov 10 HG
G0J290569-1
Hg 1.03 ppb 4094

*** Sample ID: L9CEMP5 Seq: 53 20:36:11 10 Nov 10 HG
G0J290569-1
Hg .197 ppb 978

*** Sample ID: L9CEMS Seq: 54 20:38:04 10 Nov 10 HG
G0J290569-1
Hg 3.30 ppb 12644

*** Sample ID: L9CEMD Seq: 55 20:40:16 10 Nov 10 HG
G0J290569-1
Hg 3.30 ppb 12669

*** Sample ID: L9CE5 Seq: 56 20:41:59 10 Nov 10 HG
G0J290569-2
Hg .157 ppb 826

*** Sample ID: L9CNW Seq: 57 20:43:51 10 Nov 10 HG
G0J290609-2
Hg .161 ppb 839

*** Sample ID: L9CNWP5 Seq: 58 20:45:31 10 Nov 10 HG
G0J290609-2
Hg -.007 ppb 210

*** Sample ID: CCV-1 Seq: 59 20:47:10 10 Nov 10 HG
Hg 4.93 ppb 18798

*** Sample ID: CCB-1 Seq: 60 20:49:00 10 Nov 10 HG
Hg -.017 ppb 172

*** Sample ID: L9CNWS Seq: 61 20:50:49 10 Nov 10 HG
G0J290609-2
Hg 3.04 ppb 11676

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: L9CNWD Seq: 62 20:52:32 10 Nov 10 HG

G0J290609-2

Hg	2.97	ppb	11420

*** Sample ID: L9CNX Seq: 63 20:54:22 10 Nov 10 HG

G0J290609-3

Hg	.162	ppb	844

*** Sample ID: L9C76 Seq: 64 20:56:18 10 Nov 10 HG

G0J300481-1

Hg	.285	ppb	1306

*** Sample ID: L9FXD Seq: 65 20:58:03 10 Nov 10 HG

G0K020530-4

Hg	.335	ppb	1494

*** Sample ID: L9FXE Seq: 66 20:59:57 10 Nov 10 HG

G0K020530-5

Hg	.360	ppb	1590

*** Sample ID: L9FXF Seq: 67 21:01:52 10 Nov 10 HG

G0K020530-6

Hg	.855	ppb	3450

*** Sample ID: L9FXG Seq: 68 21:03:44 10 Nov 10 HG

G0K020530-7

Hg	.225	ppb	1082

*** Sample ID: L9FXH Seq: 69 21:05:33 10 Nov 10 HG

G0K020530-8

Hg	.247	ppb	1164

*** Sample ID: L9FXJ Seq: 70 21:07:13 10 Nov 10 HG

G0K020530-9

Hg	.089	ppb	570

*** Sample ID: CCV-1 Seq: 71 21:09:03 10 Nov 10 HG

Hg	5.08	ppb	19359

POST-RUN REPORT

```
Line   Conc.  Units     SD/RSD      1       2       3       4       5
-----------------------------------------------------------------------------

*** Sample ID: CCB-1                Seq:  72     21:10:53 10 Nov 10   HG

Hg    .039    ppb      382
                                                                          =
=============================================================================
*** Sample ID: L9FXL                Seq:  73     21:12:38 10 Nov 10   HG
                           G0K020530-10
Hg    .256    ppb      1198
                                                                          =
=============================================================================
*** Sample ID: L9FXM                Seq:  74     21:14:21 10 Nov 10   HG
                           G0K020530-11
Hg    .200    ppb      988
                                                                          =
=============================================================================
*** Sample ID: L9FXN                Seq:  75     21:16:12 10 Nov 10   HG
                           G0K020530-12
Hg    .096    ppb      596
                                                                          =
=============================================================================
*** Sample ID: L9FXNP5              Seq:  76     21:17:55 10 Nov 10   HG
                           G0K020530-12
Hg   -.022    ppb      152
                                                                          =
=============================================================================
*** Sample ID: L9FXNS               Seq:  77     21:21:08 10 Nov 10   HG
                           G0K020530-12
Hg    2.96    ppb      11366
                                                                          =
=============================================================================
*** Sample ID: L9FXND               Seq:  78     21:23:49 10 Nov 10   HG
                           G0K020530-12
Hg    2.83    ppb      10891
                                                                          =
=============================================================================
*** Sample ID: L9FXQ                Seq:  79     21:25:41 10 Nov 10   HG
                           G0K020530-13
Hg    1.91    ppb      7424
                                                                          =
=============================================================================
*** Sample ID: L9FXW                Seq:  80     21:27:23 10 Nov 10   HG
                           G0K020530-14
Hg    .072    ppb      507
                                                                          =
=============================================================================
*** Sample ID: L9F5R                Seq:  81     21:29:04 10 Nov 10   HG
                           G0K020557-1
Hg    .330    ppb      1476
                                                                          =
=============================================================================
```

Protocol: STL3

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: L9F5V Seq: 82 21:30:49 10 Nov 10 HG
G0K020557-3
Hg .259 ppb 1211

*** Sample ID: CCV-1 Seq: 83 21:32:43 10 Nov 10 HG

Hg 5.02 ppb 19136

*** Sample ID: CCB-1 Seq: 84 21:34:36 10 Nov 10 HG

Hg .015 ppb 291

*** Sample ID: L9F5X Seq: 85 21:36:17 10 Nov 10 HG
G0K020557-5
Hg .363 ppb 1600

*** Sample ID: L9F51 Seq: 86 21:38:50 10 Nov 10 HG
G0K020557-7
Hg .351 ppb 1556

*** Sample ID: L9F53 Seq: 87 21:41:03 10 Nov 10 HG
G0K020557-9
Hg .288 ppb 1317

*** Sample ID: L9JPM Seq: 88 21:42:46 10 Nov 10 HG
G0K040449-1
Hg .297 ppb 1352

*** Sample ID: L9JP0 Seq: 89 21:44:37 10 Nov 10 HG
G0K040449-3
Hg .273 ppb 1261

*** Sample ID: L9L5F Seq: 90 21:46:23 10 Nov 10 HG
G0K050467-1
Hg .289 ppb 1322

*** Sample ID: L9L5K Seq: 91 21:48:09 10 Nov 10 HG
G0K050467-3
Hg .331 ppb 1482

POST-RUN REPORT

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: L9L5M Seq: 92 21:50:20 10 Nov 10 HG
G0K050467-5

Hg	.342	ppb	1521

*** Sample ID: L9L5V Seq: 93 21:52:10 10 Nov 10 HG
G0K050467-7

Hg	.301	ppb	1369

*** Sample ID: L9NJR Seq: 94 21:54:02 10 Nov 10 HG
G0K060474-1

Hg	.419	ppb	1812

*** Sample ID: CCV Seq: 95 21:55:45 10 Nov 10 HG

Hg	5.03	ppb	19158

*** Sample ID: CCB Seq: 96 21:57:27 10 Nov 10 HG

Hg	-.039	ppb	89

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica West Sacramento
Hg Data Review Checklist

Run Date: 11/16/10 Analyst: TP Instrument H03

Prep Batches Run: 314330, 311036, 314382, 313105, 312146, 313106

Circle Methods Used: 7470A / 245.1 7471 / 245.5

A. Calibration/Instrument Run QC	Yes	No	N/A	2ndLevel
1. Instrument calibrated per manufacturer's instructions and at SOP specified levels?	✓			✓
2. ICV/CCV analyzed at appropriate frequency and within control limits?	✓			✓
3. ICB/CCB analyzed at appropriate frequency and within ± RL?	✓			✓
B. Sample Results				
1. Were samples with concentrations > the high calibration standard diluted and reanalyzed?			✓	✓
2. All reported results bracketed by in control QC?	✓			✓
3. Sample analyses done within holding time?	✓			✓
C. Preparation/Matrix QC				
1. LCS done per prep batch and within QC limits?	✓			✓
2. Method blank done per prep batch and < RL?	✓			✓
3. MS run at required frequency and within limits?		✓		✓
4. MSD or DU run at required frequency and RPD within SOP limits?		✓		✓
D. Other				
1. Are all nonconformances documented appropriately?	✓			✓
2. Current IDL/MDL data on file?	✓			✓
3. Calculations and transcriptions checked for error?	✓			✓
4. All client / project specific requirements met?	✓			✓
5. Date of analysis verified as correct?	✓			✓

Analyst: TP Date: 11/15/10

Comments:

2nd Level Reviewer: MTL Date: 11/18/10

Comments:

q:\forms\checklists\qa-506_hg_review new.doc

QA-506 Hg Review
KS 12/10/07

Sample Preparation Log

TestAmerica West Sacramento
METALS SAMPLE PREPARATION LOG

	November 8, 2010		**Analyst**	NM		**Matrix:**	**AQUEOUS**		
Balance ID:	QA-007								
PrepCode:		04		WS-IP-0001		**Method:**	ICPMS		
			pH	Initial Vol mL	Final Vol (mL)	Batch		MS run	Comments
G0K080000	242	L9PEMB	<2	50	50	0312242			
G0K080000	242	L9PEMC	<2	50	50	0312242			
G0K020530	1	L9FW8S	<2	50	50	0312242		0312159	
G0K020530	1	L9FW8	<2	50	50	0312242		0312159	
G0K020530	1	L9FW8D	<2	50	50	0312242		0312159	
G0K020530	2	L9FXA	<2	50	50	0312242		0312159	
G0K020530	3	L9FXC	<2	50	50	0312242		0312159	

CHEMIST: NM

***INITIAL/FINAL: Initial weight or volume and final volume, g/ml.**

Page 1 of 1
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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento

Metals Spiking Documentation Form

Lot #(s): G0K020530(1-3)

Batch Number: 0312242

EPA Analytical Method ID: 6020

Spiked Date: 11/08/10

MS Sample(s): G0K020530(1)

EPA Prep Method ID: 3005A

Hot Plate Microwave ID: A

Analyst Initial/Date: 11/08/10 NM

Witness Initial/Date: PF 11/8/10

Hot Plate Temp Initial: 94°C Final: 94°C

Correct Folder ID Witness: NA

Digestion Cup Lot # 100723

Thermometer ID: BT 0012

Filter Paper Lot # NA

Fin Vol Cup Lot 100723

Check If Used	Bottle Name	Elements	Stock Concentration (mg/L)	Tracking Number	LCS/LCSD Volume Spiked	MS/SD Volume Spiked	Expiration Date
	ICP Part 1 5% HNO_3	Ca, Mg Al, As, Ba, Se, Sn, Tl Fe,Mo,Ti Sb,Co,Pb,Mn,Ni,V,Zn Cu Cr ,Be,Cd Ag	5,000 200 100 50 25 20 5 5.0				
	ICP Part 2 2% HNO_3	K,Na P,S B,Li,Sr	5,000 1,000 100				
	Si H20/Tr HF	Si	1,000		11/08/10 NM		
✓	TACA-1 5% HNO_3	Al,K,Mg,Ca,Na,Fe,P,B As,Be,Cd,Cr,Co,Cu,Pb, Mn,Ni,Se,U,V,Zn,Ba,Li Sr Ag,Tl	500 100 25	3189-6-5	0.1mL	0.1mL	08/31/11
✓	TACA-2 5% HNO_3	Mo, Sb, Sn, Ti	100	3189-6-6	0.1mL	0.1mL	08/31/11
	Misc. Elements				11/08/10 NM		

Prep Reagents:

Check If Used	Reagent	Supplier	Lot Number	Check If Used	Reagent	Supplier	Lot Number
✓	70% HNO_3	Mallinckrodt	J12035		30% H_2O_2	Mallinckrodt	
✓	37% HCl	Mallinckrodt	J23A13		49% HF	Fisher	
	3M HNO_3	In-House			1:1 HCl	In-House	11/08/10 NM

ICP matrix spike and LCS: For final volumes of 100ml, add 1mL from bottles ICP Part 1, ICP Part 2. Add 1ml of Silica (Si) when requested.
ICPMS matrix spike and LCS: For final volumes of 100ml, add 0.2 mL each of TACA-1 and TACA-2.
Amount to spike is as listed above for final volumes of 100ml. If a different final volume is used, increase or decrease the amount you spike proportionally.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento Metals Volume Log

11/8/2010				
SOP No: WS-IP-0001				
Chimest NM				
Balance ID :007				
Lot Number	Sample	In sample	SampleFin.	Comments
	#	Ph	Ph	
G0K020530	1	<2	<2	
G0K020530	2	<2	↓	
G0K020530	3	<2	✓	

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento

Preparation Data Review Checklist

Prep Batch(es) 0312242 **Test:** 6020

Prep Date: 11\08\10 **Holding Times:** 04/27/11 **NCM:** Y N

A. Spike Witness/Batch setup	Spike Witness	Reviewer
1. **Holding times checked?** NCMs filed as appropriate	✓	✓
2. QAS checked for QC instructions (LCS, LCSD, MS,MSD, etc)	✓	✓
3. Amount of samples in hood match amount of samples on bench sheet. Sample IDS match.	✓	NA
4. Worksheets have been checked for required spiking compounds	✓	✓
5. Spiking volumes are correctly documented	✓	✓
6. Std ID numbers on spike labels match numbers on bench sheet	✓	NA
7. Expiration dates have been checked	✓	✓
8. Calibration expiration dates on pipettors have been checked	✓	NA
9. Spiker and spike witness have signed and dated bench sheet	✓	✓
B. Weights and Volumes		
1. Recorded weights are in anticipated range	NA	NA
2. Balance upload or raw data for weights is included	NA	NA
3. Weights and volumes have been transcribed correctly to LIMS.	NA	✓
4. Weights are not targeted to meet exact weights.	NA	NA
5. Each weight or volume measurement is a unique record (no dittos or line downs)	NA	✓
C. Standards and Reagents		
1. Lot numbers for all reagents, including clean up stages, are recorded.	NA	✓
2. Are dates and analysts for cleanups recorded?	NA	NA
3. Are correct IDs used for standards? Are expiration dates to day/month/year, when listed?	NA	✓
D. Documentation		
1. Are all nonconformances documented appropriately?	NA	NA
2. QuantIMs entry correct, including dates and times.	NA	✓
3. Are all fields completed?	NA	✓

Spike witness: RV Date: 11/8/10

2nd Level Reviewer: SH Date: 11/9/10

Comments:
MB and LCS shares with batch 0312236

q:\forms\checklists\qa-588 prep_review.doc QA-588 Revised 12/30/2008 ERS

TestAmerica West Sacramento
METALS SAMPLE PREPARATION LOG

	November 9, 2010		**Analyst**	NM		**Matrix:**	**SOLID**		
Balance ID:	QA-007								
PrepCode:		46		WS-IP-0002		**Method:**	ICPMS		
			pH	Initial Vol g	Final Vol (mL)	Batch		MS run	Comments
G0K090000	206	L9QF0B	NA	1	100	0313206			
G0K090000	206	L9QF0C	NA	1	100	0313206			
G0K020530	4	L9FXD	NA	1.03	100	0313206		0313108	
G0K020530	5	L9FXE	NA	1.01	100	0313206		0313108	
G0K020530	6	L9FXF	NA	1	100	0313206		0313108	
G0K020530	7	L9FXG	NA	1.01	100	0313206		0313108	
G0K020530	8	L9FXH	NA	1.05	100	0313206		0313108	
G0K020530	9	L9FXJ	NA	1	100	0313206		0313108	
G0K020530	10	L9FXL	NA	1.04	100	0313206		0313108	
G0K020530	11	L9FXM	NA	1.02	100	0313206		0313108	
G0K020530	12	L9FXN	NA	0.98	100	0313206		0313108	
G0K020530	12	L9FXNS	NA	1.04	100	0313206		0313108	
G0K020530	12	L9FXND	NA	0.99	100	0313206		0313108	
G0K020530	13	L9FXQ	NA	0.97	100	0313206		0313108	
G0K020530	14	L9FXW	NA	0.99	100	0313206		0313108	

CHEMIST: NM

***INITIAL/FINAL: Initial weight or volume and final volume, g/ml.**

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento Metals Weights Log

11/9/2010

Prep code 46

SOP: WS-IP-0002

NM

Matrix: Solid Other ___

BATCH: 0313206

Balance ID QA-007

Lot Number	Sample	Initial Wt/Volg	Comments
G0K020530	4	1.03	
G0K020530	5	1.01	
G0K020530	6	1.00	
G0K020530	7	1.01	
G0K020530	8	1.05	
G0K020530	9	1.00	
G0K020530	10	1.04	
G0K020530	11	1.02	
G0K020530	12	0.98	
G0K020530	12MS	1.04	
G0K020530	12MSD	0.99	
G0K020530	13	0.97	
G0K020530	14	0.99	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento

Metals Spiking Documentation Form

Lot #(s): G0K020530(4-14)

Batch Number: 0313206

EPA Analytical Method ID: 6020

Spiked Date: 11/09/10

MS Sample(s): G0K020530(12)

EPA Prep Method ID: 3050 B

Hot Plate Microwave ID: C

Analyst Initial/Date: 11/09/10 NM

Witness Initial/Date: 11/9/10

Hot Plate Temp: Initial: 91°C Final: 91°C

Correct Folder ID Witness: NR

Digestion Cup Lot #: 100723

Thermometer ID: BT-0012

Filter Paper Lot #: J1150702

Fin Vol Cup Lot: 100503

Check If Used	Bottle Name	Elements	Stock Concentration (mg/L)	Tracking Number	LCS/LCSD Volume Spiked	MS/SD Volume Spiked	Expiration Date
	ICP Part 1 5% HNO_3	Ca, Mg Al, As, Ba, Se, Sn, Tl Fe,Mo,Ti Sb,Co,Pb,Mn,Ni,V,Zn Cu Cr ,Be,Cd Ag	5,000 200 100 50 25 20 5 5.0				
	ICP Part 2 2% HNO_3	K,Na P,S B,Li,Sr	5,000 1,000 100				
	Si H20/Tr ~~HF~~	Si	1,000		11/09/10 NM		
✓	TACA-1 5% HNO_3	Al,K,Mg,Ca,Na,Fe,P,B As,Be,Cd,Cr,Co,Cu,Pb, Mn,Ni,Se,U,V,Zn,Ba,Li Sr Ag,Tl	500 100 25	3189-6-5	0.2mL	0.2mL	08/31/11
✓	TACA-2 5% HNO_3	Mo, Sb, Sn, Ti	100	3189-6-6	0.2mL	0.2mL	08/31/11
	Misc. Elements				11/09/10 NM		

Prep Reagents:

Check If Used	Reagent	Supplier	Lot Number	Check If Used	Reagent	Supplier	Lot Number
✓	70% HNO_3	Mallinckrodt	J12035		30% H_2O_2	Mallinckrodt	J10A10
✓	~~37% HCl~~	Mallinckrodt			~~49% HF~~	~~Fisher~~	11/09/10 NM
	3M ~~HNO_3~~	In-House	11/09/10 NM	✓	1:1 HCl	In-House	4028-26-6

ICP matrix spike and LCS: For final volumes of 100ml, add 1mL from bottles ICP Part 1, ICP Part 2. Add 1ml of Silica (Si) when requested.
ICPMS matrix spike and LCS: For final volumes of 100ml, add 0.2 mL each of TACA-1 and TACA-2.
Amount to spike is as listed above for final volumes of 100ml. If a different final volume is used, increase or decrease the amount you spike proportionally.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento

Preparation Data Review Checklist

Prep Batch(es) 0313206 **Test:** 6020

Prep Date: 11/09/10 **Holding Times:** 04/27/11 **NCM:** Y (N)

A. Spike Witness/Batch setup	Spike Witness	Reviewer
1. **Holding times checked?** NCMs filed as appropriate	✓	✓
2. QAS checked for QC instructions (LCS, LCSD, MS,MSD, etc)	✓	✓
3. Amount of samples in hood match amount of samples on bench sheet. Sample IDS match.	✓	NA
4. Worksheets have been checked for required spiking compounds	✓	✓
5. Spiking volumes are correctly documented	✓	✓
6. Std ID numbers on spike labels match numbers on bench sheet	✓	NA
7. Expiration dates have been checked	✓	✓
8. Calibration expiration dates on pipettors have been checked	✓	NA
9. Spiker and spike witness have signed and dated bench sheet	✓	✓
B. Weights and Volumes		
1. Recorded weights are in anticipated range	NA	✓
2. Balance upload or raw data for weights is included	NA	✓
3. Weights and volumes have been transcribed correctly to LIMS.	NA	✓
4. Weights are not targeted to meet exact weights.	NA	NA
5. Each weight or volume measurement is a unique record (no dittos or line downs)	NA	✓
C. Standards and Reagents		
1. Lot numbers for all reagents, including clean up stages, are recorded.	NA	✓
2. Are dates and analysts for cleanups recorded?	NA	NA
3. Are correct IDs used for standards? Are expiration dates to day/month/year, when listed?	NA	✓
D. Documentation		
1. Are all nonconformances documented appropriately?	NA	NA
2. QuantIMs entry correct, including dates and times.	NA	✓
3. Are all fields completed?	NA	✓

Spike witness: [illegible] Date: 11/9/10

2nd Level Reviewer: SA Date: 11/10/10

Comments:

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TestAmerica West Sacramento

Mercury Sample Preparation Log

ANALYST: TP/FF							SOP NO: WS-MT-0005
Date: 11/08/10							
			Method:7470				Autoclave Start Time:20:00
Balance ID:007							Autoclave End Time:21:00
Lot Number	WO #	pH	Matrix	Initial Wt(g)	Final Vol (mL)	Batch #	Comments:
G0K080000-130	L9N05BF	<2	AQUEOUS	30.00	30.00	312130	
G0K080000-130	L9N05CF	<2	AQUEOUS	30.00	30.00	312130	
G0J280597-1	L89P0F	<2	AQUEOUS	30.00	30.00	312130	
G0J280597-1	L89P0SF	<2	AQUEOUS	30.00	30.00	312130	
G0J280597-1	L89P0DF	<2	AQUEOUS	30.00	30.00	312130	
G0J280597-2	L89P1F	<2	AQUEOUS	30.00	30.00	312130	
G0J280597-3	L89P3F	<2	AQUEOUS	30.00	30.00	312130	
G0J280603-1	L89VGF	<2	AQUEOUS	30.00	30.00	312130	
G0J280603-2	L89VRF	<2	AQUEOUS	30.00	30.00	312130	
G0J280603-3	L89VTF	<2	AQUEOUS	30.00	30.00	312130	
G0J280603-4	L89VVF	<2	AQUEOUS	30.00	30.00	312130	
G0J280603-12	L89WAF	<2	AQUEOUS	30.00	30.00	312130	
G0J290605-5	L9CLJF	<2	AQUEOUS	30.00	30.00	312130	
G0K010484-8	L9EEQF	<2	AQUEOUS	30.00	30.00	312130	
G0K080000-131	L9N08BF	<2	AQUEOUS	30.00	30.00	312131	
G0K080000-131	L9N08CF	<2	AQUEOUS	30.00	30.00	312131	
G0J300458-1	L9C4MF	<2	AQUEOUS	30.00	30.00	312131	
G0J300458-2	L9C5DF	<2	AQUEOUS	30.00	30.00	312131	
G0J300458-3	L9C5EF	<2	AQUEOUS	30.00	30.00	312131	
G0K060482-1	L9NLNF	<2	AQUEOUS	30.00	30.00	312131	
G0K060482-2	L9NLPF	<2	AQUEOUS	30.00	30.00	312131	
G0K060482-3	L9NLQF	<2	AQUEOUS	30.00	30.00	312131	
G0K060482-4	L9NLRF	<2	AQUEOUS	30.00	30.00	312131	
G0K060482-5	L9NLTSF	<2	AQUEOUS	30.00	30.00	312131	
G0K060482-5	L9NLTF	<2	AQUEOUS	30.00	30.00	312131	
G0K060482-5	L9NLTDF	<2	AQUEOUS	30.00	30.00	312131	
G0K090000-131	L9P8MB	<2	AQUEOUS	30.00	30.00	313131	
G0K090000-131	L9P8MC	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-2	L880P	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-3	L880QS	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-3	L880Q	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-3	L880QD	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-4	L880R	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-5	L880T	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-6	L880V	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-7	L880W	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-8	L880X	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-9	L8801	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-10	L8802	<2	AQUEOUS	30.00	30.00	313131	
G0J280529-11	L8804	<2	AQUEOUS	30.00	30.00	313131	

TestAmerica West Sacramento

Mercury Sample Preparation Log

G0K090000-132	L9P8TB	<2	AQUEOUS	30.00	30.00	313132	
G0K090000-132	L9P8TC	<2	AQUEOUS	30.00	30.00	313132	
G0J290569-3	L9CE6S	<2	AQUEOUS	30.00	30.00	313132	
G0J290569-3	L9CE6	<2	AQUEOUS	30.00	30.00	313132	
G0J290569-3	L9CE6D	<2	AQUEOUS	30.00	30.00	313132	
G0K090000-136	L9P87B	<2	AQUEOUS	30.00	30.00	313136	
G0K090000-136	L9P87C	<2	AQUEOUS	30.00	30.00	313136	
G0J300458-1	L9C4M	<2	AQUEOUS	30.00	30.00	313136	
G0J300458-2	L9C5D	<2	AQUEOUS	30.00	30.00	313136	
G0J300458-3	L9C5E	<2	AQUEOUS	30.00	30.00	313136	
G0K060482-1	L9NLN	<2	AQUEOUS	30.00	30.00	313136	
G0K060482-2	L9NLP	<2	AQUEOUS	30.00	30.00	313136	
G0K060482-3	L9NLQ	<2	AQUEOUS	30.00	30.00	313136	
G0K060482-4	L9NLR	<2	AQUEOUS	30.00	30.00	313136	
G0K060482-5	L9NLTS	<2	AQUEOUS	30.00	30.00	313136	
G0K060482-5	L9NLT	<2	AQUEOUS	30.00	30.00	313136	
G0K060482-5	L9NLTD	<2	AQUEOUS	30.00	30.00	313136	
G0K090000-137	L9P89B	<2	AQUEOUS	30.00	30.00	313137	
G0K090000-137	L9P89C	<2	AQUEOUS	30.00	30.00	313137	
G0K020530-1	L9FW8S	<2	AQUEOUS	30.00	30.00	313137	
G0K020530-1	L9FW8	<2	AQUEOUS	30.00	30.00	313137	
G0K020530-1	L9FW8D	<2	AQUEOUS	30.00	30.00	313137	
G0K020530-2	L9FXA	<2	AQUEOUS	30.00	30.00	313137	
G0K020530-3	L9FXC	<2	AQUEOUS	30.00	30.00	313137	
G0K090000-185	L9QA6B	<2	AQUEOUS	30.00	30.00	313185	
G0K090000-185	L9QA6C	<2	AQUEOUS	30.00	30.00	313185	
G0K010425-1	L9DQCS	<2	AQUEOUS	30.00	30.00	313185	
G0K010425-1	L9DQC	<2	AQUEOUS	30.00	30.00	313185	
G0K010425-1	L9DQCD	<2	AQUEOUS	30.00	30.00	313185	
0.0 ppb Curve	N/A	N/A	AQUEOUS	30.00	30.00		
ICB	N/A	N/A	AQUEOUS	30.00	30.00		
CCB1	N/A	N/A	AQUEOUS	30.00	30.00		
CCB2	N/A	N/A	AQUEOUS	30.00	30.00		
CCB3	N/A	N/A	AQUEOUS	30.00	30.00		

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento Mercury Preparation Spiking Documentation Form

G0K060482(1-5T) G0K060482(1-5)(SS)
G0J280529 G0J290605(5) G0K010484(8) G0J300458(1-3) G0K020530(1-3)

Lot #(s): G0J280597(1-3) G0J280603(1-4, 12) G0K010425(1) Matrix: AQUEOUS

Batch Number(s): 0312130, 0312131, 0313187, 0313137 MS Run #(s): G0K020530-15/50 (G0K060482-5 5/50 T-D) G0K010425-15/50 G0J280597-15/50 SOP No: WS-MT-0005

Spiked by Initial/Date: 0313137, 0313131, 0313136 11/08/10 Witness Initial/Date: G0J280529-35/50 G0J290564-35/50 11-08/10 NM Date: 11/8/10

Dig. Cup Lot # 0158551

ICV

Bottle Name	Concentration (ug/L)	Tracking Number	ICV Volume Spiked	Expiration Date
Mercury Standard	100 ug/L Mercury	3638-15-14	600ul ☑ Witness	11/9/10

LCS/LCSD/MS/MSD

Bottle Name	Concentration (ug/L)	Tracking Number	LCS/LCSD Volume Spiked	MS/SD Volume Spiked	Expiration Date
Mercury Standard	100 ug/L Mercury	3638.15-15	300ul ☑ Witness	300ul ☑ Witness	11/9/10

ICAL & CCVs

Solution	Conc'n	Tracking Number	Expiration Date	Volume Spiked								
				ICAL 0.2	ICAL 0.5	ICAL 1.0	ICAL 5.0	ICAL 10	CCV1	CCV2	CCV3	CCV4
Mercury Standard	100 ug/L Mercury	3638-1515	11/9/10	60ul ☑ Witness	150ul ☑ Witness	300ul ☑ Witness	1.5ml ☑ Witness	3.0ml ☑ Witness	1.5 ☑ Witness	1.5 ☑ Witness	1.5 ☑ Witness	☑ Witness

Reagents

Check If Used	Reagent	Supplier	Lot Number	Check If Used	Reagent	Supplier	Lot Number
✓	HNO_3	Mallinkrodt	J12035	✓	$K_2S_2O_8$	Mallinkrodt	4028-17-11
✓	H_2SO_4	Mallinkrodt	J09F01	✓	$NaCl(NH_2OH)_2$	Mallinkrodt J. T. Baker	4028-27-4
✓	$KMnO_4$	J. T. Baker	4028-27-3	✓	$SnCl_2$	Mallinkrodt	4028-28-2

Recipes/Recommended Spiking (100 ug/mL solution)

Element	Solid (50mL FV)	Aq/Leach (30mL FV)	Element	Solid (50mL FV)	Aq/Leach (30mL FV)
ICAL 0.2	100 uL	60 uL	CCV 5.0	2.5 mL	1.5 mL
ICAL 0.5	250 uL	150 uL	LCS 1.0	0.5 mL	300 uL
ICAL 1.0	0.5 mL	300 uL	MS/MSD 3.0	1.5 mL	300 uL
ICAL 5.0	2.5 mL	1.5 mL	ICV 2.0	1.0 mL	600 uL
ICAL 10	5.0 mL	3.0 mL			

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento

Preparation Data Review Checklist

0313136, 0313137, 0313185
0313131, 0313132

Prep Batch(es) 0312130, 0312131 **Test:** Hg

Prep Date: 11/8/10 **Holding Times:** ~~5/24/11~~ 11/23/10 11/09/10 **NCM:** Y (N)

A. Spike Witness/Batch setup	Spike Witness	Reviewer
1. **Holding times checked?** NCMs filed as appropriate	✓	✓
2. QAS checked for QC instructions (LCS, LCSD, MS,MSD, etc)	✓	✓
3. Amount of samples in hood match amount of samples on bench sheet. Sample IDS match.	✓	NA
4. Worksheets have been checked for required spiking compounds	✓	✓
5. Spiking volumes are correctly documented	✓	✓
6. Std ID numbers on spike labels match numbers on bench sheet	✓	NA
7. Expiration dates have been checked	✓	✓
8. Calibration expiration dates on pipettors have been checked	✓	NA
9. Spiker and spike witness have signed and dated bench sheet	✓	✓
B. Weights and Volumes		
1. Recorded weights are in anticipated range	NA	NA
2. Balance upload or raw data for weights is included	NA	NA
3. Weights and volumes have been transcribed correctly to LIMS.	NA	✓
4. Weights are not targeted to meet exact weights.	NA	NA
5. Each weight or volume measurement is a unique record (no dittos or line downs)	NA	✓
C. Standards and Reagents		
1. Lot numbers for all reagents, including clean up stages, are recorded.	NA	✓
2. Are dates and analysts for cleanups recorded?	NA	NA
3. Are correct IDs used for standards? Are expiration dates to day/month/year, when listed?	NA	✓
D. Documentation		
1. Are all nonconformances documented appropriately?	NA	NA
2. QuantIMs entry correct, including dates and times.	NA	✓
3. Are all fields completed?	NA	✓

Spike witness: NM Date: 11/08/10

2nd Level Reviewer: SH Date: 11/10/10

Comments:

q:\forms\checklists\qa-588 prep_review.doc QA-588 Revised 12/30/2008 ERS

TestAmerica West Sacramento

Mercury Sample Preparation Log

ANALYST: TP							SOP NO: WS-MT-0007
Date: 11/10/10							
			Method:7471				Autoclave Start Time:16:00
Balance ID:007							Autoclave End Time:17:00
Lot Number	WO #	pH	Matrix	Initial Wt(g)	Final Vol (mL	Batch #	Comments:
G0K100000-330	L9T0TB	N/A	SOLID	0.60	50.00	314330	
G0K100000-330	L9T0TC	N/A	SOLID	0.60	50.00	314330	
G0K100000-330	L9T0TL	N/A	SOLID	0.60	50.00	314330	
G0K020557-1	L9F5R	N/A	SOLID	0.60	50.00	314330	
G0K020557-3	L9F5V	N/A	SOLID	0.56	50.00	314330	
G0K020557-5	L9F5X	N/A	SOLID	0.62	50.00	314330	
G0K020557-7	L9F51	N/A	SOLID	0.62	50.00	314330	
G0K020557-9	L9F53	N/A	SOLID	0.63	50.00	314330	
G0K040449-1	L9JPM	N/A	SOLID	0.59	50.00	314330	
G0K040449-3	L9JP0	N/A	SOLID	0.62	50.00	314330	
G0K050467-1	L9L5F	N/A	SOLID	0.56	50.00	314330	
G0K050467-3	L9L5K	N/A	SOLID	0.62	50.00	314330	
G0K050467-5	L9L5M	N/A	SOLID	0.65	50.00	314330	
G0K050467-7	L9L5V	N/A	SOLID	0.64	50.00	314330	
G0K060474-1	L9NJR	N/A	SOLID	0.59	50.00	314330	
G0K060474-3	L9NJV	N/A	SOLID	0.62	50.00	314330	
G0K070000-36	L9NM1B	N/A	SOLID	0.60	50.00	311036	
G0K070000-36	L9NM1C	N/A	SOLID	0.60	50.00	311036	
G0J260451-1	L84EX	N/A	SOLID	0.60	50.00	311036	
G0J260451-2	L84E9	N/A	SOLID	0.58	50.00	311036	
G0J260451-3	L84FA	N/A	SOLID	0.57	50.00	311036	
G0J260451-4	L84FDS	N/A	SOLID	0.58	50.00	311036	
G0J260451-4	L84FD	N/A	SOLID	0.57	50.00	311036	
G0J260451-4	L84FDD	N/A	SOLID	0.64	50.00	311036	
G0J260451-5	L84FF	N/A	SOLID	0.57	50.00	311036	
G0J260451-7	L84FL	N/A	SOLID	0.62	50.00	311036	
G0J260451-8	L84FN	N/A	SOLID	0.64	50.00	311036	
G0J260451-9	L84FQ	N/A	SOLID	0.61	50.00	311036	
G0J260451-10	L84FR	N/A	SOLID	0.63	50.00	311036	
G0J260451-11	L84FT	N/A	SOLID	0.58	50.00	311036	
G0J260451-12	L84FV	N/A	SOLID	0.64	50.00	311036	
G0J260451-13	L84FW	N/A	SOLID	0.63	50.00	311036	
G0K100000-382	L9VGDB	N/A	SOLID	0.60	50.00	314382	
G0K100000-382	L9VGDC	N/A	SOLID	0.60	50.00	314382	
G0J280447-22	L88A0S	N/A	SOLID	0.58	50.00	314382	
G0J280447-22	L88A0	N/A	SOLID	0.60	50.00	314382	
G0J280447-22	L88A0D	N/A	SOLID	0.57	50.00	314382	
G0K090000-105	L9P7WB	N/A	SOLID	0.60	50.00	313105	
G0K090000-105	L9P7WC	N/A	SOLID	0.60	50.00	313105	
G0J260587-24	L85K1	N/A	SOLID	0.60	50.00	313105	

TestAmerica West Sacramento

Mercury Sample Preparation Log

G0J290569-1	L9CEMS	N/A	SOLID	0.56	50.00	313105	
G0J290569-1	L9CEM	N/A	SOLID	0.57	50.00	313105	
G0J290569-1	L9CEMD	N/A	SOLID	0.57	50.00	313105	
G0J290569-2	L9CE5	N/A	SOLID	0.60	50.00	313105	
G0K100000-146	L9RPDB	N/A	SOLID	0.60	50.00	314146	
G0K100000-146	L9RPDC	N/A	SOLID	0.60	50.00	314146	
G0J290609-2	L9CNWS	N/A	SOLID	0.62	50.00	314146	
G0J290609-2	L9CNWD	N/A	SOLID	0.60	50.00	314146	
G0J290609-2	L9CNW	N/A	SOLID	0.63	50.00	314146	
G0J290609-3	L9CNX	N/A	SOLID	0.60	50.00	314146	
G0J300481-1	L9C76	N/A	SOLID	0.56	50.00	314146	
G0K080481-1	L9P12	N/A	SOLID	0.56	50.00	314146	
G0K100000-306	L9P70B	N/A	SOLID	0.60	50.00	313106	
G0K100000-306	L9P20C	N/A	SOLID	0.60	50.00	313106	
G0K020530-4	L9FXD	N/A	SOLID	0.57	50.00	313106	
G0K020530-5	L9FXE	N/A	SOLID	0.63	50.00	313106	
G0K020530-6	L9FXF	N/A	SOLID	0.63	50.00	313106	
G0K020530-7	L9FXG	N/A	SOLID	0.59	50.00	313106	
G0K020530-8	L9FXH	N/A	SOLID	0.58	50.00	313106	
G0K020530-9	L9FXJ	N/A	SOLID	0.59	50.00	313106	
G0K020530-10	L9FXL	N/A	SOLID	0.56	50.00	313106	
G0K020530-11	L9FXM	N/A	SOLID	0.62	50.00	313106	
G0K020530-12	L9FXNS	N/A	SOLID	0.62	50.00	313106	
G0K020530-12	L9FXN	N/A	SOLID	0.60	50.00	313106	
G0K020530-12	L9FXND	N/A	SOLID	0.63	50.00	313106	
G0K020530-13	L9FXQ	N/A	SOLID	0.64	50.00	313106	
G0K020530-14	L9FXW	N/A	SOLID	0.57	50.00	313106	
ICB	N/A	N/A	SOLID	50.00	50.00		
0.0 ppb Curve	N/A	N/A	SOLID	50.00	50.00		
CCB1	N/A	N/A	SOLID	50.00	50.00		
CCB2	N/A	N/A	SOLID	50.00	50.00		
CCB3	N/A	N/A	SOLID	50.00	50.00		

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THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento Mercury Preparation Spiking Documentation Form

G0K040449 (1,3)
G0K050447 (1,3,5,7,9) G0J260587 (2,4) G0J290569 (1-2), G0K020530 (1-3,5,7,9) G0K040449 (1,3)

Lot #(s): G0K020530 (4-14) G0J260451 (1-5,7-13) Matrix: Solid

0313105, 0311034. G0K020530-12 S/SD, G0J290569-15/SD

Batch Number(s): 0313105 0314144. MS Run #(s): G0J260451-45/SD SOP No: WS-M-007

0314330 G0J260447-22 S/22SD

Spiked by Initial/Date: PF 11/10/10 Witness Initial/Date: 11/10/10 NH Date: 11/10/10

Dig. Cup Lot # 0158551

ICV

Bottle Name	Concentration (ug/L)	Tracking Number	ICV Volume Spiked	Expiration Date
Mercury Standard	100 ug/L Mercury	3638-15-18	1.0 ml ☑ Witness	11/11/10

LCS/LCSD/MS/MSD

Bottle Name	Concentration (ug/L)	Tracking Number	LCS/LCSD Volume Spiked	MS/SD Volume Spiked	Expiration Date
Mercury Standard	100 ug/L Mercury	3638-15-17	0.5 ml ☑ Witness	1.5 ml ☑ Witness	11/11/10

ICAL & CCVs

Solution	Conc'n	Tracking Number	Expiration Date	Volume Spiked								
				ICAL 0.2	ICAL 0.5	ICAL 1.0	ICAL 5.0	ICAL 10	CCV1	CCV2	CCV3	CCV4
Mercury Standard	100 ug/L Mercury	3638-15-17	11/11/10	100 ul	250 ul	0.5 ml	2.5 ml	~~10.0 ml~~ 10.0 ml PF 11/14/10	~~10.0 ml~~ 2.5 ml	2.5 ml	2.5 ml	
				☑ Witness	☑ Witness	☑ Witness	☑ Witness	☑ Witness	☑ Witness	☑ Witness	☑ Witness	☐ Witness

Reagents

Check If Used	Reagent	Supplier	Lot Number	Check If Used	Reagent	Supplier	Lot Number
✓	HNO_3	Mallinkrodt	J 12035	✓	$K_2S_2O_8$	Mallinkrodt	4028-17-11
✓	H_2SO_4	Mallinkrodt	J 09F01	✓	$NaCl(NH_2OH)_2$	Mallinkrodt J. T. Baker	4028-27-4
✓	$KMnO_4$	J. T. Baker	4028-28-1	✓	$SnCl_2$	Mallinkrodt	4028-28-3

Recipes/Recommended Spiking (100 ug/mL solution)

Element	Solid (50mL FV)	Aq/Leach (30mL FV)	Element	Solid (50mL FV)	Aq/Leach (30mL FV)
ICAL 0.2	100 uL	60 uL	CCV 5.0	2.5 mL	1.5 mL
ICAL 0.5	250 uL	150 uL	LCS 1.0	0.5 mL	300 uL
ICAL 1.0	0.5 mL	300 uL	MS/MSD 3.0	1.5 mL	300 uL
ICAL 5.0	2.5 mL	1.5 mL	ICV 2.0	1.0 mL	600 uL
ICAL 10	5.0 mL	3.0 mL			

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THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento Metals Weights Log

11/9/2010 Prep code 46

SOP: WS-IP-002

Chemist:FF Matrix: Solid 6020

BATCH: 0313106

Balance ID QA-007

Lot Number	Sample	Initial Wt/Vol	Comments
G0K020530	4	0.57	
G0K020530	5	0.63	
G0K020530	6	0.63	
G0K020530	7	0.59	
G0K020530	8	0.58	
G0K020530	9	0.59	
G0K020530	10	0.56	
G0K020530	11	0.62	
G0K020530	12	0.60	
G0K020530	12MS	0.62	
G0K020530	12MSD	0.63	
G0K020530	13	0.64	
G0K020530	14	0.57	

C:\Documents and Settings\francisf\Desktop\QA-591 Metals Weights.xlsSoils QA-591(Solid) ERS 11/13/2008

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

West Sacramento

Preparation Data Review Checklist

Prep Batch(es) 0313105 0313105, 0311036 **Test:** Hg

Prep Date: 11/10/10 **Holding Times:** 11/18/10 **NCM:** Y (N)

A. Spike Witness/Batch setup	Spike Witness	Reviewer
1. **Holding times checked?** NCMs filed as appropriate	✓	✓
2. QAS checked for QC instructions (LCS, LCSD, MS,MSD, etc)	✓	✓
3. Amount of samples in hood match amount of samples on bench sheet. Sample IDS match.	✓	NA
4. Worksheets have been checked for required spiking compounds	✓	✓
5. Spiking volumes are correctly documented	✓	✓
6. Std ID numbers on spike labels match numbers on bench sheet	✓	NA
7. Expiration dates have been checked	✓	✓
8. Calibration expiration dates on pipettors have been checked	✓	NA
9. Spiker and spike witness have signed and dated bench sheet	✓	✓
B. Weights and Volumes		
1. Recorded weights are in anticipated range	NA	✓
2. Balance upload or raw data for weights is included	NA	✓
3. Weights and volumes have been transcribed correctly to LIMS.	NA	✓
4. Weights are not targeted to meet exact weights.	NA	NA
5. Each weight or volume measurement is a unique record (no dittos or line downs)	NA	✓
C. Standards and Reagents		
1. Lot numbers for all reagents, including clean up stages, are recorded.	NA	✓
2. Are dates and analysts for cleanups recorded?	NA	NA
3. Are correct IDs used for standards? Are expiration dates to day/month/year, when listed?	NA	✓
D. Documentation		
1. Are all nonconformances documented appropriately?	NA	NA
2. QuantIMs entry correct, including dates and times.	NA	✓
3. Are all fields completed?	NA	✓

Spike witness: N M Date: 11/10/10

2nd Level Reviewer: SA Date: 11/15/10

Comments:

q:\forms\checklists\qa-588 prep_review.doc *QA-588 Revised 12/30/2008 ERS*

SOLID, D 2216-90, Percent Moisture

% Moisture/Solid Worksheet

QCBATCH: 0313210

Analyzed by: FRANCISF Report created: 11/10/10 11:35:14 AM

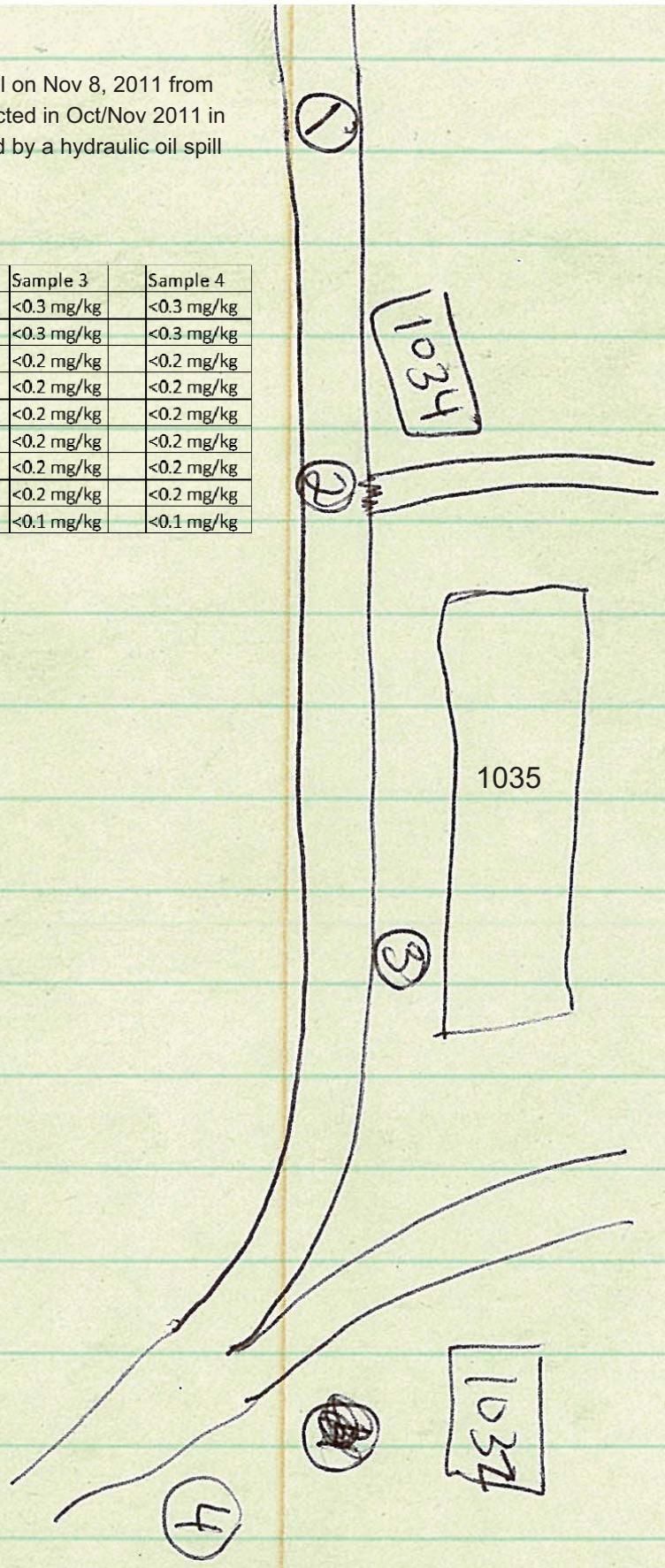
Lot ID	WorkOrder	Pan Tare	Sample Wet Wt	Sample Dry Wt	Wt Diff (Water)	Percent Water	Percent Solid	Reporting Limit	Foot Note	Date Time
G0J280451-10	L88C41AK	1.34	9.27	8.69	0.58	7.31	92.69	0.1		11/10/10 11:33:00 AM
G0J280451-10	L88C41AN	1.33	8.67	8.15	0.52	7.08	92.92	0.1		11/10/10 11:33:09 AM
G0J280451-11	L88C61AK	1.34	9.81	9.05	0.76	8.97	91.03	0.1		11/10/10 11:33:21 AM
G0J280451-12	L88C71AK	1.34	11.67	11.08	0.59	5.71	94.29	0.1		11/10/10 11:33:29 AM
G0J300481-1	L9C761AA	1.34	11.36	9.83	1.53	15.27	84.73	0.1		11/10/10 11:33:37 AM
G0K020530-4	L9FXD1AA	1.35	9.51	7.97	1.54	18.87	81.13	0.1		11/10/10 11:33:46 AM
G0K020530-5	L9FXE1AA	1.35	11.70	9.80	1.90	18.36	81.64	0.1		11/10/10 11:33:55 AM
G0K020530-6	L9FXF1AA	1.34	9.75	8.33	1.42	16.88	83.12	0.1		11/10/10 11:34:02 AM
G0K020530-7	L9FXG1AA	1.34	12.35	10.97	1.38	12.53	87.47	0.1		11/10/10 11:34:10 AM
G0K020530-8	L9FXH1AA	1.33	12.19	10.61	1.58	14.55	85.45	0.1		11/10/10 11:34:18 AM
G0K020530-9	L9FXJ1AA	1.33	10.00	9.05	0.95	10.96	89.04	0.1		11/10/10 11:34:25 AM
G0K020530-10	L9FXL1AA	1.33	11.52	10.23	1.29	12.66	87.34	0.1		11/10/10 11:34:33 AM
G0K020530-11	L9FXM1AA	1.33	11.36	10.31	1.05	10.47	89.53	0.1		11/10/10 11:34:41 AM
G0K020530-12	L9FXN1AA	1.33	9.66	8.14	1.52	18.25	81.75	0.1		11/10/10 11:34:50 AM
G0K020530-13	L9FXQ1AA	1.33	9.39	8.22	1.17	14.52	85.48	0.1		11/10/10 11:34:58 AM
G0K020530-14	L9FXW1AA	1.33	8.76	7.62	1.14	15.34	84.66	0.1		11/10/10 11:35:06 AM

All weights are in grams.
Sample weights (wet & dry) include the weight (tare) of the sample pan.
Wt. Diff. = sample wet weight (+ tare) - sample dry weight (+ tare).
% Water = (Wt. Diff/(sample wet weight - pan tare))*100
% Solid = 100 - percent Water

3

Sketch and analytical data received via email on Nov 8, 2011 from NSF-IH Environmental Dept. Samples collected in Oct/Nov 2011 in preparation for cleanup of soils contaminated by a hydraulic oil spill at the "Trident Plant" portion at IRP Site 69.

	Sample 1		Sample 2		Sample 3		Sample 4
RDX	<0.3 mg/kg		<0.3 mg/kg		<0.3 mg/kg		<0.3 mg/kg
HMX	<0.3 mg/kg		<0.3 mg/kg		<0.3 mg/kg		<0.3 mg/kg
TNT	<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg
TEGDN	<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg
PGDN	<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg
NG	<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg
BTTN	<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg
TMETN	<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg		<0.2 mg/kg
NC	<0.2 mg/kg		<0.1 mg/kg		<0.1 mg/kg		<0.1 mg/kg



Henderson, Chris CTR

From: Helberg, Steven L CIV NAVSURFWARCENDIV
Sent: Thursday, August 12, 2010 8:37 AM
To: Henderson, Chris CTR
Subject: B-259 Soil Analysis
Attachments: B259_52626 to 52630 SS.xls
Signed By: steven.helberg@navy.mil

Chris,
I've attached a summary spreadsheet that lists the quantitated elements I feel are important for the ICAP analysis. Lead and mercury are present in varying amounts from a little to a lot for an environmental sample. I'm sure that all of these samples would not pass the TCLP test for toxicity for lead or mercury or both.

Joe Petitto ran DSC on any samples and didn't find anything that would indicate the samples contain explosives. If azides, either sodium from the starting material or lead from the finished product, were present, he would have seen a large exotherm between 300C and 350C.

I checked the samples for reactivity using a few simple tests and made the following observations:

1. At the start of the digestion when I added 50% nitric acid, customer sample ids 250-004 and 250-005 noticeably effervesced indicating gas was being produced. The clay soils of this area don't normally do that and I didn't expect any azides to be present after 50 years or so in the environment because they are fairly reactive so I was a little puzzled. In addition, azides are normally destroyed by a reducing medium and not an oxidizing acid like nitric. I gave these samples the sniff test and didn't detect any rotten egg smell from hydrogen sulfide or burnt almond smell from hydrogen cyanide so they probably pass EPA's reactivity test for those particular gases.

2. I checked for azide in all the samples by creating hydrozoic acid from a solution of sodium nitrite and acidifying it with 50% hydrochloric acid after the nitrite was added to beakers that contained five grams of each sample and 50ml of water that stood overnight. The first three samples, 259-001 -002 -003, had a frothy layer on the surface of the water after an hour, sample 259-004 effervesced fairly vigorously, and sample 259-005 effervesced but with less vigor than 259-004. At this point I had the DSC results and knew that the gas production from the samples was not from azide.

3. I checked the elemental analysis from the ICAP for sodium to see if the samples were possibly contaminated with sodium bicarbonate or carbonate from a cleaning or neutralization process that might have occurred at B-259 in the past but found no detectable sodium at all in any of the samples. Magnesium and zinc were found in elevated levels in the samples that effervesced most vigorously, 259-004 and 259-005, leading me to suspect that they were present in samples as metal powders from manufacturing processes or waste and not as compounds spilled near B-259 as a process or occurring naturally in the soil. Magnesium and zinc levels in the first three samples, 259-001 -002 -003, were elevated for the clay soil type found in this area and I suspect they also present in these samples as metal powders but to a lesser degree than samples 259-004 and 259-005. In any case, if magnesium and zinc are present as metal powders, they will react with acids to form hydrogen gas. This would make the samples reactive (potentially explosive) in accordance with EPA's definition of reactivity. Further testing would be required to verify the presence of metal powders or the production of hydrogen gas in the presence of acids.

n summary, samples 259-001 thru 259-005, are hazardous waste because they are most likely oxic and reactive by EPA definition even though they do not contain explosives. Please call e if you have any questions.

teve Helberg
hemist-Code R32SH
SWC Indian Head Division
326 Whitman Court Suite 102
uilding 1864
ndian Head, MD 20640
oicemail/Direct Ph. 301-744-1253
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ax 301-744-4865

BUILDING 259 SOILS ELEMENTAL ANALYSIS

	Lab Reference Number / Customer Sample ID				
	QUANTITATED IN WEIGHT PERCENT (WT%)				
	52626 / 259-001	52627 / 259-002	52628 / 259-003	52629 / 259-004	52630 / 259-005
ELEMENTS					
LEAD	0.172	0.722	0.420	0.164	2.36
MAGNESIUM	0.0628	0.149	0.142	0.768	0.108
MERCURY	6.78	0.0186	0.720	0.0394	0.00579
ZINC	0.0411	0.240	0.198	0.165	0.797

Work Review Form to Decontaminate Building 259 at the Naval Surface Warfare Center Indian Head, Maryland

1. WRF Number:	20100331- Building 259	**2. Date:**	03/31/10
3. Location:	IHD NSWC Indian Head, Maryland	**4. Originator:**	J. Beitler L. Scott
5. General or Site Specific:	Site Specific		
6. Description:	Explosives Decontamination of Building 259		
7. WRF Revision: N/A			
8. Title/Number of associated SOPs:			
SOP #381-001 (General Building Decontamination Instructions) SOP #500-005 (Materials Potentially Presenting an Explosive Hazard (MPPEH)) SOP #500-006 (All Procedures Certification and Verification)			
9. Name of hazardous material: cyclotetramethylene trinitramine (HMX), cyclotrimethylenetrinitramine (RDX), trinitrotoluene (TNT), Nitrocellulose (NC), Nitroglycerin (NG), Ammonium Perchlorate (AP), Lead Azide			
10. Scale of Operation (Total Weight): Trace amounts			
11. Dates of Operation (From / To): 03/31/10 to 6/30/10			
12. Refer to any pertinent approved WRF: none			
13. Recommendations:	(Signature)	(Date)	
Project Supervisor James Fenwick	James A. Fenwick	5/3/10	
Project Engineer Anne Caris	Anne Caris	3 MAY 2010	
Deputy Department Head Joseph D. Anderson	Joseph D. Anderson	18 May 2010	
14. Approval:	(Signature)	(Date)	
Explosive Safety Dianne Newton	Dianne Newton	21 May 2010	

15.	**Explosive Characteristics (Sensitivity) L=Low, M = Medium, H = High, N/A = Not Available**			
	Explosive	**Impact**	**Friction**	**ESD**
	HMX	M	M	M
	RDX	M	M	M
	TNT	M	L	M
	NC	M	L	M
	NG	H	H	M
	AP	M	L	M
	Lead Azide	H	H	N/A

16.	**Environmental Protection**
	A. Explosive Hazardous Waste (EHW) Materials Generated: EHW may be generated if bulk contamination is found. Any EHW will be identified and placed in a Velostat® bag. The inventory log (Enclosure 1) must be filled out to ensure that the material is properly tracked and inspected. All EHW will be stored in an approved explosive hazardous waste accumulation site.
	B. Hazardous Waste (HW) Material Generated: No hazardous waste is expected to be generated.
	C. List Method and Location for Disposal of Wastes: 1. Any explosive material found will be collected in Velostat® bags and disposed of through burning at the Strauss Avenue Thermal Treatment Point (SATTP). 2. Rags contaminated with trace amounts of explosives and/or solvent will be disposed of at the SATTP. 3. Decontamination water is to be collected in tanks or drums and labeled as "wastewater". Decontamination water will be managed as a controlled waste until characterized. The water is to be sampled and disposed of per the sample results.
	D. List Other Environmental Issues and Their Resolution: There is presumed asbestos containing material (PACM) in the rope on the Precision Scientific oven doors. There may be PACM within any ovens stored within the building.

17.	**Supplementary Setup Information. Follow the following SOP steps:**
General Building Decontamination Instructions SOP: 381-001	All Sections
Materials Potentially Presenting an Explosive Hazard (MPPEH) SOP 500-005	All Sections
All Procedures Certification and Verification SOP: 500-006	All Sections

18. Supplementary Process Information

This procedure addresses the decontamination of Building 259 (Figures 1 and 2) at IHD NSWC in Indian Head, Maryland. A review of Public Works facility records, Safety Department records, and applicable blueprints was completed. Building 259 was constructed in 1917 and used as a storehouse. During WWI, lead azide was produced outside the building and cooled by water that ran through the trench outside. The inside of the building was used for storage. It is currently full of equipment including heat exchangers, mills, reactors, ovens and a fume hood. It has a concrete foundation and occupies approximately 320 square feet.

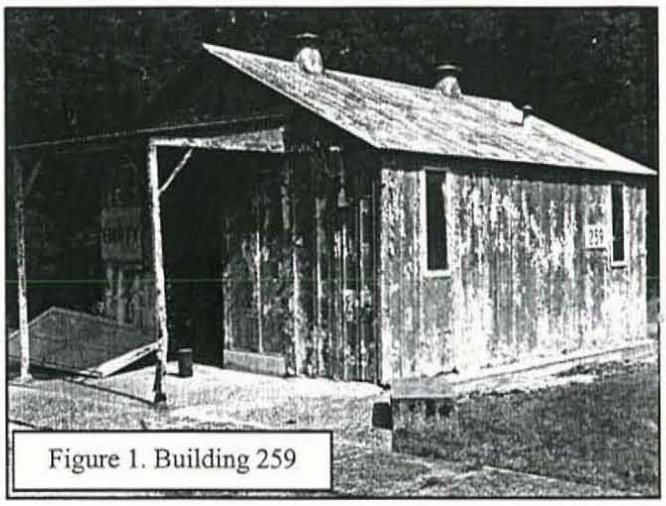


Figure 1. Building 259

Building 259 is an inert storehouse with no explosive limits on the building. The explosive contaminants of concern are potential trace amounts of HMX, RDX, TNT, NC, NG, AP, and Lead Azide. There is potential for explosive contamination within any equipment stored in the building.

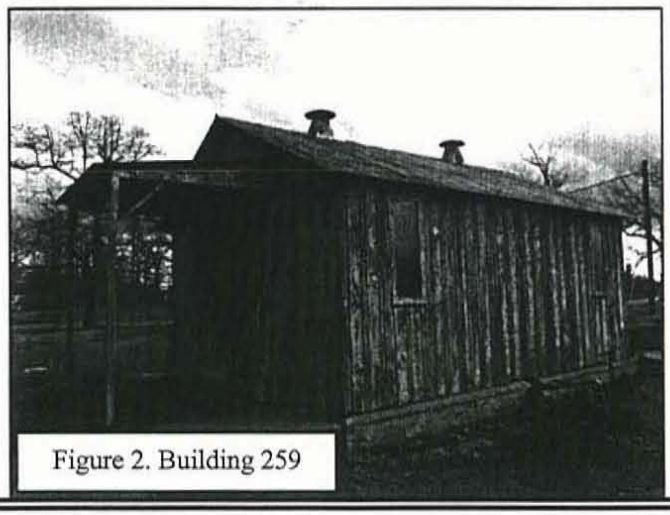
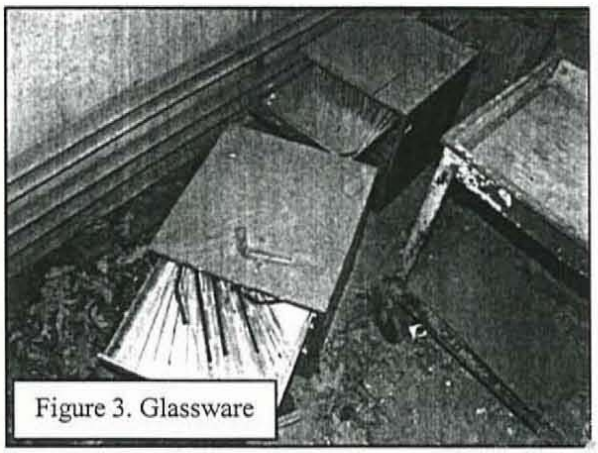


Figure 2. Building 259

19A. Building 259 Decontamination Pre-Start	
	Personnel performing tasks shall initial and date in the space to the left of the step performed to certify that the task has been accomplished.
5-25-10 B.B. L.L.D. 9B9	1. Stage all equipment on site as specified in the 'Equipment Authorized for Use' section of this report. NOTE: Any electrical power on site must be run through a ground fault circuit interrupter (GFCI) including power supplied from a portable generator.
9B9 - BO 5-25-10 BO L.L.D.	2. Don personal protective equipment as listed in the 'Personal Protective Equipment' section of this report. Ear plugs or circumaural muffs must be worn within the radii listed in the hazard control briefing.
L.L.D. → 9B9 - 5-25-10 BO	3. Lockout/tagout any energy isolating devices in the building. All lines Cut off
19B. Building 259 Decontamination	
NOTE: Any items that can only be decontaminated to the 3X level are to be thermally treated at the Industrial Waste Processor (IWP). WARNING: In the event that bulk explosives contamination is found, collect the material in a labeled Velostat® bag and prepare the material for disposal at the SATTP. Record the material in Enclosure 1 (inventory log).	
5-25-10 B.B. L.L.D. 9B9	2. Locate the small cabinets containing glassware (Figure 3). Inspect any glassware to ensure that no explosive hazards are present. Any glassware certified as being free from explosive contamination may be disposed of as general trash. Any glassware that cannot be certified as being free of explosive hazards may be transported as 3X to IWP for thermal treatment.  Figure 3. Glassware

5-27-10 BG. L.L.D. 989

3. Locate the Forma oven (Figure 4). Perform an inspection of the oven for PACM. Use a spray bottle to wet down the oven with water prior to using hand tools for disassembly. Disassemble the oven and remove the oven door. Inspect the oven for additional PACM.

If abatement is required to complete the inspection of all voids then follow the instructions in Step 4 of this section.

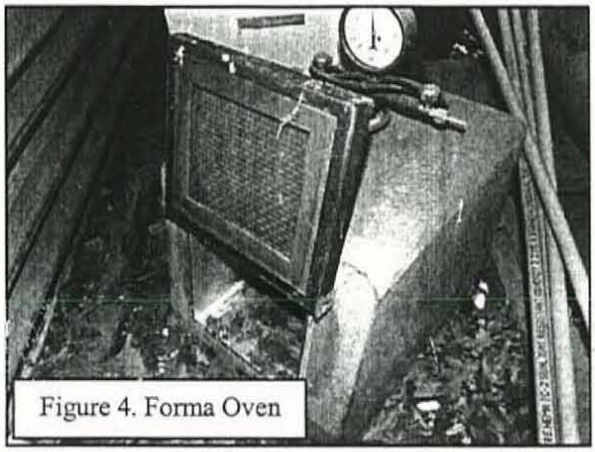


Figure 4. Forma Oven

5-27-10 BG L.L.D. 989

4. Arrange for all PACM to be removed by certified abatement personnel with full-time oversight from decon personnel. Prior to the start of work, a member of the decon team must provide the abatement contractor with a hazard control briefing explaining the potential explosive hazards. The hazard control briefing for asbestos abatement is provided in Enclosure 2. Decon personnel must wear personal protective equipment (PPE) as required by the contractor when in the work area providing oversight.

5-27-10 BG. L.L.D. 989

5. Place oven components with 3X items to be transported to the industrial waste processor (IWP) at Building 1770 for thermal treatment.

NOTE: Components with PACM cannot be processed at the IWP.

5-27-10 BG L.L.D. 989

6. Locate the Grieve oven (Figure 5). Perform an inspection of the oven for PACM. Use a spray bottle to wet down the oven with water prior to using hand tools for disassembly. Disassemble the oven and remove the oven door. Inspect the oven for additional PACM.

If abatement is required to complete the inspection of all voids then follow the instructions in Step 4 of this section.

Figure 5. Grieve Oven

5-27-10 BG L.L.D. 989

7. Place oven components with 3X items to be transported to the industrial waste processor (IWP) at Building 1770 for thermal treatment.

NOTE: Components with PACM cannot be processed at the IWP.

Steps #3-7 - All oven were move to the outside of Bldg #722
L.L.D.
989

5-27-10 B.G. 9B9

WARNING: there is presumed asbestos containing material (PACM) in the roping around the oven doors. There may be more PACM within the oven units. Do not attempt to break or disturb PACM.

8. Locate the Precision Scientific ovens (Figures 6 and 7). Use a spray bottle to wet down the ovens with water prior to using hand tools for disassembly. Disassemble the ovens and remove the oven doors without disturbing their roping. Inspect the ovens for additional PACM.

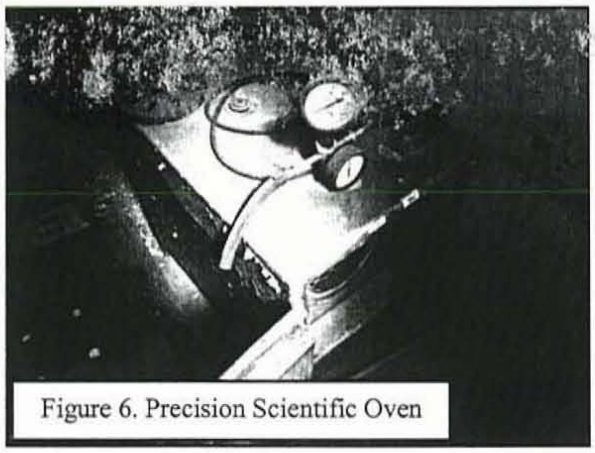


Figure 6. Precision Scientific Oven

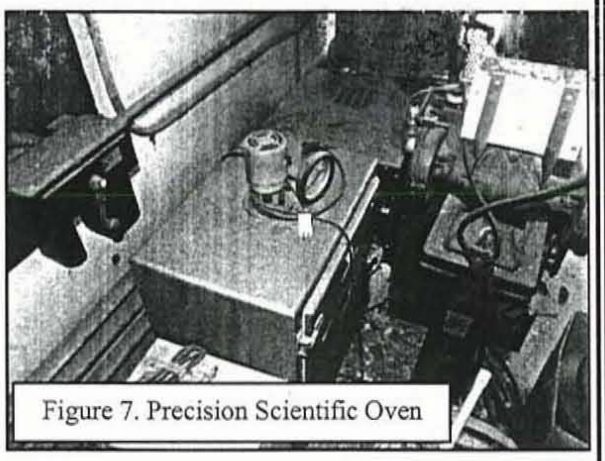


Figure 7. Precision Scientific Oven

If abatement is required to complete the inspection of all voids then follow the instructions in Step 4 of this section.

9B9 - 5-27-10 BG

9. Place oven components with 3X items to be transported to the industrial waste processor (IWP) at Building 1770 for thermal treatment.

NOTE: Components with PACM cannot be processed at the IWP.

5-27-10 B.G. 9B9

10. Locate the vacuum ovens (Figure 8). Perform an inspection of the oven for PACM. Use a spray bottle to wet down the ovens with water prior to using hand tools for disassembly. Disassemble the ovens and remove the oven doors. Inspect the ovens for additional PACM.

If abatement is required to complete the inspection of all voids then follow the instructions in Step 4 of this section.

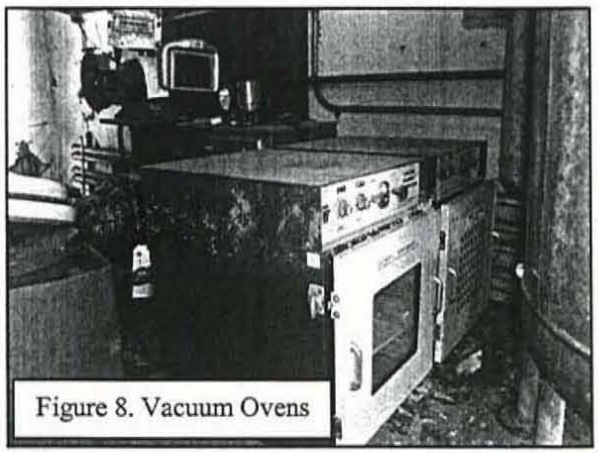


Figure 8. Vacuum Ovens

9B9 - 5-27-10 B.G.

11. Place oven components with 3X items to be transported to the industrial waste processor (IWP) at Building 1770 for thermal treatment.

NOTE: Components with PACM cannot be processed at the IWP.

5-27-10 B.G. 9B9

12. Locate the large reactors (Figure 9). Using hand tools, disassemble as necessary into moveable sections to be transported to the IWP as 3X for thermal treatment. The equipment must be water wet while hand tools are used for disassembly.

If bulk explosives contamination is found, collect the material in a labeled Velostat® bag and prepare the material for disposal at the SATTP. Record the material in Enclosure 1 (inventory log).

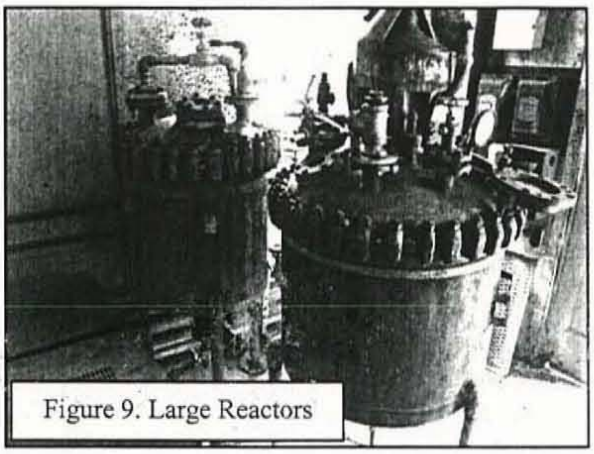


Figure 9. Large Reactors

5-27-10 B.G. 9B9

13. Locate the heat exchangers stored within the building (Figure 10). Using hand tools, disassemble as necessary to expose all concealed spaces and ensure that no explosive hazards are present. The equipment must be water wet while hand tools are used for disassembly. If all concealed spaces cannot be exposed, disassemble as necessary into moveable sections to be transported to the IWP as 3X for thermal treatment.

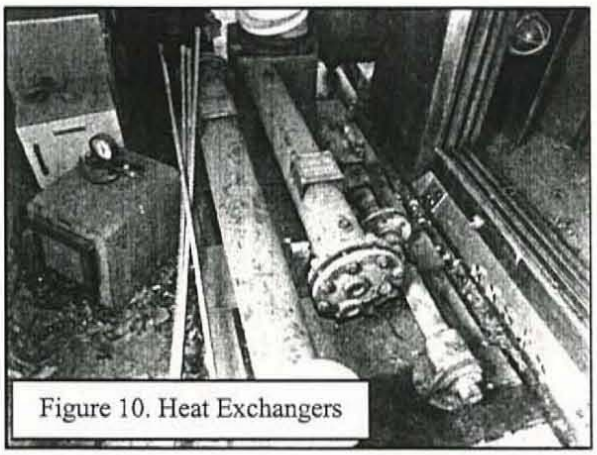


Figure 10. Heat Exchangers

If bulk explosives contamination is found, collect the material in a labeled Velostat® bag and prepare the material for disposal at the SATTP. Record the material in Enclosure 1 (inventory log).

5-27-10 B.G. 9B9

14. Locate the small reactor (Figure 11). Using hand tools, disassemble as necessary into moveable sections to be transported to the IWP as 3X for thermal treatment. The equipment must be water wet while hand tools are used for disassembly.

If bulk explosives contamination is found, collect the material in a labeled Velostat® bag and prepare the material for disposal at the SATTP. Record the material in Enclosure 1 (inventory log).

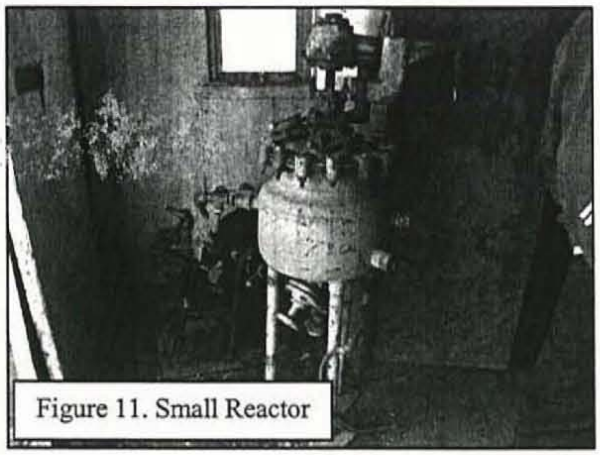


Figure 11. Small Reactor

5-27-10 B.G. L.L.D. 189

15. Locate the fume hood (Figure 12). Using hand tools, disassemble as necessary to expose all concealed spaces and ensure that no explosive hazards are present. The equipment must be water wet while hand tools are used for disassembly.

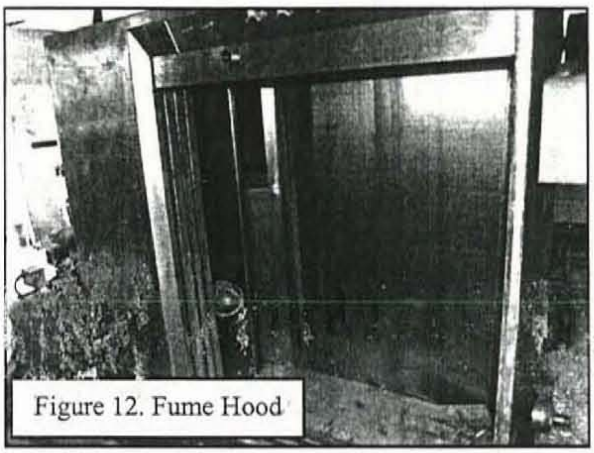


Figure 12. Fume Hood

If bulk explosives contamination is found, collect the material in a labeled Velostat® bag and prepare the material for disposal at the SATTP. Record the material in Enclosure 1 (inventory log).

5-27-10 B.G. L.L.D. 189

16. Locate the large and small mills (Figures 13 and 14). Perform a visual inspection to ensure that no visible explosive hazards are present. Take a wipe sample on each mill which will be sampled for NG. Refer to Section 19C of this report for sampling requirements.

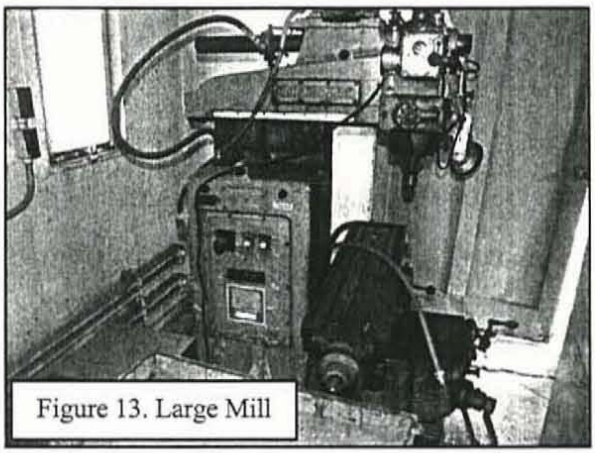


Figure 13. Large Mill

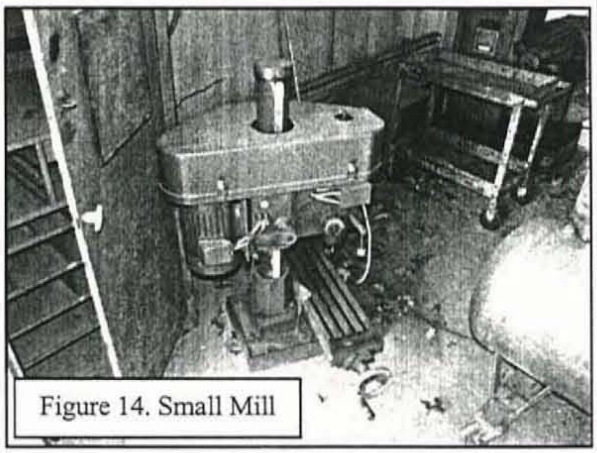


Figure 14. Small Mill

If bulk explosives contamination is found, collect the material in a labeled Velostat® bag and prepare the material for disposal at the SATTP. Record the material in Enclosure 1 (inventory log).

L.L.D. 189 5-27-10 BG

17. Clear any remaining non-explosive and non-hazardous debris off of the floor and dispose of as general trash. Sweep out the floor area of the building.

6-22-19 BG LLD 9B9

18. Locate the concrete trench outside the building (Figure 15). Take a sample from the end of the trench and from any cracks or seams in the trench. Up to three samples may be taken and sampled for Lead Azide. Refer to Section 19C of this report for sampling requirements.

Figure 15. Building 259 and Concrete Trench

19C. Building 258 Sampling and Certification

6-22-19 BG LLD 9B9

1. Perform quantitative verification sampling (swab, wipe, or bulk). Nitrile gloves must be worn during sampling. Take one sample from each mill (as noted in Section 19B Step 16) and take up to three samples from the outside trench (as noted in Section 19B Step 18) for a maximum total of five samples. All wipe samples will be taken using a 10 centimeter by 10 centimeter square template.

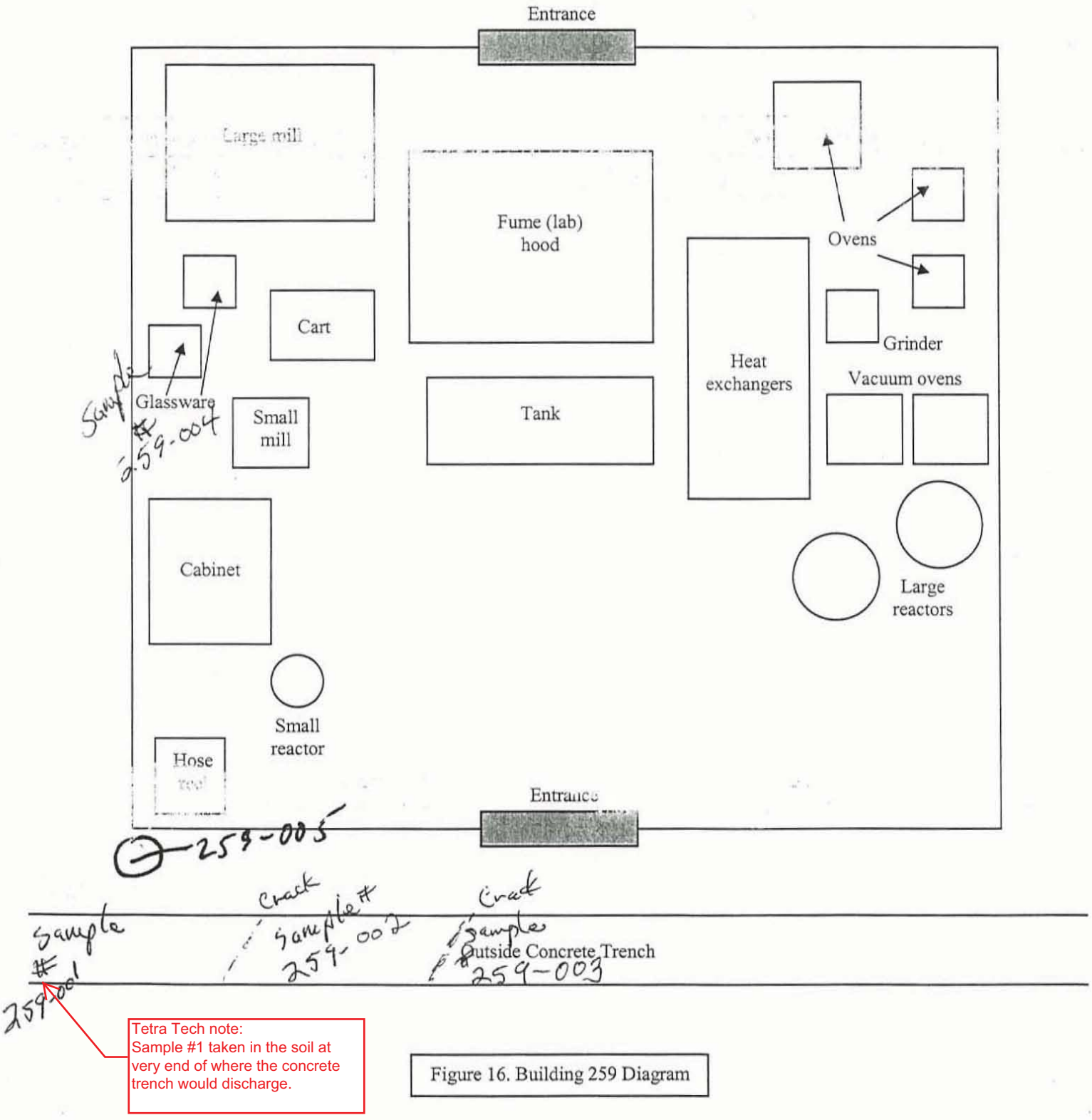
Each mill sample will be analyzed for NG. Each sample from the outside trench will be analyzed for Lead Azide. Wipe samples for both NG and Lead Azide will use acetone as a solvent. Bulk samples do not require solvent. A minimum of one out of ten samples must be a blank sample. Record the sample in Section 20 and mark the sample location on the building floor diagram in Figure 16.

Sample jars will be labeled with the provided labels. All samples shall be sent to the IHD NSWC analytical lab in Building 1864.

2. Prepare decontamination tags (Department of Defense Form 2271) for any item that is to be certified at the 3X (contaminated) level. Items will be transported to the IWP for thermal treatment.

3. If building verification sample results dictate that no explosive hazards remain, prepare a decontamination tag (Department of Defense Form 2271) for the building at the 5X level.

Section 20. Quantitative Samples for Building 259			
Sample No.	**Location**	**Test type (bulk, wipe, swab)**	**Contaminant to be tested for**
259-001	AT End of Trench	Bulk	~~NG~~ Lead Azide
259-002	From Crack in Trench	"	~~NG~~ Lead Azide
259-003	From Crack in Trench	"	Lead Azide
259-004	Inside Left Corner Crack along side of wall	Bulk	Lead Azide
259-005	PIT OUTSIDE FRONT OF 259 AT CORNER	Bulk	Lead Azide



Tetra Tech note:
Sample #1 taken in the soil at very end of where the concrete trench would discharge.

Figure 16. Building 259 Diagram

21. Work Permit Requirements:			
PRIOR TO START			
Yes	**No**	**Requirement**	**Person to Contact**
X		Contact immediate supervisor.	James Fenwick (301) 672-1639
22. Equipment Authorized for Use			
Yes	**No**	**Requirement**	**Item to use**
X		Power Tools/Equipment	Power generator, portable GFCI
X		Hand Tools	Wrenches, pliers, screwdriver, extension cords, work lights, flash lights, shovels, broom, pry bars, hammer, chisels, metal snips, wheel cutter
X		Low-Sparking Tools	
X		Other (specify)	Velostat® bags, rags, cell phone, sampling equipment
23. Personal Protective Equipment			
Yes	**No**	**Requirement**	**Item to use**
X		Eye Protection	Safety Glasses
X		Hearing Protection	EAR Classic disposable ear plugs or Peltor Optime 95 circumaural muffs when in high noise environment (refer to hazard control briefing)
X		Protective Clothing	Powder coveralls or disposable coveralls
X		Safety Shoes	Standard steel-toed safety footwear with slip resistant soles
	X	Respiratory Protection	As required by asbestos abatement contractor if necessary
X		Hand/Head Protection	Hard hat or soft cap, leather palmed gloves, nitrile gloves while sampling
	X	Other	
Emergency Contact Information:			
For HAZMAT spill, medical emergency, or fire contact the Fire Department (Ext. 4333)			

24. HAZARD CONTROL BRIEFING

The purpose of this procedure is to remove any explosive contamination from Building 259. Prior to the start of work, lockout/tagout any energy-isolating devices in the building. Inspect all surfaces for explosive residue before applying force such as impact or friction. Any visible suspect explosive contamination is to be removed and the area is to be wet down before applying impact or friction (eg. using a pry bar). The main explosives of concern at Building 259 are trace amounts of HMX, RDX, TNT, NC, NG, AP, and Lead Azide.

A portable generator will be used for electrical power on this project. Ground fault circuit interrupter (GFCI) protection must be used at all times to protect personnel from shock hazard. All electrical power must be directed through the GFCI.

It is presumed that the roping around some of the ovens contains asbestos. Additional PACM may be encountered during oven disassembly. In the event that PACM is encountered, work must stop and certified abatement personnel must be notified to abate the material with oversight from the decontamination team. PACM is to remain undisturbed by the decontamination team throughout inspection and decontamination operations. Asbestos is known to have toxicity and can cause serious illness when inhaled.

Personnel may be exposed to overhead hazards. Hard hats shall be worn for the duration of the job. Powder or disposable coveralls shall be worn until the decontamination phase of the process is completed. Steel toe safety footwear shall be worn at all times while on the job site. Nitrile gloves shall be worn while sampling.

Personnel may be exposed to noise hazards. EAR Classic disposable ear plugs or Peltor Optime 95 circumaural muffs must be worn while in a high noise environment. Noise survey results stipulate that hearing protection must be worn within the following radii of the specified equipment: North Star gas generator- 12'.

Gasoline powered engines must be operated only in areas where good ventilation is available to disperse exhaust emissions. Operate gasoline powered engines outdoors. Gasoline powered equipment shall not be refueled while the engine is still hot or while engine is running. Flammable or combustible liquids shall be stored in approved safety containers (UL Listed) only. Bulk fuel and solvents shall be stored in secondary containment. A fire extinguisher shall be in the immediate area when fueling equipment. There must be a mimimum of one 10 lb. ABC fire extinguisher on the work site at all times.

A working cell phone (HERO approved) must be on site and available at all times . The "two person" rule shall apply for the duration of this job. No one shall work alone on the site. Personnel shall work within "ear shot" of other personnel.

25. OPERATION HAZARD ANALYSIS

PROCEDURE NUMBER: Building 259
PROCEDURE TITLE: WRF 20100331- Building 259

PROCESS STEP OR NUMBER	HAZARD	TRIGGERING EVENT	POTENTIAL MISHAP RESULT (MOST REASONABLY CREDIBLE)	INITIAL RISK CODE	HAZARD MITIGATIONS	FINAL RISK CODE
19A, 19B	Electrical energy	Inadvertent operation or discharge of energy during decontamination operations	Personal injury, electrical burns	IIC (3)	Prior to the start of work, personnel shall lockout/tagout any energy isolating devices in the building. All electrical power must be run through a GFCI.	IID (4)
19A, 19B	Hearing hazard	Operation of power equipment	Hearing threshold shift (loss of hearing)	IIIC (4)	Personnel briefed and required to wear EAR Classic disposable ear plugs or Peltor Optime 95 circumaural muffs while within the following radii: North Star gas generator- 12'.	IIID (5)
Entire operation	Personal injury to eyes, feet, hands, body including head	General inspection and cleaning/ decontamination of building	Foreign object in eyes, foot injury, hand injury, respiratory injury	IIC (3)	Minimum PPE required is safety footwear, safety glasses, leather gloves, hard hat, and coveralls for entire operation	IIIC (4)
19B	Reaction of explosive residue (spark, fire, explosion)	Imparted friction, impact or electrostatic discharge	Personnel injury, facility damage	IIC (3)	Administrative control, briefing provided to ensure personnel do not impart forces to items under inspection. Equipment will be wet with water prior to disassembly with hand tools. In the event that explosive residue is found it shall be placed in Velostat® bag prior to disposal to control electrostatic discharge hazard.	IID (4)

25. OPERATION HAZARD ANALYSIS

PROCEDURE NUMBER: Building 259
PROCEDURE TITLE: WRF 20100331- Building 259

PROCESS STEP OR NUMBER	HAZARD	TRIGGERING EVENT	POTENTIAL MISHAP RESULT (MOST REASONABLY CREDIBLE)	INITIAL RISK CODE	HAZARD MITIGATIONS	FINAL RISK CODE
19B	Exposure to presumed asbestos containing material (PACM)	Inadvertent casual contact with ACM through inspection and decontamination work	Lung cancer, asbestosis, mesothelioma	IIC (3)	Administrative control, briefing provided to ensure personnel do not disturb PACM. Asbestos abatement is to be performed by certified personnel with oversight from decon personnel.	IID (4)

Enclosure 1

Hazardous Waste Inventory Log for Building 259 at NSWC, IHDIV

Identification Number	Item Description	Total Weight of Item	Net Explosive Weight (NEW) of Item	Date Item was Collected	Date Item was Turned in	Initials of Receiver
259HW1						
259HW2						
259HW3						
259HW4						
259HW5						
259HW6						
259HW7						
259HW8						

Enclosure 2

Hazard Control Briefing for Asbestos Abatement at Building 259

The purpose of this procedure is to remove any PACM from Building 259. It is presumed that the roping around some of the ovens contains asbestos. Prior to asbestos abatement, the ovens with PACM must be inspected by decon personnel. During asbestos abatement operations, a member of the decon team will provide full-time oversight during. The explosive hazards of concern are HMX, RDX, TNT, NC, NG, AP, and Lead Azide.

Inspect all surfaces for residues before applying force such as impact or friction. In the event that any visible suspect explosive contamination is seen, stop work immediately and notify the decon personnel providing oversight or James Fenwick (301-672-1639). Do not disturb any suspect explosive contamination.

Sign below as a record of receipt of this hazard control briefing.

PRINT NAME	SIGNATURE	DATE

Appendix B

Fieldwork SOPs

TABLE OF CONTENTS

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5.0 PROCEDURES **2**

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5.2 SAMPLE IDENTIFICATION FIELD REQUIREMENTS 3
5.3 EXAMPLE SAMPLE FIELD DESIGNATIONS 4
5.4 EXAMPLES OF SAMPLE NOMENCLATURE 5
5.5 FIELD QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SAMPLE NOMENCLATURE 6
5.6 EXAMPLES OF FIELD QA/QC SAMPLE NOMENCLATURE 6

6.0 DEVIATIONS **6**

1.0 PURPOSE

The purpose of this document is to specify a consistent sample nomenclature system that will facilitate subsequent data management in a cost-effective manner. The sample nomenclature system has been devised such that the following objectives can be attained:

- Sorting of data by matrix.
- Sorting of data by depth.
- Maintenance of consistency (field, laboratory, and data base sample numbers).
- Accommodation of all project-specific requirements.
- Accommodation of laboratory sample number length constraints (maximum of 20 characters).

2.0 SCOPE

The methods described in this procedure shall be used consistently for all projects requiring electronic data.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Program Manager - It shall be the responsibility of the Program Manager (or designee) to inform contract-specific Project Managers of the existence and requirements of this Standard Operating Procedure.

Project Manager - It shall be the responsibility of the Project Manager to determine the applicability of this Standard Operating Procedure based on: (1) program-specific requirements, and (2) project size and objectives. It shall be the responsibility of the Project Manager (or designee) to ensure that the sample nomenclature is thoroughly specified in the relevant project planning document (e.g., sampling and analysis plan) and is consistent with this Standard Operating Procedure if relevant. It shall be the responsibility of the project manager to ensure that the Field Operations Leader is familiar with the sample nomenclature system.

Field Operations Leader - It shall be the responsibility of the Field Operations Leader to ensure that all field technicians or sampling personnel are thoroughly familiar with this Standard Operating Procedure and the project-specific sample nomenclature system. It shall be the responsibility of the Field Operations Leader to ensure that the sample nomenclature system is used during all project-specific sampling efforts.

5.0 PROCEDURES

5.1 Introduction

The sample identification (ID) system can consist of as few as 8 but not more than 20 distinct alpha-numeric characters. The sample ID will be provided to the laboratory on the sample labels and chain-of-custody forms. The basic sample ID provided to the lab has three segments and shall be as follows where "A" indicates "alpha," and "N" indicates "numeric":

A or N 3- or 4-Characters	AAA 2- or 3-Characters	A or N 3- to 6-Characters
Site Identifier	Sample Type	Sample Location

Additional segments may be added as needed. For example:

See Sample Details Table on Worksheet 8 for specified sample IDs for this project.

(1) Soil and Sediment Sample ID

A or N 3- or 4-Characters	AAA 2- or 3-Characters	A or N 3- to 6-Characters	NNNN 4-Characters
Site Identifier	Sample Type	Sample Location	Sample Depth

(2) Aqueous (groundwater or surface water) Sample ID

NNNNNN
Sample Date

A or N 3- or 4-Characters	AAA 2- or 3-Characters	A or N 3- to 6-Characters	~~NN~~ ~~2-Characters~~	~~-A~~
Site Identifier	Sample type	Sample Location	~~Round Number~~	~~Filtered Sample only~~

~~(3) Biota Sample ID~~

A or N 3- or 4-Characters	~~AAA~~ ~~2- or 3-Characters~~	A or N ~~3- to 6-Characters~~	~~AA~~ ~~2-Characters~~	NNN 3-Characters
Site Identifier	~~Sample Type~~	Sample Location	~~Species Identifier~~	Sample Group ~~Number~~

5.2 Sample Identification Field Requirements

The various fields in the sample ID will include but are not limited to the following:

- Site Identifier
- Sample Type
- Sample Location
- Sample Depth
- Sampling Round Number
- Filtered
- Species Identifier
- Sample Group Number

The site identifier must be a three- or four-character field (numeric characters, alpha characters, or a mixture of alpha and numeric characters may be used). A site number is necessary since many facilities/sites have multiple individual sites, SWMUs, operable units, etc. Several examples are presented in Section 5.3 of this SOP.

The sample type must be a two- or three-character alpha field. Suggested codes are provided in Section 5.3 of this SOP.

The sample location must be at least a three-character field but may have up to six-characters (alpha, numeric, or a mixture). The six-characters may be useful in identifying a monitoring well to be sampled or describing a grid location.

The sample depth field is used to note the depth below ground surface (bgs) at which a soil or sediment sample is collected. The first two numbers of the four-number code specify the top interval, and the third and fourth specify the bottom interval in feet bgs of the sample. If the sample depth is equal to or greater than 100, then only the top interval would be represented and the sampling depth would be truncated to

three-characters. The depths will be noted in whole numbers only; further detail, if needed, will be recorded on the sample log sheet, boring log, logbook, etc.

Date in MMDDYY format distinguishes 'sample rounds.'

A two-digit round numb ~~aken from a particular~~ aqueous sample locatio ed the round identifier 01, the second 02, etc ~~ells and surface water locations.~~

Filtered samples have same sample ID as parent sample.

Aqueous samples that ~~F" in the last field segment. No entry in t~~

The species identifier must be a two-character alpha field. Several suggested codes are provided in Section 5.3 of this SOP.

~~The three digit sample group number will be used to track the number of biota sample groups (a particular group size may be determined by sample technique, media type, the number of individual caught, weight issues, time, etc.) by species and location. The first sample group of a particular species collected from a given location will be assigned the sample group number 001 and the second sample group of the same species collected from the same location will be assigned the sample group number 002.~~

5.3 Example Sample Field Designations

Examples of each of the fields are as follows:

Site Identifier - Examples of site numbers/designations are as follows:

A01 - Area of Concern Number 1
125 - Solid Waste Management Unit Number 125
000 - Base or Facility Wide Sample (e.g., upgradient well)
BBG - Base Background

The examples cited are only suggestions. Each Project Manager (or designee) must designate appropriate (and consistent) site designations for their individual project.

Sample Type - Examples of sample types are as follows:

AH - Ash Sample
AS - Air Sample
BM - Building Material Sample
BSB - Biota Sample Full Body
BSF - Biota Sample Fillet
CP - Composite Sample
CS - Chip Sample
DS - Drum Sample
DU - Dust Sample
FP - Free Product
IDW - Investigation Derived Waste Sample
LT - Leachate Sample
MW - Monitoring Well Groundwater Sample
OF - Outfall Sample
RW - Residential Well Sample
SB - Soil Boring Sample
SD - Sediment Sample
SC - Scrape Sample

SG - Soil Gas Sample
SL - Sludge Sample
SP - Seep Sample
SS - Surface Soil Sample
ST - Storm Sewer Water Sample
SW - Surface Water Sample
TP - Test Pit Sample
TW - Temporary Well Sample
WC - Well Construction Material Sample
WP - Wipe Sample
WS - Waste/Solid Sample
WW - Wastewater Sample

Sample Location - Examples of the location field are as follows:

001 - Monitoring Well 1
N32E92 - Grid location 32 North and 92 East
D096 - Investigation derived waste drum number 96

Species Identifier - Examples of species identifier are as follows:

BC - Blue Crab
GB - Blue Gill
CO - Corn
SB - Soybean

5.4 Examples of Sample Nomenclature

The first round monitoring well groundwater sample collected from existing monitoring well 001 at SWMU 16 for a filtered sample would be designated as 016MW00101-F.

The second round monitoring well groundwater sample collected from existing monitoring well C20P2 at Site 23 for an unfiltered sample would be designated as 023MWC20P202.

The second surface water sample collected from point 01 at SWMU 130 for an unfiltered sample would be designated as 130SW00102.

A surface soil sample collected from grid location 32 North and 92 East at Site 32 at the 0- to 2-foot interval would be designated as 032SSN32E920002.

A subsurface soil sample from soil boring 03 at SWMU 32 at an interval of 4 to 5 feet bgs would be designated as 032SB0030405.

A sediment sample collected at SWMU 19 from 0 to 6 inches at location 14 would be designated as 019SD0140001. The sample data sheet would reflect the precise depth at which this sample was collected.

During biota sampling for full body analysis the first time a minnow trap was checked at grid location A25 of SWMU 1415 three small blue gills were captured, collected and designated with the sample ID of 1415BSBA25BG001. The second time blue gill were collected at the same location (grid location A25 at SWMU 1415) the sample ID designation given was 1415BSBA25BG002.

Note: No dash (-) or spacing is used between the segments with the exception of the filtered segment. The "F" used for a filtered aqueous sample is preceded by a dash "-F".

5.5 Field Quality Assurance/Quality Control (QA/QC) Sample Nomenclature

Field QA/QC will be designated using a different coding system. The QC code will consist of a three- to four-segment alpha-numeric code that identifies the sample QC type, the date the sample was collected, and the number of this type of QC sample collected on that date.

A or N Site Identifier

AA	NNNNNN	NN	-F
QC Type	Date	Sequence Number (per day)	Filtered (aqueous only, if needed)

The QC types are identified as:

TB = Trip Blank
EB ~~RB~~ = Rinsate Blank (Equipment Blank)
~~FD = Field Duplicate~~
AB = Ambient Conditions Blank
WB = Source Water Blank

Add "P" after sample location in sample ID to indicate field duplicate at that location

The sampling time recorded on the Chain-of-Custody Form, labels, and tags for duplicate samples will be 0000 so that the samples are "blind" to the laboratory. Notes detailing the sample number, time, date, and type will be recorded on the routine sample log sheets and will document the location of the duplicate sample (sample log sheets are not provided to the laboratory). Documentation for all other QC types (TB, EB ~~RB~~, AB, and WB) will be recorded on the QC Sample Log sheet (see SOP on Field Documentation).

5.6 Examples of Field QA/QC Sample Nomenclature

~~The first duplicate of the day for a filtered ground w~~ ~~uld be designated as FD06030001-F.~~

~~The third duplicate of the day taken of a subsurface sc~~ ~~uld be designated as FD11170303.~~

~~The first trip blank associated with samples collect~~ ~~ted as TB10120001.~~

Duplicate of groundwater sample collected from well MW01 on November 17, 2001, would be designated as S67-MW01P-111701

The ~~only~~ first rinsate blank collected on November 17, 2001 would be designated as ~~RB11170101.~~ S67-EB01-111701

6.0 DEVIATIONS

Any deviation from this SOP must be addressed in detail in the site specific planning documents.

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A SITE RECONNAISSANCE CHECKLIST 6

1.0 PURPOSE

The purpose of a site reconnaissance is to collect both general and technical information which will support the scoping, scheduling, implementing project activities, and writing reports for an environmental investigation. This procedure is not intended as a guide for Phase I investigations or for Environmental Baseline Survey activities.

2.0 SCOPE

This procedure is applicable to the performance of a site reconnaissance for initial site characterization. The steps necessary to develop and carry out a site reconnaissance are presented here. These steps include a list of equipment and items which may be needed, areas of special interest during field observations, and methods by which the field observation team can ensure that necessary and appropriate observations have been made.

3.0 GLOSSARY

Site reconnaissance. An onsite inspection program used to identify site-specific conditions that control scheduling, manpower, and affect costs. A site reconnaissance usually consists of visual observations and, often, the use of field monitoring instruments to identify potential health and safety threats and potential sampling locations for site evaluation during subsequent field investigations.

4.0 RESPONSIBILITIES

Field Operations Leader (FOL) is responsible for ensuring that the survey is carried out in sufficient detail. To accomplish this, the FOL must assign the proper personnel and equipment to characterize the site adequately, in accordance with the requirements defined in this procedure and best engineering practices. Other disciplines which may be applicable include (but are not limited to): Geology/Hydrogeology; Health and Safety; Ecological Specialists; and/or Engineering. In addition, the FOL is responsible for supervising equipment preparation, including necessary calibrations, and supervising field data collection and documentation in accordance with the methods described in all referenced standard operation procedures.

Project Manager is responsible for the following:

- Supervising the retrieval and examination of available, applicable information regarding the site.
- Obtaining appropriate program approvals and ensuring the preparation of a site Health and Safety plan for the site reconnaissance.
- Coordinating the field activities with facility personnel and other Navy and regulatory personnel, as applicable.

Field Personnel are primarily responsible for observing and documenting, either through written documentation or photographic evidence, the site reconnaissance. Field personnel will take direction from the FOL.

5.0 PROCEDURES

5.1 Equipment Items/Needed

Below is a list of items that may be useful when conducting a site reconnaissance. All, or a portion of these items may be required, depending upon the objective of the site reconnaissance.

- Health and Safety equipment and information as required by the Site Safety Officer.
- Maps (U.S.G.S. quadrangle, geologic maps, street and highway maps, and client facility maps).
- Geologic tools (compass, tape measure, hand level, digital camera, etc.).
- Physical monitoring equipment, if applicable (PID, Immunoassay Test Kits, etc.)
- Regional publications (U.S.G.S reports, water well surveys, U.S.D.A. soil conservation surveys, etc.).
- Site-specific publications by previous investigators (EPA aerial photographic analyses, remedial investigation reports, data on waste disposal practices, boring logs, etc.).
- Marking items (ink markers, surveyor's flagging, spray paint, pin flags, wooden stakes).
- Field notebooks.
- Local telephone book with yellow pages (for obtaining utilities, site trailer, living accommodations, etc.).

Sufficient time will be required in order to obtain some of the aforementioned material. In general, most publications can be obtained in time to be used in the site reconnaissance if ordered approximately 2 weeks before the actual site visit takes place.

5.2 Observations

A site reconnaissance usually requires one to two days, however, additional time may be needed depending upon the objective, site size, etc. The following observations, when applicable, should be documented either on a site map, field notebook, or photographed.

- General Site Access. It should be noted whether site roads provide access to all proposed work locations, or if it will be necessary to prepare access roads with either a backhoe, dozer, chain saws, etc., in order to get drill rigs, excavators, or other work vehicles to specific locations. If temporary driveways must be constructed from existing public roads, regulatory permits may be required. Military facilities may have specific security requirements which require detailed clearance procedures.
- Location of the Command Post or Site Trailer and Sanitary Facilities. The ideal location for the site trailer and sanitary facilities is a level area, within an uncontaminated zone, and centralized in order to provide easy access to work areas on the site. However, certain utility companies may require that the site trailer be placed within a specified radius (usually 100 feet), of the nearest utility pole. Contact the necessary utility companies and inquire about the requirements regarding service before conducting the site reconnaissance. Information that may be required by the utility companies is: type of electric service needed (inquire with trailer vendor for this information); and utility pole number of interest (pole numbers are usually stamped on a brass plate on the pole).

- Potable Water Sources. Local fire departments may allow access to fire hydrants. Private water delivery companies may also be available in the area.

- Sources of Possible Contamination. Drums, tanks, sludge areas, areas of stressed vegetation, fill areas, and leachate seeps may indicate where sources of contamination exist. Filler pipes protruding from the ground surface may indicate the presence of underground storage tanks. Areas where the original ground surface has been reworked may be contaminated fill areas that have since been buried and covered with natural material. Previous environmental investigations may also identify source areas.

- Location of Decon Areas and Storage/Disposal Areas for Equipment and Wastes Generated by Field Activities.

- Locations of Surface Water Bodies. The locations of surface water bodies, both man-made and natural, and their relation to topographic highs may give an indication of the groundwater flow direction in the area (groundwater flow typically follows topography with the topographic highs serving as groundwater recharge areas, and the surface waters at topographic lows serve as groundwater discharge areas). Visible signs of contamination, the existence of aquatic life, flow rates, and approximate levels should also be observed and noted. Check if the surface water bodies could potentially be impacted by field activities. If so, appropriate sedimentation and erosion controls will be required.

- Existing Wells. Existing monitoring wells, or domestic wells within the site and off site, should be noted on a map, and access checked to see if the wells can be used for data collection.

- Outcrops. Outcrops can be useful in providing hydrogeologic data (lithologic description, strike and dip information, fracture and joint system analysis, identification of moist zones, etc.) Outcrops may occur naturally or be a part of a man-made feature such as a road-cut.

- Lineaments. A lineament is a straight lengthy feature on the earth's surface which is expressed topographically as a line of depression. Stream beds, vegetation patterns or soil characteristics may be aligned or controlled by this feature. Lineaments are due in some cases to the presence of intense jointing or faults beneath the ground surface. Groundwater in the bedrock may follow lineaments. Lineaments should be noted on site maps and described in the field notebooks.

- Bench or Property Markers. Benchmarks or property markers should be marked with paint or surveyor's flagging if encountered during a site reconnaissance. Surveyors may need to use these markers as a reference point when surveying. Benchmarks are typically a brass plate secured in concrete in the ground with numbering on the top. Property markers can range from a stake driven into the ground to a rock protruding from the ground surface. Facility contacts may also be aware of local benchmarks used during the course of other environmental or public work projects.

- Metal Cultural Effects. Overhead power lines, railroad tracks, junk automobiles, fences, etc. will greatly affect certain geophysical surveys. These features should be noted while conducting a site reconnaissance.

6.0 RECORDS

The data collected during a site reconnaissance will be compiled into a trip report when returning from the field. This trip report can then be distributed to the project team. A site reconnaissance checklist is located in Attachment A which can be copied and used while conducting the site reconnaissance.

ATTACHMENT A

SITE RECONNAISSANCE CHECKLIST

SITE SKETCH

Include the following as appropriate:

- Site name
- Site location
- Site boundaries
- Entrance locations
- Access roads and security requirements
- Disposal locations
- Storage areas
- Office areas
- Well locations
- Treatment facility locations
- Surface drainage, outcrops, general topography descriptions
- Cultural interferences
- Fences
- Aboveground utilities

CHEMICAL STORAGE FACILITIES DESCRIPTION

- Storage tanks - numbers, volumes, condition, contents, etc.
- Drums - number, conditions, labeling, etc.
- Lagoons and surface pits - number, size, use of liner, contents, etc.

TREATMENT SYSTEMS

Note the presence of any treatment systems. These can be difficult to evaluate visually. One should appraise general appearance, maintenance and visual integrity; ask operators for any monitoring records; note presence of odors; and visually characterize any effluents or residues. Describe type of wastes and volumes treated.

- Incinerators
- Flocculation/filtration
- Chemical/physical treatment
- Biological treatment
- Volume reduction
- Waste recycling
- Compositing
- Other

ATTACHMENT A
SITE RECONNAISSANCE CHECKLIST
PAGE TWO

DISPOSAL FACILITIES

Note the presence and use of any of the following operations. Include a description of the size, use of liners, soil type, and the presence of leachate. Provide a description of management practices. Interview site workers if possible. Describe waste types.

- Landfills
- Land forms
- Open dump
- Surface impoundment
- Underground injection
- Incineration

Also, records for disposal of concentrated/containerized waste should be reviewed.

HAZARDOUS SUBSTANCE CHARACTERISTICS

Ask facility contacts for manifests, inventories, or monitoring reports. Note markings on containers.

- Chemical identities
- Quantities
- Hazard characteristics (toxic, explosive, flammable, etc.)
- Container markings
- Monitoring data, other analytical data
- Physical state (liquid, solid, gas, sludge)

CHEMICAL PROCESS INFORMATION

- Manufacturing processes and chemicals
- Off-specification or by-product disposal processes
- Housekeeping practices
- Locations of plant operations

ATTACHMENT A
SITE RECONNAISSANCE CHECKLIST
PAGE THREE

HYDROGEOLOGIC ASSESSMENT

Look for situations that promote hazardous substance migration, i.e., porous soils, fractured bedrock formations, shallow water table and karst features.

- Soil type
- Surface water features
- Surface drainage pattern
- Outcrop studies
- Water wells (use, water depth, and construction details)
- Erosion potential
- Flooding potential
- Climatology

IDENTIFICATION OF SENSITIVE RECEPTORS

- Number and locations of private homes
- Public buildings including tenant usage
- Areas of dead or dying vegetation or animals
- Presence of sensitive ecosystems (wetlands, tidal marshes, etc.)
- Other public use areas (roads, parks, etc.)
- Natural areas

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B GROUNDWATER LEVEL MEASUREMENT SHEET 9

1.0 PURPOSE

The purpose of this procedure is to provide reference information regarding the proper methods for evaluating the physical condition and project utility of existing monitoring wells and determining water levels.

2.0 SCOPE

The procedures described herein are applicable to all existing monitoring wells and, for the most part, are independent of construction materials and methods.

3.0 GLOSSARY

Hydraulic Head - The height to which water will rise in a well.

Water Table - A surface in an unconfined aquifer where groundwater pressure is equal to atmospheric pressure (i.e., the pressure head is zero).

4.0 RESPONSIBILITIES

Site Geologist/Hydrogeologist - Has overall responsibility for the evaluation of existing wells, obtaining water level measurements and developing groundwater contour maps. The site geologist/hydrogeologist (in concurrence with the Project Manager) shall specify the reference point from which water levels are measured (usually a specific point on the upper edge of the inner well casing), the number and location of data points which shall be used for constructing a contour map, and how many complete sets of water levels are required to adequately define groundwater flow directions (e.g., if there are seasonal variations).

Field Personnel - Must have a basic familiarity with the equipment and procedures involved in obtaining water levels and must be aware of any project-specific requirements or objectives.

5.0 PROCEDURES

Accurate, valid and useful groundwater monitoring requires that four important conditions be met:

- Proper characterization of site hydrogeology.
- Proper design of the groundwater monitoring program, including adequate numbers of wells installed at appropriate locations and depths.
- Satisfactory methods of groundwater sampling and analysis to meet the project data quality objectives (DQOs).
- The assurance that specific monitoring well samples are representative of water quality conditions in the monitored interval.

To insure that these conditions are met, adequate descriptions of subsurface geology, well construction methods and well testing results must be available. The following steps will help to insure that the required data are available to permit an evaluation of the utility of existing monitoring wells for collecting additional samples.

5.1 Preliminary Evaluation

A necessary first step in evaluating existing monitoring well data is the study and review of the original work plan for monitoring well installation (if available). This helps to familiarize the site geologist/hydrogeologist with site-specific condition, and will promote an understanding of the original purpose of the monitoring wells.

The next step of the evaluation should involve a review of all available information concerning borehole drilling and well construction. This will allow interpretation of groundwater flow conditions and area geology, and will help to establish consistency between hydraulic properties of the well and physical features of the well or formation. The physical features which should be identified and detailed, if available, include:

- The well identification number, permit number and location by referenced coordinates, the distance from prominent site features, or the location of the well on a map.
- The installation dates, drilling methods, well development methods, past sampling dates, and drilling contractors.
- The depth to bedrock -- where rock cores were not taken, auger refusal, drive casing refusal or penetration test results (blow counts for split-barrel sampling) may be used to estimate bedrock interface.
- The soil profile and stratigraphy.
- The borehole depth and diameter.
- The elevation of the top of the protective casing, the top of the well riser, and the ground surface.
- The total depth of the well.
- The type of well materials, screen type, slot size, and length, and the elevation/depths of the screen, interval, and/or monitored interval.
- The elevation/depths of the tops and bottom of the filter pack and well seals and the type and size.

5.2 Field Inspection

During the onsite inspection of existing monitoring wells, features to be noted include:

- The condition of the protective casing, cap and lock.
- The condition of the cement seal surrounding the protective casing.
- The presence of depressions or standing water around the casing.
- The presence of and condition of dedicated sampling equipment.
- The presence of a survey mark (e.g., a notch) on the inner well casing.

If the protective casing, cap and lock have been damaged or the cement collar appears deteriorated, or if there are any depressions around the well casing capable of holding water, surface water may have infiltrated into the well. This may invalidate previous sampling results unless the time when leakage started can be precisely determined.

The routine physical inspection must be followed by a more detailed investigation to identify other potential routes of contamination or sampling equipment malfunction. Any of these occurrences may invalidate

previously-collected water quality data. If the monitoring well is to be used in the future, considerations shown in the steps described above should be rectified to rehabilitate the well.

After disconnecting any wires, cables or electrical sources, remove the lock and open the cap. Check for the presence of organic vapors with a photoionization detector (PID) or flame-ionization detector (FID) to determine the appropriate worker safety level. The following information should be noted:

- Cap function.
- Physical characteristics and composition of the inner casing or riser, including inner diameter and annular space.
- Presence of grout between the riser and outer protective casing and the existence of drain holes in the protective casing.
- Presence of a riser cap, method of attachment to casing, and venting of the riser.
- Presence of dedicated sampling equipment; if possible, remove such equipment and inspect size, materials of construction and condition.

The final step of the field inspection is to confirm previous hydraulic or physical property data and to obtain data not previously available. This includes the determination of static water levels, total well depth and well obstruction. This may be accomplished using a weighted tape measure which can also be used to check for sediment (the weight will advance slowly if sediment is present, and the presence of sediment on the weight upon removal should be noted). If sediment is present and/or the well has not been sampled in 12 or more months, it should be redeveloped before sampling.

Lastly, as a final step, the location, condition and expected water quality of the wells should be reviewed in light of their usefulness for the intended purpose of the investigation.

See Attachment A, Monitoring Well Inspection Sheet.

5.3 Water Level (Hydraulic Head) Measurements

5.3.1 General

Groundwater level measurements can be made in monitoring wells, private or public water wells, piezometers, open boreholes, or test pits (after stabilization). Groundwater measurements should generally not be made in boreholes with drilling rods or auger flights present. If groundwater sampling activities are to occur, groundwater level measurements shall take place prior to well purging or sampling.

All groundwater level measurements shall be made to the nearest 0.01 foot, and recorded in the site geologist/hydrogeologist's field notebook or on the Groundwater Level Measurement Sheet (Attachment B), along with the date and time of the reading. The total depth of the well shall be measured and recorded, if not already known. Weather changes that occur over the period of time during which water levels are being taken, such as precipitation and barometric pressure changes, should be noted.

In measuring groundwater levels, there shall be a clearly-established reference point of known elevation, which is normally identified by a mark (e.g., a notch) on the upper edge of the inner well casing. To be useful, the reference point should be tied in with an established USGS benchmark or other properly surveyed elevation datum. An arbitrary datum could be used for an isolated group of wells, if necessary.

Cascading water within a borehole or steel well casings can cause false readings with some types of sounding devices (chalked line, electrical). Oil layers may also cause problems in determining the true water level in a well. Special devices (interface probes) are available for measuring the thickness of oil layers and true depth to groundwater, if required.

Water level readings shall be taken regularly, as required by the site geologist/hydrogeologist. Monitoring wells or open-cased boreholes that are subject to tidal fluctuations should be read in conjunction with a tidal chart (or preferably in conjunction with readings of a tide staff or tide level recorder installed in the adjacent water body); the frequency of such readings shall be established by the site hydrogeologist. All water level measurements at a site used to develop a groundwater contour map shall be made in the shortest practical time to minimize affects due to weather changes.

5.3.2 Water Level Measuring Techniques

There are several methods for determining standing or changing water levels in boreholes and monitoring wells. Certain methods have particular advantages and disadvantages depending upon well conditions. A general description of these methods is presented, along with a listing of various advantages and disadvantages of each technique. An effective technique shall be selected for the particular site conditions by the site geologist/hydrogeologist.

In most instances, preparation of accurate potentiometric surface maps requires that static water level measurements be obtained to a precision of 0.01 feet. To obtain such measurements in individual accessible wells, electrical water level indicator methods have been found to be best, and thus should be utilized whenever possible when precision is required (e.g., synoptic water level measurements for defining potentiometric surfaces). Other, less precise methods, such as the popper or bell sound, or bailer line methods, should be avoided when precision is required, but may be suitable when used to establish approximate water depths for purging and sampling purposes. When a large number of (or continuous) readings are required, time-consuming individual readings are not usually feasible. In such cases, it is best to use a pressure transducer.

5.3.3 Methods

Water levels can be measured by several different techniques, but the same steps shall be followed in each case. The proper sequence is as follows:

1. Check operation of recording equipment above ground. Prior to opening the well, don personal protective equipment, as required. Never remove an air-tight lock (such as a J-plug) with your face over the well. Pressure changes within the well may explosively force the cap off once loosened.

2. Record all information specified below in the geologist/hydrogeologist's field notebook or on the Groundwater Level Measurement Sheet (Attachment B):

   - Well number.
   - Water level (to the nearest 0.01 foot). Water levels shall be taken from the surveyed reference mark (e.g., notch) on the top edge of the inner well casing. If the J-plug was on the well very tightly, it may take several minutes for the water level to stabilize.
   - Time and day of the measurement.
   - Thickness of free product if present.

Water level measuring devices with permanently marked intervals shall be used. The devices shall be free of kinks or folds which will affect the ability of the equipment to hang straight in the well pipe.

5.3.4 Water Level Measuring Devices

Electric Water Level Indicators

These are the most commonly used devices and consist of a spool of small-diameter cable and a weighted probe attached to the end. When the probe comes in contact with the water, an electrical circuit is closed and a meter, light, and/or buzzer attached to the spool will signal the contact.

There are a number of commercial electric sounders available, none of which is entirely reliable under all conditions likely to occur in a contaminated monitoring well. In conditions where there is oil on the water, groundwater with high specific conductance, water cascading into the well, steel well casing, or a turbulent water surface in the well, measuring with an electric sounder may be difficult.

For accurate readings, the probe shall be lowered slowly into the well adjacent to the survey mark on the inner well casing. The electric tape is read (to the nearest 0.01 ft.) at the measuring point and recorded where contact with the water surface was indicated.

Popper or Bell Sounder

A bell- or cup-shaped weight that is hollow on the bottom is attached to a measuring tape and lowered into the well. A "plopping" or "popping" sound is made when the weight strikes the surface of the water. An accurate reading can be determined by lifting and lowering the weight in short strokes, and reading the tape when the weight strikes the water. This method is not sufficiently accurate to obtain water levels to 0.01 feet, and thus is more appropriate for obtaining only approximate water levels quickly.

Pressure Transducer

Pressure transducers can be lowered into a well or borehole to measure the pressure of water and therefore the water elevation above the transducer. The transducer is wired into a recorder at the surface to record changes in water level with time. The recorder digitizes the information and can provide a printout or transfer the information to a computer for evaluation (using a well drawdown/recovery model). The pressure transducer should be initially calibrated with another water level measurement technique to ensure accuracy. This technique is very useful for hydraulic conductivity testing in highly permeable material where repeated, accurate water level measurements are required in a very short period of time. A sensitive transducer element is required to measure water levels to 0.01 foot accuracy.

Borehole Geophysics

Approximate water levels can be determined during geophysical logging of the borehole (although this is not the primary purpose for geophysical logging and such logging is not cost effective if used only for this purpose). Several logging techniques will indicate water level. Commonly-used logs which will indicate saturated/unsaturated conditions include the spontaneous potential (SP) log and the neutron log.

5.3.5 Data Recording

Water level measurements, time, data, and weather conditions shall be recorded in the geologist/hydrogeologist's field notebook or on the Groundwater Level Measurement Sheet. All water level measurements shall be measured from a known reference point. The reference point is generally a marked point on the upper edge of the inner well casing that has been surveyed for an elevation. The exact reference point shall be marked with permanent ink on the casing since the top of the casing may not be entirely level. It is important to note changes in weather conditions because changes in the barometric pressure may affect the water level within the well.

5.3.6 Specific Quality Control Procedures for Water Level Measuring Devices

All groundwater level measurement devices must be cleaned before and after each use to prevent cross contamination of wells. See Section 5.4 regarding decontamination of water level measuring equipment. Some devices used to measure groundwater levels may need to be calibrated. These devices shall be calibrated to 0.01 foot accuracy and any adjustments/corrections shall be recorded in the field logbook/notebook. After the corrections/adjustments are made to the measuring device and entered in the field logbook/notebook, the corrected readings shall be entered onto the Groundwater Level Measurement Sheet (Attachment B). Elevations will be entered on the sheet when they become available.

5.4 Equipment Decontamination

All portions of a device which projects down the well casing must be decontaminated prior to advancing to the next well. Manufacturer's instructions for equipment decontamination should be followed. Variations from the manufacturer's requirements may be implemented based on the project objectives, but they must be defined prior to conducting any field activities. Consult the project planning documents and SA-7.1 Decontamination of Field Equipment.

5.5 Health and Safety Considerations

Groundwater contaminated by volatile organic compounds may release toxic vapors into the air space inside the well pipe. The release of this air when the well is initially opened is a health/safety hazard which must be considered. Initial monitoring of the well headspace and breathing zone concentrations using a PID or FID shall be performed to determine required levels of protection. Under certain conditions, air-tight well caps may explosively fly off the well when the pressure is relieved. Never stand directly over a well when uncapping it.

6.0 RECORDS

A record of all field procedures, tests and observations must be recorded in the site logbook or designated field notebook. Entries in the log/notebook should include the individuals participating in the field effort, and the date and time. The use of annotated sketches may help to supplement the evaluation.

ATTACHMENT A
MONITORING WELL INSPECTION SHEET

Monitoring Well Inspection Sheet

Project Name: _____ Date: _____

Location: _____ Time: _____

Tidally Influenced: Y / N Personnel: _____

Field Measurements				
Well ID	PID Reading PPM	Depth to Water *	Total Depth *	Flush Mt./ Stick-up

Well Construction Details (Taken from construction logs)		
Total Depth *	Ground Elev.	Top/Btm Screen *

Check List:

Riser Pipe Material:
Riser Notched for Surveyors:
Well ID Tag in-place:
Well security:
Photo taken:

Condition of Well:

Protective Case:
Riser:
Well Pad:
Other:

Presence/Evidence of:

Standing Water Around Well:
Existing Sampling Equipment:
Sediment build-up in Well Btm:

Comments:

** = Measurements are from the top of the inner case to the nearest 0.01'*

ATTACHMENT B
GROUNDWATER LEVEL MEASUREMENT SHEET

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: _____ **Project No.:** _____
Location: _____ **Personnel:** _____
Weather Conditions: _____ **Measuring Device:** _____
Tidally Influenced: Yes ___ No ___ **Remarks:** _____

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Comments

** All measurements to the nearest 0.01 foot, from surveyed mark (unless noted)*

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FIGURE

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1 STANDARD SIZES OF CORE BARRELS AND CASING 15

1.0 PURPOSE

The purpose of this procedure is to describe the methods and equipment necessary to perform soil and rock borings and identify the equipment, sequence of events, and appropriate methods necessary to obtain soil, both surface and subsurface, and rock samples during field sampling activities.

2.0 SCOPE

This guideline addresses most of the accepted and standard drilling techniques, their benefits, and drawbacks. It should be used generally to determine what type of drilling techniques would be most successful depending on site-specific geologic conditions and the type of sampling required.

The sampling methods described within this procedure are applicable to collecting surface and subsurface soil samples, and obtaining rock core samples for lithologic and hydrogeologic evaluation, excavation/foundation design, remedial alternative design and related civil engineering purposes.

3.0 GLOSSARY

~~Rock Coring - A method in which a continuous solid cylindrical sample of rock or compact rock-like soil is obtained by the use of a double tube core barrel that is equipped with an appropriate diamond-studded drill bit which is advanced with a hydraulic rotary drilling machine.~~

~~Wire-Line Coring - As an alternative to conventional coring, this technique is valuable in deep hole drilling, since this method eliminates trips in and out of the hole with the coring equipment. With this technique, the core barrel becomes an integral part of the drill rod string. The drill rod serves as both a coring device and casing.~~

4.0 RESPONSIBILITIES

Project Manager - In consultation with the project geologist, the Project Manager is responsible for evaluating the drilling requirements for the site and specifying drilling techniques that will be successful given the study objectives and the known or suspected geologic conditions at the site. The Project Manager also determines the disposal methods for products generated by drilling, such as drill cuttings and well development water, as well as any specialized supplies or logistical support required for the drilling operations.

Field Operations Leader (FOL) - The FOL is responsible for the overall supervision and scheduling of drilling activities, and is strongly supported by the project geologist.

Project Geologist - The project geologist is responsible for ensuring that standard and approved drilling procedures are followed. The geologist will generate a detailed boring log for each test hole. This log shall include a description of materials, samples, method of sampling, blow counts, and other pertinent drilling and testing information that may be obtained during drilling (see SOPs SA-6.3 and GH-1.5). Often this position for inspecting the drilling operations may be filled by other geotechnical personnel, such as soils and foundation engineers, civil engineers, etc.

Determination of the exact location for borings is the responsibility of the site geologist. The final location for drilling must be properly documented on the boring log. The general area in which the borings are to be located will be shown on a site map included in the Work Plan and/or Sampling and Analysis Plan.

Drilling Subcontractor - Operates under the supervision of the FOL. Responsible for obtaining all drilling permits and clearances, and supplying all services (including labor), equipment and material required to

perform the drilling, testing, and well installation program, as well as maintenance and quality control of such required equipment except as stated in signed and approved subcontracts.

The driller must report any major technical or analytical problems encountered in the field to the FOL within 24 hours of determination, and must provide advance written notification of any changes in field procedures, describing and justifying such changes. No such changes shall be made unless requested and authorized in writing by the FOL (with the concurrence of the Project Manager). Depending on the subcontract, the Project Manager may need to obtain written authorization from appropriate administrative personnel before approving any changes.

The drilling subcontractor is responsible for following decontamination procedures specified in the project plan documents. Upon completion of the work, the driller is responsible for demobilizing all equipment, cleaning up any materials deposited on site during drilling operations, and properly backfilling any open borings.

5.0 PROCEDURES

5.1 General

The purpose of drilling boreholes is:

- To determine the type, thickness, and certain physical and chemical properties of the soil, water and rock strata which underlie the site.
- To install monitoring wells or piezometers.

All drilling and sampling equipment will be cleaned between samples and borings using appropriate decontamination procedures as outlined in SOP SA-7.1. Unless otherwise specified, it is generally advisable to drill borings at "clean" locations first, and at the most contaminated locations last, to reduce the risk of spreading contamination between locations. All borings must be logged by the site geologist as they proceed (see SOPs SA-6.3 and GH-1.5). Situations where logging would not be required would include installation of multiple well points within a small area, or a "second attempt" boring adjacent to a boring that could not be continued through resistant material. In the latter case, the boring log can be resumed 5 feet above the depth at which the initial boring was abandoned, although the site geologist should still confirm that the stratigraphy at the redrilled location conforms essentially with that encountered at the original location. If significant differences are seen, each hole should be logged separately.

5.2 Drilling Methods

The selected drilling methods described below apply to drilling in subsurface materials, including, but not limited to, sand, gravel, clay, silt, cobbles, boulders, rock and man-made fill. Drilling methods should be selected after studying the site geology and terrain, the waste conditions at the site, and reviewing the purpose of drilling and the overall subsurface investigation program proposed for the site. The full range of different drilling methods applicable to the proposed program should be identified with final selection based on relative cost, availability, time constraints, and how well each method meets the sampling and testing requirements of the individual drilling program.

5.2.1 Hollow-Stem Auger Drilling

This method of drilling consists of rotating augers with a hollow stem into the ground. Cuttings are brought to the surface by the rotating action of the auger. This method is relatively quick and inexpensive. Advantages of this type of drilling include:

- Samples can be obtained without pulling the augers out of the hole. However, this is a poor method for obtaining grab samples from thin, discrete formations because of mixing of soils which occurs as the material is brought to the surface. Sampling of such formations requires the use of split-barrel or thin-wall tube samplers advanced through the hollow core of the auger.
- No drilling fluids are required.
- A well can be installed inside the auger stem and backfilled as the augers are withdrawn.

Disadvantages and limitations of this method of drilling include:

- Augering can only be done in unconsolidated materials.

- The inside diameter of hollow stem augers used for well installation should be at least 4 inches greater than the well casing. Use of such large-diameter hollow-stem augers is more expensive than the use of small-diameter augers in boreholes not used for well installation. Furthermore, the density of unconsolidated materials and depths become more of a limiting factor. More friction is produced with the larger diameter auger and subsequently greater torque is needed to advance the boring.

- The maximum effective depth for drilling is 150 feet or less, depending on site conditions and the size of augers used.

- In augering through clean sand formations below the water table, the sand will tend to flow into the hollow stem when the plug is removed for soil sampling or well installation. If the condition of "running" or "flowing" sands is persistent at a site, an alternative method of drilling is recommended, in particular for wells or boreholes deeper than 25 feet.

Hollow-stem auger drilling is the preferred method of drilling. Most alternative methods require the introduction of water or mud downhole (air rotary is the exception) to maintain the open borehole. With these other methods, great care must be taken to ensure that the method does not interfere with the collection of a representative sample (which may be the prime objective of the borehole construction). With this in mind, the preferred order of choice of drilling method after hollow-stem augering (HSA) is:

- Drill-through casing drive
- Jet drilling
- Hand auger

However, the use of any method will also depend on efficiency and cost-effectiveness. In many cases, mud rotary is the only feasible alternative to hollow-stem augering. Thus, mud rotary drilling is generally acceptable as a first substitute for HSA.

The procedures for sampling soils through holes drilled by hollow-stem auger shall conform with the applicable ASTM Standards: D1587-83 and D1586-84. The guidelines established in SOP SA-1.3 shall also be followed. The hollow-stem auger may be advanced by any power-operated drilling machine having sufficient torque and ram range to rotate and force the auger to the desired depth. The machine must, however, be equipped with the accessory equipment needed to perform required sampling, or rock coring.

The hollow-stem auger may be used without the plug when boring for geotechnical examination or for well installation. However, when drilling below the water table, specially designed plugs which allow passage of formation water but not solid material shall be used (see Reference 1 of this guideline). This drilling configuration method also prevents blow back and plugging of the auger when the plug is removed for sampling.

Alternately, it may be necessary to keep the hollow stem full of water, at least to the level of the water table, to prevent blowback and plugging of the auger. If water is added to the hole, it must be sampled

and analyzed to determine if it is free from contaminants prior to use. In addition, the amount of water introduced, the amount recovered upon attainment of depth, and the amount of water extracted during well development must be carefully logged in order to ensure that a representative sample of the formation water can be obtained. Well development should occur as soon after well completion as practicable (see SOP GH-2.8 for well development procedures). If gravelly or hard material is encountered which prevents advancing the auger to the desired depth, augering should be halted and either driven casing or hydraulic rotary methods should be attempted. If the depth to the bedrock/soil interface and bedrock lithology must be determined, then a 5-foot confirmatory core run should be conducted (see Section 5.2.9).

At the option of the Field Operations Leader (in communication with the Project Manager), when resistant materials prevent the advancement of the auger, a new boring can be attempted. The original boring must be properly backfilled and the new boring started a short distance away at a location determined by the site geologist. If multiple water bearing strata were encountered, the original boring must be grouted. In some formations, it may be prudent to also grout borings which penetrate only the water table aquifer, since loose soil backfill in the boring may still provide a preferred pathway for surface liquids to reach the water table. Backfilling requirements may also be driven by state or local regulations.

5.2.2 Drill-through Casing Driver

The driven-casing method consists of alternately driving casing (fitted with a sharp, hardened casing shoe) into the ground using a hammer lifted and dropped by the drill rig (or an air-hammer) and cleaning out the casing using a rotary chopping bit and air or water to flush out the materials. The casing is driven down in stages (usually 5 feet per stage); a continuous record is kept of the blows per foot in driving the casing (see SOP GH-1.5). The casing is normally advanced by a 300-pound hammer falling freely through a height of 30 inches. Simultaneous washing and driving of the casing is not recommended. If this procedure is used, the elevations within which wash water is used and in which the casing is driven must be clearly recorded.

The driven casing method is used in unconsolidated formations only. When the boring is to be used for later well installation, the driven casing used should be at least 4 inches larger in diameter than the well casing to be installed. Advantages to this method of drilling include:

- Split-barrel (split-spoon) sampling can be conducted while drilling.
- Well installation is easily accomplished.
- Drill rigs used are relatively small and mobile.
- The use of casing minimizes flow into the hole from upper water-bearing layers; therefore, multiple aquifers can be penetrated and sampled for rough field determinations of some water quality parameters.

Some of the disadvantages include:

- This method can only be used in unconsolidated formations.
- The method is slower than other methods (average drilling progress is 30 to 50 feet per day).
- Maximum depth of the borehole varies with the size of the drill rig and casing diameter used, and the nature of the formations drilled.
- The cost per hour or per foot of drilling may be substantially higher than other drilling methods.

- It is difficult and time consuming to pull back the casing if it has been driven very deep (deeper than 50 feet in many formations).

5.2.3 Jet Drilling (Washing)

Jet drilling, which should be used only for piezometer or vadose zone sampler installation, consists of pumping water or drilling mud down through a small diameter (1/2- to 2-inch) standard pipe (steel or PVC). The pipe may be fitted with a chisel bit or a special jetting screen. Formation materials dislodged by the bit and jetting action of the water are brought to the surface through the annulus around the pipe. As the pipe is jetted deeper, additional lengths of pipe may be added at the surface.

Jet percussion is a variation of the jetting method, in which the casing is driven with a drive weight. Normally, this method is used to place 2-inch-diameter casing in shallow, unconsolidated sand formations, but this method has also been used to install 3- to 4-inch-diameter casings to a depth of 200 feet.

Jetting is acceptable in very soft formations, usually for shallow sampling, and when introduction of drilling water to the formation is acceptable. Such conditions would occur during rough stratigraphic investigation or installation of piezometers for water level measurement. Advantages of this method include:

- Jetting is fast and inexpensive.
- Because of the small amount of equipment required, jetting can be accomplished in locations where access by a normal drilling rig would be very difficult. For example, it would be possible to jet down a well point in the center of a lagoon at a fraction of the cost of using a drill rig.
- Jetting numerous well points just into a shallow water table is an inexpensive method for determining the water table contours, hence flow direction.

Disadvantages include the following:

- A large amount of foreign water or drilling mud is introduced above and into the formation to be sampled.
- Jetting is usually done in very soft formations which are subject to caving. Because of this caving, it is often not possible to place a grout seal above the screen to assure that water in the well is only from the screened interval.
- The diameter of the casing is usually limited to 2 inches.
- Jetting is only possible in very soft formations that do not contain boulders or coarse gravel, and the depth limitation is shallow (about 30 feet without jet percussion equipment).
- Large quantities of water are often needed.

5.2.4 Drilling with a Hand Auger

This method is applicable wherever the formation, total depth of sampling, and the site and groundwater conditions are such as to allow hand auger drilling. Hand augering can also be considered at locations where drill rig access is not possible. All hand auger borings will be performed according to ASTM D1452-80.

Samples should be taken continuously unless otherwise specified by the project plan documents. Any required sampling is performed by rotation, pressing, or driving in accordance with the standard or approved method governing use of the particular sampling tool. Typical equipment used for sampling and advancing shallow "hand auger" holes are Iwan samplers (which are rotated) or post hole diggers (which are operated like tongs). These techniques are slow but effective where larger pieces of equipment do not have access, and where very shallow holes are desired (less than 15 feet). Surficial soils must be composed of relatively soft and non-cemented formations to allow penetration by the auger.

5.2.5 Rock Drilling and Coring

When soil borings cannot be continued using augers or rotary methods due to the hardness of the soil or when rock or large boulders are encountered, drilling and sampling can be performed using a diamond bit corer in accordance with ASTM D2113.

Drilling is done by rotating and applying downward pressure to the drill rods and drill bit. The drill bit is a circular, hollow, diamond-studded bit attached to the outer core barrel in a double-tube core barrel. The use of single-tube core barrels is not recommended, as the rotation of the barrel erodes the sample and limits its use for detailed geological evaluation. Water or air is circulated down through the drill rods and annular space between the core barrel tubes to cool the bit and remove the cuttings. The bit cuts a core out of the rock which rises into an inner barrel mounted inside the outer barrel. The inner core barrel and rock core are removed by lowering a wire line with a coupling into the drill rods, latching onto the inner barrel and withdrawing the inner barrel. A less efficient variation of this method utilizes a core barrel that cannot be removed without pulling all of the drill rods. This variation is practical only if less than 50 feet of core is required.

Core borings are made through the casing used for the soil borings. The casing must be driven and sealed into the rock formation to prevent seepage from the overburden into the hole to be cored (see Section 5.3 of this guideline). A double-tube core barrel with a diamond bit and reaming shell or equivalent should be used to recover rock cores of a size specified in the project plans. The most common core barrel diameters are listed in Attachment A.

Soft or decomposed rock should be sampled with a driven split-barrel whenever possible or cored with a Denison or Pitcher sampler.

When coring rock, including shale and claystone, the speed of the drill and the drilling pressure, amount and pressure of water, and length of run can be varied to give the maximum recovery from the rock being drilled. Should any rock formation be so soft or broken that the pieces continually fall into the hole causing unsatisfactory coring, the hole should be reamed and a flush-joint casing installed to a point below the broken formation. The size of the flush-joint casing must permit securing the core size specified. When soft or broken rock is anticipated, the length of core runs should be reduced to less than 5 feet to avoid core loss and minimize core disturbance.

Advantages of core drilling include:

- Undisturbed rock cores can be recovered for examination and/or testing.
- In formations in which the cored hole will remain open without casing, water from the rock fractures may be recovered from the well without the installation of a well screen and gravel pack.
- Formation logging is extremely accurate.
- Drill rigs are relatively small and mobile.

Disadvantages include:

- Water or air is needed for drilling.
- Coring is slower than rotary drilling (and more expensive).
- Depth to water cannot accurately be determined if water is used for drilling.
- The size of the borehole is limited.

This drilling method is useful if accurate determinations of rock lithology are desired or if open wells are to be installed into bedrock. To install larger diameter wells in coreholes, the hole must be reamed out to the proper size after boring, using air or mud rotary drilling methods.

5.2.6 Drilling & Support Vehicles

In addition to the drilling method required to accomplish the objectives of the field program, the type of vehicle carrying the drill rig and/or support equipment and its suitability for the site terrain, will often be an additional deciding factor in planning the drilling program. The types of vehicles available are extensive, and depend upon the particular drilling subcontractor's fleet. Most large drilling subcontractors will have a wide variety of vehicle and drill types suited for most drilling assignments in their particular region, while smaller drilling subcontractors will usually have a fleet of much more limited diversity. The weight, size, and means of locomotion (tires, tracks, etc.) of the drill rig must be selected to be compatible with the site terrain to assure adequate mobility between borehole locations. Such considerations also apply to necessary support vehicles used to transport water and/or drilling materials to the drill rigs at the borehole locations. When the drill rigs or support vehicles do not have adequate mobility to easily traverse the site, provisions must be made for assisting equipment, such as bulldozers, winches, timber planking, etc., to maintain adequate progress during the drilling program.

Some of the typical vehicles which are usually available for drill rigs and support equipment are:

- Totally portable drilling/sampling equipment, where all necessary components (tripods, samplers, hammers, catheads, etc.) may be hand carried to the borehole site. Drilling/sampling methods used with such equipment include:

  - Hand augers and lightweight motorized augers.
  - Retractable plug samplers--driven by hand (hammer).
  - Motorized cathead - a lightweight aluminum tripod with a small gas-engine cathead mounted on one leg, used to install small-diameter cased borings. This rig is sometimes called a "monkey on a stick."

- Skid-mounted drilling equipment containing a rotary drill or engine-driven cathead (to lift hammers and drill string), a pump, and a dismounted tripod. The skid is pushed, dragged, or winched (using the cathead drum) between boring locations.

- Small truck-mounted drilling equipment using a Jeep, stake body or other light truck (4 to 6 wheels), upon which are mounted the drill and/or a cathead, a pump, and a tripod or small drilling derrick. On some rigs, the drill and/or a cathead are driven by a power take-off from the truck, instead of by a separate engine.

- Track-mounted drilling equipment is similar to truck-mounted rigs, except that the vehicle used has wide bulldozer tracks for traversing soft ground. Sometimes a continuous-track "all terrain vehicle" is also modified for this purpose. Some types of tracked drill rigs are called "bombardier" or "weasel" rigs.

- Heavy truck-mounted drilling equipment is mounted on tandem or dual tandem trucks to transport the drill, derrick, winches, and pumps or compressors. The drill may be provided with a separate engine or may use a power take-off from the truck engine. Large augers, hydraulic rotary and reverse circulation rotary drilling equipment are usually mounted on such heavy duty trucks. For soft-ground sites, the drilling equipment is sometimes mounted on vehicles having low pressure, very wide diameter tires and capable of floating; these vehicles are called "swamp buggy" rigs.

- Marine drilling equipment is mounted on various floating equipment for drilling borings in lakes, estuaries and other bodies of water. The floating equipment varies, and is often manufactured or customized by the drilling subcontractor to suit specific drilling requirements. Typically, the range of flotation vehicles include:

  - Barrel-float rigs - a drill rig mounted on a timber platform buoyed by empty 55-gallon drums or similar flotation units.

  - Barge-mounted drill rigs.

  - Jack-up platforms - drilling equipment mounted on a floating platform having retractable legs to support the unit on the sea or lake bed when the platform is jacked up out of the water.

  - Drill ships - for deep ocean drilling.

In addition to the mobility for the drilling equipment, similar consideration must be given for equipment to support the drilling operations. Such vehicles or floating equipment are needed to transport drill water, drilling supplies and equipment, samples, drilling personnel, etc. to and/or from various boring locations.

5.2.7 Equipment Sizes

In planning subsurface exploration programs, care must be taken in specifying the various drilling components, so that they will fit properly in the boring or well.

For drilling open boreholes using rotary drilling equipment, tri-cone drill bits are employed with air, water or drilling mud to remove cuttings and cool the bit. Tri-cone bits are slightly smaller than the holes they drill (i.e., 5-7/8-inch or 7-7/8-inch bits will nominally drill 6-inch and 8-inch holes, respectively).

For obtaining split-barrel samples of a formation, samplers are commonly manufactured in sizes ranging from 2 inches to 3-1/2 inches in outside diameter. However, the most commonly used size is the 2-inch O.D., 1-3/8-inch I.D. split-barrel sampler. When this sampler is used and driven by a 140-pound (± 2-pound) hammer dropping 30 inches (± 1 inch), the procedure is called a Standard Penetration Test, and the blows per foot required to advance the sampler into the formation can be correlated to the formation's density or strength.

In planning the drilling of boreholes using hollow-stem augers or casing, in which thin-wall tube samples or diamond core drilling will be performed, refer to the various sizes and clearances provided in Attachment A of this guideline. Sizes selected must be stated in the project plan documents.

5.2.8 Estimated Drilling Progress

To estimate the anticipated rates of drilling progress for a site, the following must be considered:

- The speed of the drilling method employed.
- Applicable site conditions (e.g., terrain, mobility between borings, difficult drilling conditions in bouldery soils, rubble fill or broken rock, etc.).
- Project-imposed restrictions (e.g., drilling while wearing personal protective equipment, decontamination of drilling equipment, etc.).

Based on recent experience in drilling average soil conditions (no boulders) and taking samples at 5-foot intervals, for moderate depth (30 feet to 50 feet) boreholes (not including installation or development of wells), the following daily rates of total drilling progress may be anticipated for the following drilling methods:

Drilling Method	Average Daily Progress (linear feet)
Hollow-stem augers	75'
~~Solid-stem augers~~	~~50'~~
~~Mud Rotary Drilling~~	~~100' (cuttings samples)~~
~~Rotosonic Drilling~~	~~100'-160' (continuous core)~~
~~Reverse-Circulation Rotary~~	~~100' (cuttings samples)~~
~~Skid-Rig with driven casing~~	~~30'~~
~~Rotary with driven casing~~	~~50'~~
~~Cable Tool~~	~~30'~~
Hand Auger	Varies
~~Continuous Rock Coring~~	~~50'~~

5.3 Prevention of Cross-Contamination

A telescoping or multiple casing technique minimizes the potential for the migration of contaminated groundwater to lower strata below a confining layer. The telescoping technique consists of drilling to a confining layer utilizing a spun casing method with a diamond cutting or augering shoe (a method similar to the rock coring method described in Section 5.2.10, except that larger casing is used) or by using a driven-casing method (see Section 5.2.6 of this guideline) and installing a specified diameter steel well casing. The operation consists of three separate steps. Initially, a drilling casing (usually of 8-inch diameter) is installed followed by installation of the well casing (6-inch-diameter is common for 2-inch wells). This well casing is driven into the confining layer to ensure a tight seal at the bottom of the hole. The well casing is sealed at the bottom with a bentonite-cement slurry. The remaining depth of the boring is drilled utilizing a narrower diameter spun or driven casing technique within the outer well casing. A smaller diameter well casing with an appropriate length of slotted screen on the lower end, is installed to the surface.

Clean sand is placed in the annulus around and to a point of about 2 feet above the screen prior to withdrawal of the drilling casing. The annular space above the screen and to a point 2 feet above the bottom of the outer well casing is sealed with a tremied cement-bentonite slurry which is pressure-grouted or displacement-grouted into the hole. The remaining casing annulus is backfilled with clean material and grouted at the surface, or it is grouted all the way to the surface.

5.4 Cleanout of Casing Prior to Sampling

The boring hole must be completely cleaned of disturbed soil, segregated coarse material and clay adhering to the inside walls of the casing. The cleaning must extend to the bottom edge of the casing and, if possible, a short distance further (1 or 2 inches) to bypass disturbed soil resulting from the advancement of the casing. Loss of wash water during cleaning should be recorded.

For disturbed samples both above and below the water table and where introduction of relatively large volumes of wash water is permissible, the cleaning operation is usually performed by washing the material out of the casing with water; however, the cleaning should never be accomplished with a strong, downward-directed jet which will disturb the underlying soil. When clean out has reached the bottom of the casing or slightly below (as specified above), the string of tools should be lifted one foot off the bottom with the water still flowing, until the wash water coming out of the casing is clear of granular soil particles. In formations where the cuttings contain gravel and other larger particles, it is often useful to repeatedly raise and lower the drill rods and wash bit while washing out the hole, to surge these large particles upward out of the hole. As a time saver, the drilling contractor may be permitted to use a split-barrel (split-spoon) sampler with the ball check valve removed as the clean-out tool, provided the material below the spoon is not disturbed and the shoe of the spoon is not damaged. However, because the ball check valve has been removed, in some formations it may be necessary to install a flap valve or spring sample retainer in the split-spoon bit, to prevent the sample from falling out as the sampler is withdrawn from the hole. The use of jet-type chopping bits is discouraged except where large boulders and cobbles or hard-cemented soils are encountered. If water markedly softens the soils above the water table, clean out should be performed dry with an auger.

For undisturbed samples below the water table, or where wash water must be minimized, clean out is usually accomplished with an appropriate diameter clean out auger. This auger has cutting blades at the bottom to carry loose material up into the auger, and up-turned water jets just above the cutting blades to carry the removed soil to the surface. In this manner, there is a minimum of disturbance at the top of the material to be sampled. If any gravel material washes down into the casing and cannot be removed by the clean out auger, a split-barrel sample can be taken to remove it; bailers and sandpumps should not be used. For undisturbed samples above the groundwater table, all operations must be performed in a dry manner.

If all of the cuttings created by drilling through the overlying formations are not cleaned from the borehole prior to sampling, some of the problems which may be encountered during sampling include:

- When sampling is attempted through the cuttings remaining in the borehole, all or part of the sampler may become filled with the cuttings. This limits the amount of sample from the underlying formation which can enter and be retained in the sampler, and also raises questions as to the validity of the sample.

- If the cuttings remaining in the borehole contain coarse gravel and/or other large particles, these may block the bit of the sampler and prevent any materials from the underlying formation from entering the sampler when the sampler is advanced.

- In cased borings, should sampling be attempted through cuttings which remain in the lower portion of the casing, these cuttings could cause the sampler to become bound into the casing, such that it becomes very difficult to either advance or retract the sampler.

- When sampler blow counts are used to estimate the density or strength of the formation being sampled, the presence of cuttings in the borehole will usually give erroneously high sample blow counts.

To confirm that all cuttings have been removed from the borehole prior to attempting sampling, it is important that the site geologist measure the "stickup" of the drill string. This is accomplished by measuring the assembled length of all drill rods and bits or samplers (the drill string) as they are lowered to the bottom of the hole, below some convenient reference point of the drill string, then measuring the height of this reference point above the ground surface. The difference of these measurements is the depth of the drill string (lower end of the bit or sampler) below the ground surface, which must then be compared with the depth of sampling required (installed depth of casing or depth of borehole drilled). If the length of drill string below grade is more than the drilled or casing depth, the borehole has been cleaned too deeply, and this deeper depth of sampling must be recorded on the log. If the length of drill string below grade is less than the drilled or casing depth, the difference represents the thickness of cuttings which remain in the borehole. In most cases, an inch or two of cuttings may be left in the borehole with little or no problem. However, if more than a few inches of cuttings are encountered, the borehole must be recleaned prior to attempting sampling.

5.5 Materials of Construction

The effects of monitoring well construction materials on specific chemical analytical parameters are described and/or referenced in SOP GH-2.8. However, there are several materials used during drilling, particularly drilling fluids and lubricants, which must be used with care to avoid compromising the representativeness of soil and ground water samples.

The use of synthetic or organic polymer slurries is not permitted at any location where soil samples for chemical analysis are to be collected. These slurry materials could be used for installation of long-term monitoring wells, but the early time data in time series collection of ground water data may then be suspect. If synthetic or organic polymer muds are proposed for use at a given site, a complete written justification including methods and procedures for their use must be provided by the site geologist and approved by the Project Manager. The specific slurry composition and the concentration of suspected contaminants for each site must be known.

For many drilling operations, potable water is an adequate lubricant for drill stem and drilling tool connections. However, there are instances, such as drilling in tight clayey formations or in loose gravels, when threaded couplings must be lubricated to avoid binding. In these instances, to be determined in the field by the judgment of the site geologist and noted in the site logbook, and only after approval by the Project Manager, a vegetable oil or silicone-based lubricant should be used. Petroleum based greases, etc. will not be permitted. Samples of lubricants used must be provided and analyzed for chemical parameters appropriate to the given site.

5.6 Subsurface Soil Samples

Subsurface soil samples are used to characterize subsurface stratigraphy. This characterization can indicate the potential for migration of chemical contaminants in the subsurface. In addition, definition of the actual migration of contaminants can be obtained through chemical analysis of the soil samples. Where the remedial activities may include in-situ treatment or excavation and removal of the contaminated soil, the depth and areal extent of contamination must be known as accurately as possible.

Engineering and physical properties of soil may also be of interest should site construction activities be planned. Soil types, grain size distribution, shear strength, compressibility, permeability, plasticity, unit weight, and moisture content are some of the physical characteristics that may be determined for soil samples.

Penetration tests are also described in this procedure. The tests can be used to estimate various physical and engineering parameters such as relative density, unconfined compressive strength, and consolidation characteristics of soils.

Surface protocols for various soil sampling techniques are discussed in SOP SA-1.3. Continuous-core soil sampling and rock coring are discussed below. The procedures described here are representative of a larger number of possible drilling and sampling techniques. The choice of techniques is based on a large number of variables such as cost, local geology, etc. The final choice of methods must be made with the assistance of drilling subcontractors familiar with the local geologic conditions. Alternative techniques must be based upon the underlying principles of quality assurance implicit in the following procedures.

The CME continuous sample tube system provides a method of sampling soil continuously during hollow-stem augering. The 5-foot sample barrel fits within the lead auger of a hollow-auger column. The sampling system can be used with a wide range of I.D. hollow-stem augers (from 3-1/4-inch to 8-1/4-inch I.D.). This method has been used to sample many different materials such as glacial drift, hard clays and shales, mine tailings, etc. This method is particularly used when SPT samples are not required and a large volume of material is needed. Also, this method is useful when a visual description of the subsurface lithology is required. Rotosonic drilling methods also provide a continuous soil sample.

5.7 Rock Sampling (Coring) (ASTM D2113-83)

Rock coring enables a detailed assessment of borehole conditions to be made, showing precisely all lithologic changes and characteristics. Because coring is an expensive drilling method, it is commonly used for shallow studies of 500 feet or less, or for specific intervals in the drill hole that require detailed logging and/or analyzing. Rock coring can, however, proceed for thousands of feet continuously, depending on the size of the drill rig, and yields better quality data than air-rotary drilling, although at a substantially reduced drilling rate. Rate of drilling varies widely, depending on the characteristics of lithologies encountered, drilling methods, depth of drilling, and condition of drilling equipment. Average output in a 10-hour day ranges from 40 to over 200 feet. Down hole geophysical logging or television camera monitoring is sometimes used to complement the data generated by coring.

Borehole diameter can be drilled to various sizes, depending on the information needed. Standard sizes of core barrels (showing core diameter) and casing are shown in Figure 1.

Core drilling is used when formations are too hard to be sampled by soil sampling methods and a continuous solid sample is desired. Usually, soil samples are used for overburden, and coring begins in sound bedrock. Casing is set into bedrock before coring begins to prevent loose material from entering the borehole, to prevent loss of drilling fluid, and to prevent cross-contamination of aquifers.

Drilling through bedrock is initiated by using a diamond-tipped core bit threaded to a drill rod (outer core barrel) with a rate of drilling determined by the downward pressure, rotation speed of drill rods, drilling fluid pressure in the borehole, and the characteristics of the rock (mineralogy, cementation, weathering).

FIGURE 1

STANDARD SIZES OF CORE BARRELS AND CASING

Coring Bit Size	Nominal*		Set Size*	
	O.D.	I.D.	O.D.	I.D.
RWT	1 5/32	3/4	1.160	0.735
EWT	1 1/2	29/32	1.470	0.905
EX, EXL, EWG, EWM	1 1/2	13/16	1.470	0.845
AWT	1 7/8	1 9/32	1.875	1.281
AX, AXL, AWG, AWM	1 7/8	1 3/16	1.875	1.185
BWT	2 3/8	1 3/4	2.345	1.750
BX, BXL, BWG, BWM	2 3/8	1 5/8	2.345	1.655
NWT	3	2 5/16	2.965	2.313
NX, NXL, NWG, NWM	3	2 1/8	2.965	2.155
HWT	3 29/32	3 3/16	3.889	3.187
HWG	3 29/32	3	3.889	3.000
2 3/4 x 3 7/8	3 7/8	2 3/4	3.840	2.690
4 x 5 1/2	5 1/2	4	5.435	3.970
6 x 7 3/4	7 3/4	6	7.655	5.970
AX Wire line ___|___/	1 7/8	1	1.875	1.000
BX Wire line ___|___/	2 3/8	1 7/16	2.345	1.437
NX Wire line ___|___/	3	1 15/16	2.965	1.937

* All dimensions are in inches; to convert to millimeters, multiply by 25.4.

___|___/ Wire line dimensions and designations may vary according to manufacturer.

FIGURE 1
STANDARD SIZES OF CORE BARRELS AND CASING
PAGE TWO

Size Designations			Casing Coupling					Approximate Core Diameter	
Casing; Casing coupling; Casing bits; Core barrel bits	Rod; rod couplings	Casing O.D., Inches	O.D., Inches	I.D., Inches	Casing bit O.D., Inches	Core barrel bit O.D., Inches*	Drill rod O.D., Inches	Normal, Inches	Thinwall, Inches
RX	RW	1.437	1.437	1.188	1.485	1.160	1.094	---	0.735
EX	E	1.812	1.812	1.500	1.875	1.470	1.313	0.845	0.905
AX	A	2.250	2.250	1.906	2.345	1.875	1.625	1.185	1.281
BX	B	2.875	2.875	2.375	2.965	2.345	1.906	1.655	1.750
NX	N	3.500	3.500	3.000	3.615	2.965	2.375	2.155	2.313
HX	HW	4.500	4.500	3.938	4.625	3.890	3.500	3.000	3.187
RW	RW	1.437	Flush Joint	No Coupling	1.485	1.160	1.094	---	0.735
EW	EW	1.812			1.875	1.470	1.375	0.845	0.905
AW	AW	2.250			2.345	1.875	1.750	1.185	1.281
BW	BW	2.875			2.965	2.345	2.125	1.655	1.750
NW	NW	3.500			3.615	2.965	2.625	2.155	2.313
HW	HW	4.500			4.625	3.890	3.500	3.000	3.187
PW	---	5.500			5.650	---	---	---	---
SW	---	6.625			6.790	---	---	---	---
UW	---	7.625			7.800	---	---	---	---
ZW	---	8.625			8.810	---	---	---	---
---	AX __|__\	---	---	---	---	1.875	1.750	1.000	---
---	BX __|__\	---	---	---	---	2.345	2.250	1.437	---
---	NX __|__\	---	---	---	---	2.965	2.813	1.937	---

* All dimensions are in inches; to convert to millimeters, multiply by 25.4.

__\|__/ Wire line dimensions and designations may vary according to manufacturer.

NOMINAL DIMENSIONS FOR DRILL CASINGS AND ACCESSORIES. (DIAMOND CORE DRILL MANUFACTURERS ASSOCIATION). 288-D-2889

5.7.1 Diamond Core Drilling

A penetration of typically less than 6 inches per 50 blows using a 140-lb. hammer dropping 30 inches with a 2-inch split-barrel sampler shall be considered an indication that soil sampling methods may not be applicable and that coring may be necessary to obtain samples.

When formations are encountered that are too hard to be sampled by soil sampling methods, the following diamond core drilling procedure may be used:

- Firmly seat a casing into the bedrock or the hard material to prevent loose materials from entering the hole and to prevent the loss of drilling fluid return. Level the surface of the rock or hard material when necessary by the use of a fishtail or other bits. If the drill hole can be retained open without the casing and if cross-contamination of aquifers in the unconsolidated materials is unlikely, leveling may be omitted.

- Begin the core drilling using a double-tube swivel-core barrel of the desired size. After drilling no more than 10 feet (3 m), remove the core barrel from the hole and take out the core. If the core blocks the flow of the drilling fluid during drilling, remove the core barrel immediately. In soft materials, a large starting size may be specified for the coring tools; where local experience indicates satisfactory core recovery or where hard, sound materials are anticipated, a smaller size or the single-tube type may be specified and longer runs may be drilled. NX/NW size coring equipment is the most commonly used size.

- When soft materials are encountered that produce less than 50 percent recovery, stop the core drilling. If soil samples are desired, secure such samples in accordance with the procedures described in ASTM Method D 1586 (Split-barrel Sampling) or in Method D 1587 (Thin-Walled Tube Sampling); sample soils per SOP SA-1.3. Resume diamond core drilling when refusal materials are again encountered.

- Since rock structures and the occurrence of seams, fissures, cavities, and broken areas are among the most important items to be detected and described, take special care to obtain and record these features. If such broken zones or cavities prevent further advance of the boring, one of the following three steps shall be taken: (1) cement the hole; (2) ream and case; or (3) case and advance with the next smaller size core barrel, as conditions warrant.

- In soft, seamy, or otherwise unsound rock, where core recovery may be difficult, M-design core barrels may be used. In hard, sound rock where a high percentage of core recovery is anticipated, the single-tube core barrel may be employed.

5.7.2 Rock Sample Preparation and Documentation

Once the rock coring has been completed and the core recovered, the rock core shall be carefully removed from the barrel, placed in a core tray (previously labeled "top" and "bottom" to avoid confusion), classified, and measured for percentage of recovery as well as the rock quality designation (RQD). Each core shall be described, classified, and logged using a uniform system as presented in SOP GH-1.5. If moisture content will be determined or if it is desirable to prevent drying (e.g., to prevent shrinkage of clay formations) or oxidation of the core, the core shall be wrapped in plastic sleeves immediately after logging. Each plastic sleeve shall be labeled with indelible ink. The boring number, run number, and the footage represented in each sleeve shall be included, as well as designating the top and bottom of the core run.

After sampling, rock cores shall be placed in the sequence of recovery in well-constructed wooden boxes provided by the drilling contractor. Rock cores from two different borings shall not be placed in the same core box unless accepted by the Project Geologist. The core boxes shall be constructed to accommodate

at least 20 linear feet of core in rows of approximately 5 feet each and shall be constructed with hinged tops secured with screws, and a latch (usually a hook and eye) to keep the top securely fastened down. Wood partitions shall be placed at the end of each core run and between rows.

The depth from the surface of the boring to the top and bottom of the drill run and run number shall be marked on the wooden partitions with indelible ink. A wooden partition (wooden block) shall be placed at the end of each run with the depth of the bottom of the run written on the block. These blocks will serve to separate successive core runs and indicate depth intervals for each run. The order of placing cores shall be the same in all core boxes. Rock core shall be placed in the box so that, when the box is open, with the inside of the lid facing the observer, the top of the cored interval contained within the box is in the upper left corner of the box, and the bottom of the cored interval is in the lower right corner of the box. The top and bottom of each core obtained and its true depth shall be clearly and permanently marked on each box. The width of each row must be compatible with the core diameter to prevent lateral movement of the core in the box. Similarly, an empty space in a row shall be filled with an appropriate filler material or spacers to prevent longitudinal movement of the core in the box.

The inside and outside of the core-box lid shall be marked by indelible ink to show all pertinent data on the box's contents. At a minimum, the following information shall be included:

- Project name.
- Project number.
- Boring number.
- Run numbers.
- Footage (depths).
- Recovery.
- RQD (%).
- Box number and total number of boxes for that boring (Example: Box 5 of 7).

For easy retrieval when core boxes are stacked, the sides and ends of the box shall also be labeled and include project number, boring number, top and bottom depths of core and box number.

Prior to final closing of the core box, a photograph of the recovered core and the labeling on the inside cover shall be taken. If moisture content is not critical, the core shall be wetted and wiped clean for the photograph. (This will help to show true colors and bedding features in the cores).

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ATTACHMENT A

DRILLING EQUIPMENT SIZES

Drilling Component	Designation or Hole Size (Inches)	O.D. (Inches)	I.D. (Inches)	Coupling I.D. (Inches)
Hollow-stem augers (Ref. 7)	6 1/4	5	2 1/4	
	6 3/4	5 3/4	2 3/4	---
	7 1/4	6 1/4	3 1/4	---
	13 1/4	12	6	---
Thin Wall Tube Samplers (Ref. 7)	---	2	1 7/8	---
	---	2 1/2	2 3/8	---
	---	3	2 7/8	---
	---	3 1/2	3 3/8	---
	---	4 1/2	4 3/8	---
	---	5	4 3/4	---
Drill Rods (Ref. 7)	RW	1 3/32	23/32	13/32
	EW	1 3/8	15/16	7/16
	AW	1 3/4	1 1/4	5/8
	BW	2 1/8	1 3/4	3/4
	NW	2 5/8	2 1/4	1 3/8
	HW	3 1/2	3 1/16	2 3/8
	E	1 5/16	7/8	7/16
	A	1 5/8	1 1/8	9/16
	B	1 7/8	1 1/4	5/8
	N	2 3/8	2	1
				Wall Thickness (Inches)
Driven External Coupled Extra Strong Steel* Casing (Ref. 8)	2 1/2	2.875	2.323	0.276
	3	3.5	2.9	0.300
	3 1/2	4.0	3.364	0.318
	4	4.5	3.826	0.337
	5	5.63	4.813	0.375
	6	6.625	5.761	0.432
	8	8.625	7.625	0.500
	10	10.750	9.750	0.500
	12	12.750	11.750	0.500

* Add twice the casing wall thickness to casing O.D. to obtain the approximate O.D. of the external pipe couplings.

ATTACHMENT A
DRILLING EQUIPMENT SIZES
PAGE TWO

Drilling Component	Designation or Hole Size (Inches)	O.D. (Inches)	I.D. (Inches)	Coupling I.D. (Inches)
Flush Coupled Casing (Ref. 7)	RX	1 7/16	1 3/16	1 3/16
	EX	1 13/16	1 5/8	1 1/2
	AX	2 1/4	2	1 29/32
	BX	2 7/8	2 9/16	2 3/8
	NX	3 1/2	3 3/16	3
	HX	4 1/2	4 1/8	3 15/16
Flush Joint Casing (Ref. 7)	RW	1 7/16	1 3/16	
	EW	1 13/16	1 1/2	
	AW	2 1/4	1 29/32	
	BW	2 7/8	2 3/8	
	NW	3 1/2	3	
	HW	4 1/2	4	
	PW	5 1/2	5	
	SW	6 5/8	6	
	UW	7 5/8	7	
	ZW	8 5/8	8	
Diamond Core Barrels (Ref. 7)	EWM	1 1/2	7/8**	
	AWM	1 7/8	1 1/8**	
	BWM	2 3/8	1 5/8**	
	NWM	3	2 1/8	
	HWG	3 7/8	3	
	2 3/4 x 3 7/8	3 7/8	2 11/16	
	4 x 5 1/2	5 1/2	3 15/16	
	6 x 7 3/4	7 3/4	5 15/16	
	AQ (wireline)	1 57/64	1 1/16**	
	BQ (wireline)	2 23/64	1 7/16**	
	NQ (wireline)	2 63/64	1 7/8	
	HQ (wireline)	3 25/32	2 1/2	

** Because of the fragile nature of the core and the difficulty to identify rock details, use of small-diameter core (1 3/8") is not recommended.

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1.0 PURPOSE

The purpose of this document is to establish standard procedures and technical guidance on borehole and sample logging.

2.0 SCOPE

These procedures provide descriptions of the standard techniques for borehole and sample logging. These techniques shall be used for each boring logged to provide consistent descriptions of subsurface lithology. While experience is the only method to develop confidence and accuracy in the description of soil and rock, the field geologist/engineer can do a good job of classification by careful, thoughtful observation and by being consistent throughout the classification procedure.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Site Geologist. Responsible for supervising all boring activities and assuring that each borehole is completely logged. If more than one rig is being used on site, the Site Geologist must make sure that each field geologist is properly trained in logging procedures. A brief review or training session may be necessary prior to the start up of the field program and/or upon completion of the first boring.

5.0 PROCEDURES

The classification of soil and rocks is one of the most important jobs of the field geologist/engineer. To maintain a consistent flow of information, it is imperative that the field geologist/engineer understand and accurately use the field classification system described in this SOP. This identification is based on visual examination and manual tests.

5.1 Materials Needed

When logging soil and rock samples, the geologist or engineer may be equipped with the following:

- Rock hammer
- Knife
- Camera
- Dilute hydrochloric acid (HCl)
- Ruler (marked in tenths and hundredths of feet)
- Hand Lens

5.2 Classification of Soils

All data shall be written directly on the boring log (Figure 1) or in a field notebook if more space is needed. Details on filling out the boring log are discussed in Section 5.5.

FIGURE 1
BORING LOG (EXAMPLE)

BORING LOG

Page ___ of ___

PROJECT NAME: _____ BORING NUMBER: _____
PROJECT NUMBER: _____ DATE: _____
DRILLING COMPANY: _____ GEOLOGIST: _____
DRILLING RIG: _____ DRILLER: _____

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	PID/FID Reading (ppm): Sampler BZ	PID/FID Reading (ppm): Borehole**	PID/FID Reading (ppm): Driller BZ**

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated response read.

Drilling Area Background (ppm): ____

Remarks: _____

Converted to Well: Yes _____ No _____ Well I.D. #: _____

FIGURE 1 (CONTINUED)

SOIL TERMS

UNIFIED SOIL CLASSIFICATION (USCS)

COARSE-GRAINED SOILS More Than Half of Material is LARGER Than No. 200 Sieve Size					FINE-GRAINED SOILS More Than Half of Material is SMALLER Than			
FIELD IDENTIFICATION PROCEDURES (Excluding Particles Larger Than 3 Inches and Basing Fractions on Estimated Weights			GROUP SYMBOL	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (Excluding Particles Larger Than 3 Inches and Basing Fractions on Estimated Weights)			
					Identification Procedures on Fraction Smaller than No. 40 Sieve Size			
						DAY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to Shaking)	TOUGHNESS (Consistency Near Plastic Limit)
GRAVELS (50%(+)>1/4"⊘	CLEAN GRAVELS (Low % Fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	SILTS AND CLAYS Liquid Limit <50	None to Slight	Quick to Slow	None
		Predominantly one size or a range of sizes with some intermediate sizes missing.	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.		Medium to High	None to Very Slow	Medium
	GRAVELS W/FINES (High % Fines)	Non-plastic fines (for identification procedures, see ML)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.		Slight to Medium	Slow	Slight
		Plastic fines (for identification procedures, see CL)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.	SILTS AND CLAYS Liquid Limit >50	Slight to Medium	Slow to None	Slight to Medium
SANDS 50%(+)<1/4"⊘	CLEAN SANDS (Low % Fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	SW	Well graded sand, gravelly sands, little or no fines.		High to Very High	None	High
		Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravelly sands, little or no fines.		Medium to High	None to Very Slow	Slight to Medium
	SANDS W/FINES (High % Fines)	Non-plastic fines (for identification procedures, see MCL)	SM	Silty sands, poorly graded sand-silt mixtures.	HIGHLY ORGANIC SOILS	Readily identified by color, odor, spongy feel and frequently by fibrous texture.		
		Plastic fines (for identification procedures, see CL)	SC	Clayey sands, poorly graded sand-clay mixtures.				

Boundary classifications: Soils possessing characteristics of two groups are designated by combining group symbols. For example, GW-GC, well graded gravel-sand mixture with clay binder.
All sieve sizes on this chart are U.S. Standard.

DENSITY OF GRANULAR SOILS

DESIGNATION	STANDARD PENETRATION RESISTANCE-BLOWS/FOOT
Very Loose	0-4
Loose	5-10
Medium Loose	11-30
Dense	31-50
Very Dense	Over 50

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNC COMPRESSIVE STRENGTH (TONS/SQ. FT.)	STANDARD PENETRATION RESISTANCE-BLOWS/FOOT	
Very Soft	Less than 0.25	0 to 2	Easily penetra
Soft	0.25 to 0.50	2 to 4	Easily penetra
Medium Stiff	0.50 to 1.0	4 to 8	Can be penet
Stiff	1.0 to 2.0	8 to 15	Readily indent
Very Stiff	2.0 to 4.0	15 to 30	Readily indent
Hard	More than 4.0	Over 30	Indented with

ROCK TERMS

ROCK HARDNESS (FROM CORE SAMPLES)			ROCK BROKENNESS		
Descriptive Terms	Screwdriver or Knife Effects	Hammer Effects	Descriptive Terms	Abbreviation	Spacing
Soft	Easily Gouged	Crushes when pressed with hammer	Very Broken	(V. Br.)	0-2"
Medium Soft	Can be Gouged	Breaks (one blow); crumbly edges	Broken	(Br.)	2"-1'
Medium Hard	Can be scratched	Breaks (one blow); sharp edges	Blocky	(Bl.)	1'-3'
Hard	Cannot be scratched	Breaks conchoidally (several blows); sharp edges	Massive	(M.)	3'-10'

LEGEND:

SOIL SAMPLES - TYPES	ROCK SAMPLES - TYPES		WATER LEVELS
5-2" Split-Barrel Sample	X-NX (Conventional) Core (~2-1/8" O.D.)	12/18	▽ 12.6' Initial Level w/Date & Depth
ST-3" O.D. Undisturbed Sample	Q-NQ (Wireline) Core (~1-7/8" O.D.)		
O - Other Samples, Specify in Remarks	Z - Other Core Sizes, Specify in Remarks	12/18	▽ 12.6' Stabilized Level w/Date & Depth

5.2.1 USCS Classification

Soils are to be classified according to the Unified Soil Classification System (USCS). This method of classification is detailed in Figure 1 (Continued).
This method of classification identifies soil types on the basis of grain size and cohesiveness.

Fine-grained soils, or fines, are smaller than the No. 200 sieve and are of two types: silt (M) and clay (C). Some classification systems define size ranges for these soil particles, but for field classification purposes, they are identified by their respective behaviors. Organic material (O) is a common component of soil but has no size range; it is recognized by its composition. The careful study of the USCS will aid in developing the competence and consistency necessary for the classification of soils.

Coarse-grained soils shall be divided into rock fragments, sand, or gravel. The terms sand and gravel not only refer to the size of the soil particles but also to their depositional history. To insure accuracy in description, the term rock fragments shall be used to indicate angular granular materials resulting from the breakup of rock. The sharp edges typically observed indicate little or no transport from their source area, and therefore the term provides additional information in reconstructing the depositional environment of the soils encountered. When the term "rock fragments" is used it shall be followed by a size designation such as "(1/4 inchΦ-1/2 inchΦ)" or "coarse-sand size" either immediately after the entry or in the remarks column. The USCS classification would not be affected by this variation in terms.

5.2.2 Color

Soil colors shall be described utilizing a single color descriptor preceded, when necessary, by a modifier to denote variations in shade or color mixtures. A soil could therefore be referred to as "gray" or "light gray" or "blue-gray." Since color can be utilized in correlating units between sampling locations, it is important for color descriptions to be consistent from one boring to another.

Colors must be described while the sample is still moist. Soil samples shall be broken or split vertically to describe colors. Samplers tend to smear the sample surface creating color variations between the sample interior and exterior.

The term "mottled" shall be used to indicate soils irregularly marked with spots of different colors. Mottling in soils usually indicates poor aeration and lack of good drainage.

Soil Color Charts shall not be used unless specified by the project manager.

5.2.3 Relative Density and Consistency

To classify the relative density and/or consistency of a soil, the geologist is to first identify the soil type. Granular soils contain predominantly sands and gravels. They are noncohesive (particles do not adhere well when compressed). Finer-grained soils (silts and clays) are cohesive (particles will adhere together when compressed).

The density of noncohesive, granular soils is classified according to standard penetration resistances obtained from split-barrel sampling performed according to the methods detailed in Standard Operating Procedures GH-1.3 and SA-1.3. Those designations are:

Designation	Standard Penetration Resistance (Blows per Foot)
Very loose	0 to 4
Loose	5 to 10
Medium dense	11 to 30
Dense	31 to 50
Very dense	Over 50

Standard penetration resistance is the number of blows required to drive a split-barrel sampler with a 2-inch outside diameter 12 inches into the material using a 140-pound hammer falling freely through 30 inches. The sampler is driven through an 18-inch sample interval, and the number of blows is recorded for each 6-inch increment. The density designation of granular soils is obtained by adding the number of blows required to penetrate the last 12 inches of each sample interval. It is important to note that if gravel or rock fragments are broken by the sampler or if rock fragments are lodged in the tip, the resulting blow count will be erroneously high, reflecting a higher density than actually exists. This shall be noted on the log and referenced to the sample number. Granular soils are given the USCS classifications GW, GP, GM, SW, SP, SM, GC, or SC (see Figure 1).

The consistency of cohesive soils is determined by performing field tests and identifying the consistency as shown in Figure 2.

Cohesive soils are given the USCS classifications ML, MH, CL, CH, OL, or OH (see Figure 1).

The consistency of cohesive soils is determined either by blow counts, a pocket penetrometer (values listed in the table as Unconfined Compressive Strength), or by hand by determining the resistance to penetration by the thumb. The pocket penetrometer and thumb determination methods are conducted on a selected sample of the soil, preferably the lowest 0.5 foot of the sample in the split-barrel sampler. The sample shall be broken in half and the thumb or penetrometer pushed into the end of the sample to determine the consistency. Do not determine consistency by attempting to penetrate a rock fragment. If the sample is decomposed rock, it is classified as a soft decomposed rock rather than a hard soil. Consistency shall not be determined solely by blow counts. One of the other methods shall be used in conjunction with it. The designations used to describe the consistency of cohesive soils are shown in Figure 2.

5.2.4 Weight Percentages

In nature, soils are comprised of particles of varying size and shape, and are combinations of the various grain types. The following terms are useful in the description of soil:

Terms of Identifying Proportion of the Component	Defining Range of Percentages by Weight
Trace	0 - 10 percent
Some	11 - 30 percent
Adjective form of the soil type (e.g., "sandy")	31 - 50 percent

FIGURE 2

CONSISTENCY FOR COHESIVE SOILS

Consistency	Standard Penetration Resistance (Blows per Foot)	Unconfined Compressive Strength (Tons/Sq. Foot by pocket penetration)	Field Identification
Very soft	0 to 2	Less than 0.25	Easily penetrated several inches by fist
Soft	2 to 4	0.25 to 0.50	Easily penetrated several inches by thumb
Medium stiff	4 to 8	0.50 to 1.0	Can be penetrated several inches by thumb with moderate effort
Stiff	8 to 15	1.0 to 2.0	Readily indented by thumb but penetrated only with great effort
Very stiff	15 to 30	2.0 to 4.0	Readily indented by thumbnail
Hard	Over 30	More than 4.0	Indented with difficulty by thumbnail

Examples:

- Silty fine sand: 50 to 69 percent fine sand, 31 to 50 percent silt.
- Medium to coarse sand, some silt: 70 to 80 percent medium to coarse sand, 11 to 30 percent silt.
- Fine sandy silt, trace clay: 50 to 68 percent silt, 31 to 49 percent fine sand, 1 to 10 percent clay.
- Clayey silt, some coarse sand: 70 to 89 percent clayey silt, 11 to 30 percent coarse sand.

5.2.5 Moisture

Moisture content is estimated in the field according to four categories: dry, moist, wet, and saturated. In dry soil, there appears to be little or no water. Saturated samples obviously have all the water they can hold. Moist and wet classifications are somewhat subjective and often are determined by the individual's judgment. A suggested parameter for this would be calling a soil wet if rolling it in the hand or on a porous surface liberates water, i.e., dirties or muddies the surface. Whatever method is adopted for describing moisture, it is important that the method used by an individual remains consistent throughout an entire drilling job.

Laboratory tests for water content shall be performed if the natural water content is important.

5.2.6 Stratification

Stratification can only be determined after the sample barrel is opened. The stratification or bedding thickness for soil and rock is depending on grain size and composition. The classification to be used for stratification description is shown in Figure 3.

5.2.7 Texture/Fabric/Bedding

The texture/fabric/bedding of the soil shall be described. Texture is described as the relative angularity of the particles: rounded, subrounded, subangular, and angular. Fabric shall be noted as to whether the particles are flat or bulky and whether there is a particular relation between particles (i.e., all the flat particles are parallel or there is some cementation). The bedding or structure shall also be noted (e.g., stratified, lensed, nonstratified, heterogeneous varved).

5.2.8 Summary of Soil Classification

In summary, soils shall be classified in a similar manner by each geologist/engineer at a project site. The hierarchy of classification is as follows:

- Density and/or consistency
- Color
- Plasticity (Optional)
- Soil types
- Moisture content
- Stratification
- Texture, fabric, bedding
- Other distinguishing features

FIGURE 3

BEDDING THICKNESS CLASSIFICATION

Thickness (metric)	Thickness (Approximate English Equivalent)	Classification
> 1.0 meter	> 3.3'	Massive
30 cm - 1 meter	1.0' - 3.3'	Thick Bedded
10 cm - 30 cm	4" - 1.0'	Medium Bedded
3 cm - 10 cm	1" - 4"	Thin Bedded
1 cm - 3 cm	2/5" - 1"	Very Thin Bedded
3 mm - 1 cm	1/8" - 2/5"	Laminated
1 mm - 3 mm	1/32" - 1/8"	Thinly Laminated
< 1 mm	<1/32"	Micro Laminated

(Weir, 1973 and Ingram, 1954)

5.3 Classification of Rocks

Rocks are grouped into three main divisions: sedimentary, igneous and metamorphic. Sedimentary rocks are by far the predominant type exposed at the earth's surface. The following basic names are applied to the types of rocks found in sedimentary sequences:

- Sandstone - Made up predominantly of granular materials ranging between 1/16 to 2 mm in diameter.
- Siltstone - Made up of granular materials less than 1/16 to 1/256 mm in diameter. Fractures irregularly. Medium thick to thick bedded.
- Claystone - Very fine-grained rock made up of clay and silt-size materials. Fractures irregularly. Very smooth to touch. Generally has irregularly spaced pitting on surface of drilled cores.
- Shale - A fissile very fine-grained rock. Fractures along bedding planes.
- Limestone - Rock made up predominantly of calcite ($CaCO_3$). Effervesces strongly upon the application of dilute hydrochloric acid.
- Coal - Rock consisting mainly of organic remains.
- Others - Numerous other sedimentary rock types are present in lesser amounts in the stratigraphic record. The local abundance of any of these rock types is dependent upon the depositional history of the area. Conglomerate, halite, gypsum, dolomite, anhydrite, lignite, etc. are some of the rock types found in lesser amounts.

In classifying a sedimentary rock the following hierarchy shall be noted:

- Rock type
- Color
- Bedding thickness
- Hardness
- Fracturing
- Weathering
- Other characteristics

5.3.1 Rock Type

As described above, there are numerous types of sedimentary rocks. In most cases, a rock will be a combination of several grain types, therefore, a modifier such as a sandy siltstone, or a silty sandstone can be used. The modifier indicates that a significant portion of the rock type is composed of the modifier. Other modifiers can include carbonaceous, calcareous, siliceous, etc.

Grain size is the basis for the classification of clastic sedimentary rocks. Figure 4 is the Udden-Wentworth classification that will be assigned to sedimentary rocks. The individual boundaries are slightly different than the USCS subdivision for soil classification. For field determination of grain sizes, a scale can be used for the coarse grained rocks. For example, the division between siltstone and claystone may not be measurable in the field. The boundary shall be determined by use of a hand lens. If the grains cannot be seen with the naked eye but are distinguishable with a hand lens, the rock is a siltstone. If the grains are not distinguishable with a hand lens, the rock is a claystone.

FIGURE 4

GRAIN SIZE CLASSIFICATION FOR ROCKS

Particle Name	Grain Size Diameter
Cobbles	> 64 mm
Pebbles	4 - 64 mm
Granules	2 - 4 mm
Very Coarse Sand	1 - 2 mm
Coarse Sand	0.5 - 1 mm
Medium Sand	0.25 - 0.5 mm
Fine Sand	0.125 - 0.25 mm
Very Fine Sand	0.0625 - 0.125 mm
Silt	0.0039 - 0.0625 mm

After Wentworth, 1922

5.3.2 Color

The color of a rock can be determined in a similar manner as for soil samples. Rock core samples shall be classified while wet, when possible, and air cored samples shall be scraped clean of cuttings prior to color classifications.

Rock color charts shall not be used unless specified by the Project Manager.

5.3.3 Bedding Thickness

The bedding thickness designations applied to soil classification (see Figure 3) will also be used for rock classification.

5.3.4 Hardness

The hardness of a rock is a function of the compaction, cementation, and mineralogical composition of the rock. A relative scale for sedimentary rock hardness is as follows:

- Soft - Weathered, considerable erosion of core, easily gouged by screwdriver, scratched by fingernail. Soft rock crushes or deforms under pressure of a pressed hammer. This term is always used for the hardness of the saprolite (decomposed rock which occupies the zone between the lowest soil horizon and firm bedrock).

- Medium soft - Slight erosion of core, slightly gouged by screwdriver, or breaks with crumbly edges from single hammer blow.

- Medium hard - No core erosion, easily scratched by screwdriver, or breaks with sharp edges from single hammer blow.

- Hard - Requires several hammer blows to break and has sharp conchoidal breaks. Cannot be scratched with screwdriver.

Note the difference in usage here of the works "scratch" and "gouge." A scratch shall be considered a slight depression in the rock (do not mistake the scraping off of rock flour from drilling with a scratch in the rock itself), while a gouge is much deeper.

5.3.5 Fracturing

The degree of fracturing or brokenness of a rock is described by measuring the fractures or joint spacing. After eliminating drilling breaks, the average spacing is calculated and the fracturing is described by the following terms:

- Very broken (V. BR.) - Less than 2-inch spacing between fractures
- Broken (BR.) - 2-inch to 1-foot spacing between fractures
- Blocky (BL.) - 1- to 3-foot spacing between fractures
- Massive (M.) - 3 to 10-foot spacing between fractures

The structural integrity of the rock can be approximated by calculating the Rock Quality Designation (RQD) of cores recovered. The RQD is determined by adding the total lengths of all pieces exceeding 4 inches and dividing by the total length of the coring run, to obtain a percentage.

Method of Calculating RQD
(After Deere, 1964)

$$RQD\ \% = r/l \times 100$$

r = Total length of all pieces of the lithologic unit being measured, which are greater than 4 inches length, and have resulted from natural breaks. Natural breaks include slickensides, joints, compaction slicks, bedding plane partings (not caused by drilling), friable zones, etc.

l = Total length of the coring run.

5.3.6 Weathering

The degree of weathering is a significant parameter that is important in determining weathering profiles and is also useful in engineering designs. The following terms can be applied to distinguish the degree of weathering:

- Fresh - Rock shows little or no weathering effect. Fractures or joints have little or no staining and rock has a bright appearance.
- Slight - Rock has some staining which may penetrate several centimeters into the rock. Clay filling of joints may occur. Feldspar grains may show some alteration.
- Moderate - Most of the rock, with exception of quartz grains, is stained. Rock is weakened due to weathering and can be easily broken with hammer.
- Severe - All rock including quartz grains is stained. Some of the rock is weathered to the extent of becoming a soil. Rock is very weak.

5.3.7 Other Characteristics

The following items shall be included in the rock description:

- Description of contact between two rock units. These can be sharp or gradational.
- Stratification (parallel, cross stratified).
- Description of any filled cavities or vugs.
- Cementation (calcareous, siliceous, hematitic).
- Description of any joints or open fractures.
- Observation of the presence of fossils.
- Notation of joints with depth, approximate angle to horizontal, any mineral filling or coating, and degree of weathering.

All information shown on the boring logs shall be neat to the point where it can be reproduced on a copy machine for report presentation. The data shall be kept current to provide control of the drilling program and to indicate various areas requiring special consideration and sampling.

5.3.8 Additional Terms Used in the Description of Rock

The following terms are used to further identify rocks:

- Seam - Thin (12 inches or less), probably continuous layer.

- Some - Indicates significant (15 to 40 percent) amounts of the accessory material. For example, rock composed of seams of sandstone (70 percent) and shale (30 percent) would be "sandstone -- some shale seams."

- Few - Indicates insignificant (0 to 15 percent) amounts of the accessory material. For example, rock composed of seam of sandstone (90 percent) and shale (10 percent) would be "sandstone -- few shale seams."

- Interbedded - Used to indicate thin or very thin alternating seams of material occurring in approximately equal amounts. For example, rock composed of thin alternating seams of sandstone (50 percent) and shale (50 percent) would be "interbedded sandstone and shale."

- Interlayered - Used to indicate thick alternating seams of material occurring in approximately equal amounts.

The preceding sections describe the classification of sedimentary rocks. The following are some basic names that are applied to igneous rocks:

- Basalt - A fine-grained extrusive rock composed primarily of calcic plagioclase and pyroxene.

- Rhyolite - A fine-grained volcanic rock containing abundant quartz and orthoclase. The fine-grained equivalent of a granite.

- Granite - A coarse-grained plutonic rock consisting essentially of alkali feldspar and quartz.

- Diorite - A coarse-grained plutonic rock consisting essentially of sodic plagioclase and hornblende.

- Gabbro - A coarse-grained plutonic rock consisting of calcic plagioclase and clinopyroxene. Loosely used for any coarse-grained dark igneous rock.

The following are some basic names that are applied to metamorphic rocks:

- Slate - A very fine-grained foliated rock possessing a well developed slaty cleavage. Contains predominantly chlorite, mica, quartz, and sericite.

- Phyllite - A fine-grained foliated rock that splits into thin flaky sheets with a silky sheen on cleavage surface.

- Schist - A medium to coarse-grained foliated rock with subparallel arrangement of the micaceous minerals which dominate its composition.

- Gneiss - A coarse-grained foliated rock with bands rich in granular and platy minerals.

- Quartzite - A fine- to coarse-grained nonfoliated rock breaking across grains, consisting essentially of quartz sand with silica cement.

5.4 Abbreviations

Abbreviations may be used in the description of a rock or soil. However, they shall be kept at a minimum. Following are some of the abbreviations that may be used:

C - Coarse	Lt - Light	Yl - Yellow
Med - Medium	BR - Broken	Or - Orange
F - Fine	BL - Blocky	SS - Sandstone
V - Very	M - Massive	Sh - Shale
Sl - Slight	Br - Brown	LS - Limestone
Occ - Occasional	Bl - Black	Fgr - Fine-grained
Tr - Trace		

5.5 Boring Logs and Documentation

This section describes in more detail the procedures to be used in completing boring logs in the field. Information obtained from the preceding sections shall be used to complete the logs. A sample boring log has been provided as Figure 5.

The field geologist/engineer shall use this example as a guide in completing each boring log. Each boring log shall be fully described by the geologist/engineer as the boring is being drilled. Every sheet contains space for 25 feet of log. Information regarding classification details is provided either on the back of the boring log or on a separate sheet, for field use.

5.5.1 Soil Classification

- Identify site name, boring number, job number, etc. Elevations and water level data to be entered when surveyed data is available.

- Enter sample number (from SPT) under appropriate column. Enter depth sample was taken from (1 block = 1 foot). Fractional footages, i.e., change of lithology at 13.7 feet, shall be lined off at the proportional location between the 13- and 14-foot marks. Enter blow counts (Standard Penetration Resistance) diagonally (as shown). Standard penetration resistance is covered in Section 5.2.3.

- Determine sample recovery/sample length as shown. Measure the total length of sample recovered from the split-spoon sampler, including material in the drive shoe. Do not include cuttings or wash material that may be in the upper portion of the sample tube.

- Indicate any change in lithology by drawing a line at the appropriate depth. For example, if clayey silt was encountered from 0 to 5.5 feet and shale from 5.5 to 6.0 feet, a line shall be drawn at this increment. This information is helpful in the construction of cross-sections. As an alternative, symbols may be used to identify each change in lithology.

- The density of granular soils is obtained by adding the number of blows for the last two increments. Refer to Density of Granular Soils Chart on back of log sheet. For consistency of cohesive soils refer also to the back of log sheet - Consistency of Cohesive Soils. Enter this information under the appropriate column. Refer to Section 5.2.3.

FIGURE 5
COMPLETED BORING LOG (EXAMPLE)

BORING LOG

Page 1 of 1

PROJECT NAME: NSB- SITE
PROJECT NUMBER: 9594
DRILLING COMPANY: SOILTEST CO.
DRILLING RIG: CME-55
BORING NUMBER: SB/MW 1
DATE: 3/8/96
GEOLOGIST: SJ CONTI
DRILLER: R. ROCK

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0.0	7/6	1.5/2.0		M DENSE	BRN	SILTY SAND - SOME	SM	MOIST SL. ORG.	5	0	0	0
@ 0800	2.0	9/10				TO BLK	ROCK FR.: TR BRICKS		ODOR				
							(FILL)		FILL TO 4'±				
	4.0			4.0									
S-2 @		5/7	2.9/2.0		M DENSE	BRN	SILTY SAND - TR FINE	SM	MOIST - W ODOR	10	0	–	–
0810	6.0	9/8					GRAVEL		NAT. MATL. TOOK SAMPLE				
	•			7'± ▽					SB01-0406 FOR ANALYSIS				
	8.0			8.0									
S-3 @		6/8	1.9/2.0		DENSE	TAN BRN	FINE TO COARSE SAND	SW	WET	0	0	0	0
0820	10.0	17/16					TR. F. GRAVEL		HIT WATER: 7'±				
	12.0			12.0									
S-4 @		7/6	1.6/2.0		STIFF	GRAY	SILTY CLAY	CL	MOIST → WET	0	.5	–	–
0830	14.0	5/8											
	15.0			15.0					AUGER REF @ 15'				
				11 BLUE 16	M HARD	BRN	SILTSTONE	VBR	WEATHERED				
									LO ∡ JNTS @ 15.5				
9/5	①		4.0/5.0						WATER STAINS @ 16.5, 17.1, 17.5	0	0	0	0
				19'					LOSING SOME				
	20.0				HARD	GRAY	SANDSTONE - SOME	BR	DRILL H2O @ 17'±				
							SILTSTONE		SET TEMP 6" CAS TO 15.5				
4.0/5.0	②		5.0/5.0						SET 2"Φ PVC SCREEN 16-25	0	0	0	0
									SAND 14-25				
	25.0			25					PELLETS 12-14				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated response read.

• 1-20Z
1-80Z

Drilling Area Background (ppm): 0

Remarks: CME-55 R16, 4¼" ID HSA - 9" OD ±
2" SPLIT SPOONS - 140 LB HAMMER - 30" DROP
NX CORE IN BEDROCK RUN ① = 25 MIN. RUN ② = 15 MIN

Converted to Well: Yes ✓ No ____ Well I.D. #: MW-1

- Enter color of the material in the appropriate column.

- Describe material using the USCS. Limit this column for sample description only. The predominant material is described last. If the primary soil is silt but has fines (clay) - use clayey silt. Limit soil descriptors to the following:

  - Trace: 0 - 10 percent
  - Some: 11 - 30 percent
  - And/Or: 31 - 50 percent

- Also indicate under Material Classification if the material is fill or natural soils. Indicate roots, organic material, etc.

- Enter USCS symbol - use chart on back of boring log as a guide. If the soils fall into one of two basic groups, a borderline symbol may be used with the two symbols separated by a slash. For example ML/CL or SM/SP.

- The following information shall be entered under the "Remarks" column and shall include, but is not limited by, the following:

  - Moisture - estimate moisture content using the following terms - dry, moist, wet and saturated. These terms are determined by the individual. Whatever method is used to determine moisture, be consistent throughout the log.

  - Angularity - describe angularity of coarse grained particles using the terms angular, subangular, subrounded, or rounded. Refer to ASTM D 2488 or Earth Manual for criteria for these terms.

  - Particle shape - flat, elongated, or flat and elongated.

  - Maximum particle size or dimension.

  - Water level observations.

  - Reaction with HCl - none, weak, or strong.

- Additional comments:

  - Indicate presence of mica, caving of hole, when water was encountered, difficulty in drilling, loss or gain of water.

  - Indicate odor and Photoionization Detector (PID) or Flame Ionization Detector (FID) reading if applicable.

  - Indicate any change in lithology by drawing a line through the lithology change column and indicate the depth. This will help when cross-sections are subsequently constructed.

  - At the bottom of the page indicate type of rig, drilling method, hammer size and drop, and any other useful information (i.e., borehole size, casing set, changes in drilling method).

  - Vertical lines shall be drawn (as shown in Figure 5) in columns 6 to 8 from the bottom of each sample to the top of the next sample to indicate consistency of material from sample to sample, if the material is consistent. Horizontal lines shall be drawn if there is a change in lithology, then vertical lines drawn to that point.

- Indicate screened interval of well, as needed, in the lithology column. Show top and bottom of screen. Other details of well construction are provided on the well construction forms.

5.5.2 Rock Classification

- Indicate depth at which coring began by drawing a line at the appropriate depth. Indicate core run depths by drawing coring run lines (as shown) under the first and fourth columns on the log sheet. Indicate RQD, core run number, RQD percent, and core recovery under the appropriate columns.

- Indicate lithology change by drawing a line at the appropriate depth as explained in Section 5.5.1.

- Rock hardness is entered under designated column using terms as described on the back of the log or as explained earlier in this section.

- Enter color as determined while the core sample is wet; if the sample is cored by air, the core shall be scraped clean prior to describing color.

- Enter rock type based on sedimentary, igneous or metamorphic. For sedimentary rocks use terms as described in Section 5.3. Again, be consistent in classification. Use modifiers and additional terms as needed. For igneous and metamorphic rock types use terms as described in Sections 5.3.8.

- Enter brokenness of rock or degree of fracturing under the appropriate column using symbols VBR, BR, BL, or M as explained in Section 5.3.5 and as noted on the back of the Boring Log.

- The following information shall be entered under the remarks column. Items shall include but are not limited to the following:

  - Indicate depths of joints, fractures and breaks and also approximate to horizontal angle (such as high, low), i.e., 70° angle from horizontal, high angle.
  - Indicate calcareous zones, description of any cavities or vugs.
  - Indicate any loss or gain of drill water.
  - Indicate drop of drill tools or change in color of drill water.

- Remarks at the bottom of Boring Log shall include:

  - Type and size of core obtained.
  - Depth casing was set.
  - Type of rig used.

- As a final check the boring log shall include the following:

  - Vertical lines shall be drawn as explained for soil classification to indicate consistency of bedrock material.

  - If applicable, indicate screened interval in the lithology column. Show top and bottom of screen. Other details of well construction are provided on the well construction forms.

5.5.3 Classification of Soil and Rock from Drill Cuttings

The previous sections describe procedures for classifying soil and rock samples when cores are obtained. However, some drilling methods (air/mud rotary) may require classification and borehole logging based on

identifying drill cuttings removed from the borehole. Such cuttings provide only general information on subsurface lithology. Some procedures that shall be followed when logging cuttings are:

- Obtain cutting samples at approximately 5-foot intervals, sieve the cuttings (if mud rotary drilling) to obtain a cleaner sample, place the sample into a small sample bottle or "zip lock" bag for future reference, and label the jar or bag (i.e. hole number, depth, date, etc.). Cuttings shall be closely examined to determine general lithology.
- Note any change in color of drilling fluid or cuttings, to estimate changes in lithology.
- Note drop or chattering of drilling tools or a change in the rate of drilling, to determine fracture locations or lithologic changes.
- Observe loss or gain of drilling fluids or air (if air rotary methods are used), to identify potential fracture zones.
- Record this and any other useful information onto the boring log as provided in Figure 1.

This logging provides a general description of subsurface lithology and adequate information can be obtained through careful observation of the drilling process. It is recommended that split-barrel and rock core sampling methods be used at selected boring locations during the field investigation to provide detailed information to supplement the less detailed data generated through borings drilled using air/mud rotary methods.

5.6 Review

Upon completion of the borings logs, copies shall be made and reviewed. Items to be reviewed include:

- Checking for consistency of all logs.
- Checking for conformance to the guideline.
- Checking to see that all information is entered in their respective columns and spaces.

6.0 REFERENCES

Unified Soil Classification System (USCS).

ASTM D2488, 1985.

Earth Manual, U.S. Department of the Interior, 1974.

7.0 RECORDS

Originals of the boring logs shall be retained in the project files.

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1.0 PURPOSE

This procedure provides general guidance and information pertaining to proper monitoring well design, installation, and development.

2.0 SCOPE

This procedure is applicable to the construction of monitoring wells. The methods described herein may be modified by project-specific requirements for monitoring well construction. In addition, many regulatory agencies have specific regulations pertaining to monitoring well construction and permitting. These requirements must be determined during the project planning phases of the investigation, and any required permits must be obtained before field work begins. Innovative monitoring well installation techniques, which typically are not used, will be discussed only generally in this procedure.

3.0 GLOSSARY

Monitoring Well - A well which is screened, cased, and sealed which is capable of providing a groundwater level and groundwater sample representative of the zone being monitored. Some monitoring wells may be constructed as open boreholes.

Piezometer - A pipe or tube inserted into the water bearing zone, typically open to water flow at the bottom and to the atmosphere at the top, and used to measure water level elevations. Piezometers may range in size from 1/2-inch-diameter plastic tubes to well points or monitoring wells.

Potentiometric Surface - The surface representative of the level to which water will rise in a well cased to the screened aquifer.

Well Point (Drive Point) - A screened or perforated tube (Typically 1-1/4 or 2 inches in diameter) with a solid, conical, hardened point at one end, which is attached to a riser pipe and driven into the ground with a sledge hammer, drop weight, or mechanical vibrator. Well points may be used for groundwater injection and recovery, as piezometers (i.e., to measure water levels) or to provide groundwater samples for water quality data.

4.0 RESPONSIBILITIES

Driller - The driller provides adequate and operable equipment, sufficient quantities of materials, and an experienced and efficient labor force capable of performing all phases of proper monitoring well installation and construction. The driller may also be responsible for obtaining, in advance, any required permits for monitoring well installation and construction.

Field Geologist - The field geologist supervises and documents well installation and construction performed by the driller, and insures that well construction is adequate to provide representative groundwater data from the monitored interval. Geotechnical engineers, field technicians, or other suitable trained personnel may also serve in this capacity.

5.0 PROCEDURES

5.1 Equipment/Items Needed

Below is a list of items that may be needed when installing a monitoring well or piezometer:

- Health and safety equipment (hard hats, safety glasses, etc.) as required by the Site Safety Officer.
- Well drilling and installation equipment with associated materials (typically supplied by the driller).
- Hydrogeologic equipment (weighted engineer's tape, water level indicator, retractable engineers rule, electronic calculator, clipboard, mirror and flashlight - for observing downhole activities, paint and ink marker for marking monitoring wells, sample jars, well installation forms, and a field notebook).
- Drive point installation tools (sledge hammer, drop hammer, or mechanical vibrator; tripod, pipe wrenches, drive points, riser pipe, and end caps).

5.2 Well Design

The objectives and intended use for each monitoring well must be clearly defined before the monitoring system is designed. Within the monitoring system, different monitoring wells may serve different purposes and, therefore, require different types of construction. During all phases of the well design, attention must be given to clearly documenting the basis for design decisions, the details of well construction, and the materials used. The objectives for installing the monitoring wells may include:

- Determining groundwater flow directions and velocities.
- Sampling or monitoring for trace contaminants.
- Determining aquifer characteristics (e.g., hydraulic conductivity).

Siting of monitoring wells shall be performed after a preliminary estimation of the groundwater flow direction. In most cases, groundwater flow directions and potential well locations can be determined by an experienced hydrogeologist through the review of geologic data and the site terrain. In addition, data from production wells or other monitoring wells in the area may be used to determine the groundwater flow direction. If these methods cannot be used, piezometers, which are relatively inexpensive to install, may have to be installed in a preliminary investigative phase to determine groundwater flow direction.

5.2.1 Well Depth, Diameter, and Monitored Interval

The well depth, diameter, and monitored interval must be tailored to the specific monitoring needs of each investigation. Specification of these items generally depends on the purpose of the monitoring system and the characteristics of the hydrogeologic system being monitored. Wells of different depth, diameter, and monitored interval can be employed in the same groundwater monitoring system. For instance, varying the monitored interval in several wells, at the same location (cluster wells) can help to determine the vertical gradient and the depths at which contaminants are present. Conversely, a fully penetrating well is usually not used to quantify or vertically locate a contaminant plume, since groundwater samples collected in wells that are screened over the full thickness of the water-bearing zone will be representative of average conditions across the entire monitored interval. However, fully penetrating wells can be used to establish the existence of contamination in the water-bearing zone. The well diameter desired depends upon the hydraulic characteristics of the water-bearing zone, sampling requirements, drilling method and cost.

The decision concerning the monitored interval and well depth is based on the following (and possibly other) information:

- The vertical location of the contaminant source in relation to the water-bearing zone.
- The depth, thickness and uniformity of the water-bearing zone.
- The anticipated depth, thickness, and characteristics (e.g., density relative to water) of the contaminant plume.
- Fluctuation in groundwater levels (due to pumping, tidal influences, or natural recharge/discharge events).
- The presence and location of contaminants encountered during drilling.
- Whether the purpose of the installation is for determining existence or non-existence of contamination or if a particular stratigraphic zone is being investigated.
- The analysis of borehole geophysical logs.

In most situations where groundwater flow lines are horizontal, depending on the purpose of the well and the site conditions, monitored intervals are 20 feet or less. Shorter screen lengths (5 feet or less) are usually required where flow lines are not horizontal, (i.e., if the wells are to be used for accurate measurement of the potentiometric head at a specific point).

Many factors influence the diameter of a monitoring well. The diameter of the monitoring well depends on the application. In determining well diameter, the following needs must be considered:

- Adequate water volume for sampling.
- Drilling methodology.
- Type of sampling device to be used.
- Costs.

Standard monitoring well diameters are 2, 4, 6, or 8 inches. Drive points are typically 1-1/4 or 2 inches in diameter. For monitoring programs which require screened monitoring wells, either a 2-inch or 4-inch-diameter well is preferred. Typically, well diameters greater than 4 inches are used in monitoring programs in which open-hole bedrock monitoring wells are used. With smaller diameter wells, the volume of stagnant water in the well is minimized, and well construction costs are reduced; however, the sampling devices that can be used are limited.

In specifying well diameter, sampling requirements must be considered (up to a total of 4 gallons of water may be required for a single sample to account for full organic and inorganic analyses, and split samples), particularly if the monitored formation is known to be a low-yielding formation. The unit volume of water contained within a monitoring well is dependent on the well diameter as follows:

Casing Inside Diameter (Inch)	Standing Water Length to Obtain 1 Gallon Water (Feet)
2	6.13
4	1.53
6	0.68

If a well recharges quickly after purging, then well diameter may not be an important factor regarding sample volume requirements.

Pumping tests for determining aquifer characteristics may require larger diameter wells (for installation of high capacity pumps); however, in small-diameter wells in-situ permeability tests can be performed during drilling or after well installation is completed.

5.2.2 Riser Pipe and Screen Materials

Well materials are specified by diameter, type of material, and thickness of pipe. Well screens require an additional specification of slot size. Thickness of pipe is referred to as "Schedule" for polyvinyl chloride (PVC) casing and is usually Schedule 40 (thinner wall) or 80 (thicker wall). Steel pipe thickness is often referred to as "Strength". Standard Strength is usually adequate for monitoring well purposes. With larger diameter pipe, the wall thickness must be greater to maintain adequate strength. The required thickness is also dependent on the method of installation; risers for drive points require greater strength than wells installed inside drilled borings.

The selection of well screen and riser materials depends on the method of drilling, the type of subsurface materials the well penetrates, the type of contamination expected, and natural water quality and depth. Cost and the level of accuracy required are also important. The materials generally available are Teflon, stainless steel, PVC galvanized steel, and carbon steel. Each has advantages and limitations (see Attachment A of this guideline for an extensive presentation on this topic). The two most commonly used materials are PVC and stainless steel. Properties of these two materials are compared in Attachment B. Stainless steel is a good choice where trace metals or organic sampling is required; however, costs are high. Teflon materials are extremely expensive, but are relatively inert and provide the least opportunity for water contamination due to well materials. PVC has many advantages, including low cost, excellent availability, light weight, ease of manipulation, and widespread acceptance. The crushing strength of PVC may limit the depth of installation, but the use of Schedule 80 materials may overcome some of the problems associated with depth. However, the smaller inside diameter of Schedule 80 pipe may be an important factor when considering the size of bailers or pumps required for sampling or testing. Due to this problem, the minimum well pipe size recommended for Schedule 80 wells is 4-inch I.D.

Screens and risers may have to be decontaminated before use because oil-based preservatives and oil used during thread cutting and screen manufacturing may contaminate samples. Metal pipe may corrode and release metal ions or chemically react with organic constituents, but this is considered a minor issue. Galvanized steel is not recommended where samples may be collected for metals analyses, as zinc and cadmium levels in groundwater samples may become elevated from leaching of the zinc coating.

Threaded, flush-joint casing is most often preferred for monitoring well applications. PVC, Teflon, and steel can all be obtained with threaded joints. Welded-joint steel casing is also acceptable. Glued PVC may release organic contaminants into the well, and therefore, should not be used if the well is to be sampled for organic constituents.

When the water-bearing zone is in consolidated bedrock, such as limestone or fractured granite, a well screen is often not necessary (the well is simply an open hole in bedrock). Unconsolidated materials, such as sands, clay, and silts require a screen. A screen slot size of 0.010 or 0.020 inch is generally used when a screen is necessary, and the annular borehole space around the screened interval is artificially packed with an appropriately sized sand, selected based on formation grain size. The slot size controls the quantity of water entering the well and prevents entry of natural materials or sand pack. The screen shall pass no more than 10 percent of the pack material, or in-situ aquifer material. The site geologist shall specify the combination of screen slot size and sand pack which will be compatible with the water-bearing zone, to maximize groundwater inflow and minimize head losses and movement of fines into the wells. For example, as a standard procedure, a Morie No. 1 or No. 10 to No. 20 U.S. Standard Sieve size filter pack is typically appropriate for a 0.020-inch slot screen; however, a No. 20 to No. 40 U.S. Standard Sieve size filter pack is typically appropriate for a 0.010-inch slot screen.

5.2.3 Annular Materials

Materials placed in the annular space between the borehole and riser pipe and screen include a sand pack when necessary, a bentonite seal, and cement-bentonite grout. The sand pack is usually a medium- to coarse-grained poorly graded, silica sand and should relate to the grain size of the aquifer sediments. The quantity of sand placed in the annular space is dependent upon the length of the screened interval, but should always extend at least 1 foot above the top of the screen. At least 1 to 3 feet of bentonite pellets or equivalent shall be placed above the sand pack. Cement-bentonite grout (or equivalent) is then placed to extent from the top of the bentonite pellets to the ground surface.

On occasion, and with the concurrence of the involved regulatory agencies, monitoring wells may be packed naturally (i.e., no artificial sand pack installed). In this case, the natural formation material is allowed to collapse around the well screen after the well is installed. This method has been used where the formation material itself is a relatively uniform grain size, or when artificial sand packing is not possible due to borehole collapse.

Bentonite expands by absorbing water and provides a seal between the screened interval and the overlying portion of the annular space and formation. Cement-bentonite grout is placed on top of the bentonite pellets, extending to the surface. The grout effectively seals the remaining borehole annulus and eliminates the possibility for surface infiltration reaching the screened interval. Grouting also replaces material removed during drilling and prevents hole collapse and subsidence around the well. A tremie pipe should be used to introduce grout from the bottom upward, to prevent bridging, and to provide a better seal. In shallow boreholes that don't collapse, it may be more practical to pour the grout from the surface without a tremie pipe.

Grout is a general term which has several different connotations. For all practical purposes within the monitoring well installation industry, grout refers to the solidified material which is installed and occupies the annular space above the bentonite pellet seal. Grout, most of the time, is made up of one or two assemblages of material, (e.g., cement and/or bentonite). A cement-bentonite grout, which is the most common type of grout used in monitoring well completions, normally is a mixture of cement, bentonite, and water at a ratio of one 90-pound bag of Portland Type I cement, plus 3 to 5 pounds of granular or flake-type bentonite, and 6-7 gallons of water. A neat cement consists of one ninety-pound bag of Portland Type I cement and 6-7 gallons of water. A bentonite slurry (bentonite and water mixed to a thick but pumpable mixture) is sometimes used instead of grout for deep well installations where placement of bentonite pellets is difficult. Bentonite chips are also occasionally used for annular backfill in place of grout.

In certain cases, the borehole may be drilled to a depth greater than the anticipated well installation depth. For these cases, the well shall be backfilled to the desired depth with bentonite pellets/chips or sand. A short (1- to 2-foot) section of capped riser pipe sump is sometimes installed immediately below the screen, as a silt reservoir, when significant post-development silting is anticipated. This will ensure that the entire screen surface remains unobstructed.

5.2.4 Protective Casing

When the well is completed and grouted to the surface, a protective steel casing is typically placed over the top of the well. This casing generally has a hinged cap and can be locked to prevent vandalism. The protective casing has a larger diameter than the well and is set into the wet cement grout over the well upon completion. In addition, one hole is drilled just above the cement collar through the protective casing which acts as a weep hole for the flow of water which may enter the annulus during well development, purging, or sampling.

A protective casing which is level with the ground surface (flush-mounted) is used in roadway or parking lot applications where the top of a monitoring well must be below the pavement. The top of the riser pipe is placed 4 to 5 inches below the pavement, and a locking protective casing is cemented in place to 3 inches below the pavement. A large diameter, manhole-type protective collar is set into the wet cement around the well with the top set level with or slightly above the pavement. An appropriately-sized id is placed over the protective sleeve. The cement should be slightly mounded to direct pooled water away from the well head.

5.3 Monitoring Well Installation

Pertinent data regarding monitoring well installation shall be recorded on log sheets as depicted and discussed in SOP SA-6.3. Attachments to this referenced SOP illustrate terms and physical construction of various types of monitoring wells.

5.3.1 Monitoring Wells in Unconsolidated Sediments

After the borehole is drilled to the desired depth, well installation can begin. The procedure for well installation will partially be dictated by the stability of the formation in which the well is being placed. If the borehole collapses immediately after the drilling tools are withdrawn, then a temporary casing must be installed and well installation will proceed through the center of the temporary casing, and continue as the temporary casing is withdrawn from the borehole. In the case of hollow-stem auger drilling, the augers will act to stabilize the borehole during well installation.

Before the screen and riser pipe are lowered into the borehole, all pipe and screen sections should be measured with an engineer's rule to ensure proper placement. When measuring sections, the threads on one end of the pipe or screen must be excluded while measuring, since the pipe and screen sections are screwed flush together.

After the screen and riser pipe are lowered through the temporary casing, the sand pack can be installed. A weighted tape measure must be used during the installation procedure to carefully monitor installation progress. The sand is slowly poured into the annulus between the riser pipe and temporary casing, as the casing is withdrawn. Sand should always be kept within the temporary casing during withdrawal in order to ensure an adequate sand pack. However, if too much sand is within the temporary casing (greater than 1 foot above the bottom of the casing) bridging between the temporary casing and riser pipe may occur. Centralizers may be used at the geologist's discretion, one above and one below the screen, to assure enough annular space for sand pack placement.

After the sand pack is installed to the desired depth (at least 1 foot above the top of the screen), then the bentonite pellet seal (or equivalent), can be installed in the same manner as the sand pack. At least 1 to 3 feet of bentonite pellets should be installed above the sand pack. Pellets should be added slowly and their fall monitored closely to ensure that bridging does not occur.

The cement-bentonite grout is then mixed and tremied into the annulus as the temporary casing or augers are withdrawn. Finally, the protective casing can be installed as detailed in Section 5.2.4.

~~5.3.2 Confining Layer Monitoring Wells~~

~~When drilling and installing a well in a confined aquifer, proper well installation techniques must be applied to avoid cross contamination between aquifers. Under most conditions, this can be accomplished by installing double-cased wells. This is accomplished by drilling a large-diameter boring through the upper aquifer, 1 to 5 feet into the underlying confining layer, and setting and pressure grouting or tremie grouting a large-diameter casing into the confining layer. The grout material must fill the space between the native material and the outer casing. A smaller diameter boring is then continued through the confining layer for~~

installation of the monitoring well as detailed for overburden monitoring wells. Sufficient time (determined by the field geologist), must be allowed for setting of the grout prior to drilling through the confined layer.

5.3.3 Bedrock Monitoring Wells

When installing bedrock monitoring wells, a large diameter boring is drilled through the overburden and approximately 5 –10 feet into bedrock. A casing (typically steel) is installed and either pressure grouted or tremie grouted in place. After the grout has cured, a smaller diameter boring is continued into bedrock to the desired depth. If the boring does not collapse, the well can be left open, and a screen is not necessary. If the boring collapses, then a screen is required and can be installed as detailed for overburden monitoring wells. If a screen is to be used, then the casing which is installed through the overburden and into the bedrock does not require grouting and can be removed when the final well installation is completed.

5.3.4 Drive Points

Drive points can be installed with either a sledge hammer, drop hammer, or a mechanical vibrator. The screen section is threaded and tightened onto the riser pipe with pipe wrenches. The drive point is simply pounded into the subsurface to the desired depth. If a heavy drop hammer is used, then a tripod and pulley setup is required to lift the hammer. Drive points typically cannot be manually driven to depths exceeding 10 feet.

Direct push sampling/monitoring point installation methods, using a direct push rig or drilling rig, are described in SOP SA-2.5.

5.3.5 Innovative Monitoring Well Installation Techniques

Certain innovative sampling devices have proven advantageous. These devices are essentially screened samplers installed in a borehole with only small-diameter tubes extending to the surface. This reduces drilling costs, decreases the volume of stagnant water, and provides a sampling system that minimizes cross-contamination from sampling equipment. Four manufacturers of these samplers include Timco Manufacturing Company, Inc., of Prairie du Sac, Wisconsin, BARCAD Systems, Inc., of Concord, Massachusetts, Westbay Instruments Ltd. of Vancouver, British Columbia, Canada and the University of Waterloo at Waterloo, Ontario, Canada.. Each manufacturer offers various construction materials.

5.4 Well Development Methods

The purpose of well development is to stabilize and increase the permeability of the gravel pack around the well screen, and to restore the permeability of the formation which may have been reduced by drilling operations. Wells are typically developed until all fine material and drilling water is removed from the well. Sequential measurements of pH, conductivity, turbidity, and temperature taken during development may yield information (stabilized values) regarding whether sufficient development has been performed. The selection of the well development method shall be made by the field geologist and is based on the drilling methods, well construction and installation details, and the characteristics of the formation that the well is screened in. The primary methods of well development are summarized below. A more detailed discussion may be found in Driscoll (1986).

5.4.1 Overpumping and Backwashing

Wells may be developed by alternatively drawing the water level down at a high rate (by pumping or bailing) and then reversing the flow direction (backwashing) so that water is passing from the well into the formation. This back and forth movement of water through the well screen and gravel pack serves to

remove fines from the formation immediately adjacent to the well, while preventing bridging (wedging) of sand grains. ~~Backwashing can be accomplished by several methods, including pouring water into the well and then bailing, starting and stopping a pump intermittently to change water levels, or forcing water into the well under pressure through a water-tight fitting ("rawhiding"). Care should be taken when backwashing not to apply too much pressure, which could damage or destroy the well screen.~~

5.4.2 Surging with a Surge Plunger

A surge plunger (also called a surge block) is approximately the same diameter as the well casing and is aggressively moved up and down within the well to agitate the water, causing it to move in and out of the screens. This movement of water pulls fine materials into the well, where they may be removed by any of several methods, and prevents bridging of sand particles in the gravel pack. There are two basic types of surge plungers; solid and valved surge plungers. In formations with low yields, a valved surge plunger may be preferred, as solid plungers tend to force water out of the well at a greater rate than it will flow back in. Valved plungers are designed to produce a greater inflow than outflow of water during surging.

~~5.4.3 Compressed Air~~

~~Compressed air can be used to develop a well by either of two methods: backwashing or surging. Backwashing is done by forcing water out through the screens, using increasing air pressure inside a sealed well, then releasing the pressurized air to allow the water to flow back into the well. Care should be taken when using this method so that the water level does not drop below the top of the screen, thus introducing air into the formation and reducing well yield. Surging, or the "open well" method, consists of alternately releasing large volumes of air suddenly into an open well below the water level to produce a strong surge by virtue of the resistance of water head, friction, and inertia. Pumping of the well is subsequently done using the air lift method.~~

~~5.4.4 High Velocity Jetting~~

~~In the high velocity jetting method, water is forced at high velocities from a plunger-type device and through the well screen to loosen fine particles from the sand pack and surrounding formation. The jetting tool is slowly rotated and raised and lowered along the length of the well screen to develop the entire screened area. Jetting using a hose lowered into the well may also be effective. The fines washed into the screen during this process can then be bailed or pumped from the well.~~

6.0 RECORDS

A critical part of monitoring well installation is recording of all significant details and events in the site logbook or field notebook. The geologist must record the exact depths of significant hydrogeological features, screen placement, gravel pack placement, and bentonite placement.

A Monitoring Well Sheet (see Attachments to SOP SA-6.3) shall be completed, ensuring the uniform recording of data for each installation and rapid identification of missing information. Well depth, length, materials of construction, length and openings of screen, length and type of riser, and depth and type of all backfill materials shall be recorded. Additional information shall include location, installation date, problems encountered, water levels before and after well installation, cross-reference to the geologic boring log, and methods used during the installation and development process. Documentation is very important to prevent problems involving questionable sample validity. Somewhat different information will need to be recorded, depending on whether the well is completed in overburden (single- or double-cased), as a cased well in bedrock, or as an open hole in bedrock.

The quantities of sand, bentonite, and grout placed in the well are also important. The geologist shall calculate the annular space volume and have an idea of the quantity of material needed to fill the annular

space. Volumes of backfill significantly higher than the calculated volume may indicate a problem such as a large cavity, while a smaller backfill volume may indicate a cave-in or bridging of the backfill materials. Any problems with rig operation or down-time shall be recorded and may affect the driller's final fee.

7.0 REFERENCES

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ATTACHMENT A

RELATIVE COMPATIBILITY OF RIGID WELL CASING MATERIAL (PERCENT)

Potentially-Deteriorating Substance	Type of Casing Material						
	PVC 1	Galvanized Steel	Carbon Steel	Lo-carbon Steel	Stainless Steel 304	Stainless Steel 316	Teflon*
Buffered Weak Acid	100	56	51	59	97	100	100
Weak Acid	98	59	43	47	96	100	100
Mineral Acid/ High Solids Content	100	48	57	60	80	82	100
Aqueous/Organic Mixtures	64	69	73	73	98	100	100
Percent Overall Rating	91	58	56	59	93	96	100

Preliminary Ranking of Rigid Materials:

1 Teflon®
2 Stainless Steel 316
3. Stainless Steel 304
4 PVC 1
5 Lo-Carbon Steel
6 Galvanized Steel
7 Carbon Steel

* Trademark of DuPont

RELATIVE COMPATIBILITY OF SEMI-RIGID OR ELASTOMERIC MATERIALS (PERCENT)

Potentially-Deteriorating Substance	Type of Casing Material								
	PVC Flexible	PP	PE Conv.	PE Linear	PMM	Viton®*	Silicone	Neoprene	Teflon®*
Buffered Weak Acid	97	97	100	97	90	92	87	85	100
Weak Acid	92	90	94	96	78	78	75	75	100
Mineral Acid/ High Solids Content	100	100	100	100	95	100	78	82	100
Aqueous/Organic Mixtures	62	71	40	60	49	78	49	44	100
Percent Overall Rating	88	90	84	88	78	87	72	72	100

Preliminary Ranking of Semi-Rigid or Elastomeric Materials:

1 Teflon®
2 Polypropylene (PP)
3. PVC Flexible/PE Linear
4 Viton®
5 PE Conventional
6 Plexiglas/Lucite (PMM)
7 Silicone/Neoprene

* Trademark of DuPont

Source: Barcelona et al., 1983

ATTACHMENT B

COMPARISON OF STAINLESS STEEL AND PVC FOR MONITORING WELL CONSTRUCTION

Characteristic	Stainless Steel	PVC
Strength	Use in deep wells to prevent compression and closing of screen/riser.	Use when shear and compressive strength are not critical.
Weight	Relatively heavier.	Light-weight; floats in water.
Cost	Relatively expensive.	Relatively inexpensive.
Corrosivity	Deteriorates more rapidly in corrosive water.	Non-corrosive -- may deteriorate in presence of ketones, aromatics, alkyl sulfides, or some chlorinated hydrocarbons.
Ease of Use	Difficult to adjust size or length in the field.	Easy to handle and work with in the field.
Preparation for Use	Should be steam cleaned if organics will be subsequently sampled.	Never use glue fittings -- pipes should be threaded or pressure fitted. Should be steam cleaned when used for monitoring wells.
Interaction with Contaminants*	May sorb organic or inorganic substances when oxidized.	May sorb or release organic substances.

* See also Attachment A.

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1.0 PURPOSE

The purpose of this document is to provide general reference information regarding natural attenuation parameter and methodology selection, sample collection, and a general understanding of the sample results.

2.0 SCOPE

This document provides information on selection of appropriate groundwater natural attenuation parameters, selection of sampling methods for these parameters, techniques for onsite field analysis of select parameters, and some basic understanding of the field sample results. Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling practices and techniques. To a limited extent, it shall also facilitate the understanding and interpretation of the sampling results. It addresses field procedures for collection of data at sites with organic groundwater contaminants (e.g., chlorinated and petroleum hydrocarbons) to the extent practical. The focus of this document is on natural attenuation, not enhanced bioremediation.

The techniques described shall be followed whenever applicable, noting that site-specific conditions, project-specific objectives, local, state, and federal guidelines may be used as a basis for modification of the procedures noted herein. The intent of this document is to supplement the local, state, and federal guidance documents and manufacturer's analytical methods referenced in Section 6.0. It is not intended for this document to supersede this guidance or information. Please note that natural attenuation is a relatively dynamic science with ongoing research in the science and engineering community. It is important that data collectors and interpreters use the most recent regulatory guidance, which may be updated on a periodic basis from that noted in Section 6.

3.0 GLOSSARY

Aerobe: Bacteria that use oxygen as an electron acceptor.

Anaerobe: Organisms that can use electron acceptors other than molecular oxygen to support their metabolism.

Anoxic groundwater: Groundwater that contains oxygen in concentrations less than about 0.5 mg/L. This term is synonymous with the term anaerobic.

Anthropogenic: Man-made.

Cometabolism: The process in which a compound is fortuitously degraded by an enzyme or cofactor produced during microbial metabolism of another compound.

Daughter product: A compound that results directly from the biotic or abiotic degradation of another. For example, *cis*-1,2-dichloroethene (*cis*-1,2-DCE) is a common daughter product of trichloroethene (TCE).

Diffusion: The process whereby molecules move from a region of higher concentration to a region of lower concentration as a result of Brownian motion.

Dispersion: The tendency for a solute to spread from the path that it would be expected to follow under advective transport.

Electron acceptor: A compound capable of accepting electrons during oxidation-reduction reactions. Microorganisms obtain energy by transferring electrons from an electron donor such as an organic compound (or sometimes a reduced inorganic compound such as sulfide) to an electron acceptor. Electron acceptors are compounds that are relatively oxidized and include oxygen, nitrate, iron(III), manganese(IV), sulfate, carbon dioxide, or in some cases chlorinated aliphatic hydrocarbons such as tetrachloroethene (PCE), TCE, DCE and vinyl chloride (VC).

Electron donor: A compound capable of supplying (giving up) electrons during oxidation-reduction reactions. Microorganisms obtain energy by transferring electrons from an electron donor such as an organic compound (or sometimes a reduced inorganic compound such as sulfide) to an

electron acceptor. Electron donors are compounds that are relatively reduced and include fuel hydrocarbons and native organic carbon.

Metabolic byproduct: A product of the reaction between an electron donor and an electron acceptor. Metabolic byproducts include volatile fatty acids, daughter products of chlorinated aliphatic hydrocarbons, methane, and chloride.

Oxic groundwater: Groundwater that contains oxygen in concentrations greater than about 0.5 mg/L.

Oxidation/reduction reaction: A chemical or biological reaction wherein an electron is transferred from an electron donor (donor is oxidized) to an electron acceptor (acceptor is reduced).

Predominant terminal electron-accepting process: The electron-accepting process (oxygen reduction, nitrate reduction, iron(III) reduction, etc.) that sequesters the majority of the electron flow in a given system.

Reductive dechlorination: Reduction of a chlorine-containing organic compound via the replacement of chlorine with hydrogen.

Respiration: The process of coupling the oxidation of organic compounds with the reduction of inorganic compounds such as oxygen, nitrate, iron(III), manganese(IV), and sulfate.

Seepage velocity: The average velocity of groundwater in a porous medium.

Substrate: A compound used by microorganisms to obtain energy for growth. The term can refer to either an electron acceptor or an electron donor.

4.0 RESPONSIBILITIES

Project Manager (PM) / Task Order Manager (TOM) - Responsible for ensuring that all field activities are conducted in accordance with this standard operating procedure (SOP).

Project Hydrogeologist or Geochemist - Responsible for selecting and detailing the specific groundwater sampling techniques, onsite water quality testing (type, frequency, and location), and equipment to be used, and providing detailed input in this regard to the project plan documents. The project hydrogeologist or geochemist is also responsible for properly briefing and overseeing the performance of the site sampling personnel.

Site Manager (SM) / Field Operations Leader (FOL) - Responsible for the onsite verification that all field activities are performed in compliance with approved SOPs or as otherwise directed by the approved project plan(s).

Project Geologist - is primarily responsible for the proper acquisition of the groundwater samples. He/she is also responsible for the actual analyses of onsite water quality samples, as well as instrument calibration, care, and maintenance. When appropriate, such responsibilities may be performed by other qualified personnel (e.g., field sampling technicians or site personnel).

5.0 PROCEDURES

5.1 General

Natural attenuation includes physical, chemical, and biochemical processes affecting the concentrations of dissolved contaminants in groundwater. These processes may include advection, dispersion, volatilization, dilution, sorption to aquifer solids, and/or precipitation or mineralization of compounds. Of greatest importance are those processes that lead to a reduction in contaminant mass (by degrading or destroying contaminants) such as biodegradation. These biochemical processes remove organic contaminants from the aquifer by destruction. Depending on the type of contaminant, particularly the organic contaminant (e.g., petroleum hydrocarbons or chlorinated organic solvents), the biochemical environment in the aquifer will vary. The biochemical environment within the aquifer influences and is influenced by the activities of aquifer microbiota. Specific types of microbiota, working singly or in complex consortia, may use organic contaminants as part of their normal cell functions. Natural

attenuation monitoring is designed to measure indicators of the biochemical environment within the aquifer and, with direct and indirect lines of evidence and associated chemical concentration data, evaluate the likely fate (i.e., transformation, destruction, dilution, attenuation, etc.) of organic contaminants.

5.2 Planning for Natural Attenuation Sampling

The first step in preparing a natural attenuation investigation is to develop a site-specific conceptual model. The first step in development of this model is the analysis and review of available site-specific characterization data. The development and refinement of this model should be supplemented with additional data as needed. The data should include but is not limited to:

- Geologic and hydrogeologic information in three dimensions
- Nature, extent, and magnitude of contamination
- Location and presence of potential receptors to contamination

Lines of Evidence

Several lines of evidence are used to determine whether natural attenuation is working. The most compelling, primary evidence is decreasing groundwater contaminant concentrations over time. Decreasing concentration trends can be demonstrated in several ways including:

- Isoconcentration maps of the dissolved plume over time wherein the extent of the plume is either stable or decreasing.
- Time series plots of contaminant concentrations within a well illustrating a clear downward trend.
- Contaminant concentration profiles in a series of monitoring wells along a groundwater flow path illustrating decreasing concentrations beyond that attributable to dilution and dispersion.

Secondary, or supporting, lines of evidence include:

- Analytical data showing production and subsequent destruction of primary contaminant breakdown products.
- Geochemical data indicating that the biochemical environment is favorable for the appropriate microbiota.
- Geochemical data that indicate the aquifer microbiota are active.

Monitoring Well Location and Sampling Frequency

The number and locations of wells required to monitor natural attenuation will depend on the physical setting at each location. One possible array of monitoring wells is illustrated in Attachment A. In this scenario, one well is used to monitor conditions upgradient of the source, one well is located in the source area, and several wells are used to define and monitor the downgradient and lateral extent of the dissolved plume. At a minimum, there should be at least one upgradient well (ideally with no contamination present), one well in the source area, one well downgradient from the source area in the dissolved plume, and one downgradient well where contaminant concentrations are below regulatory criteria. Note that the number and locations of monitoring wells will vary depending on the site complexity and site objectives.

Sampling frequency will be dictated by the ultimate use of the data and site-specific characteristics. Contaminant concentrations may be used to define statistically meaningful trends in contaminant concentrations. The sampling frequency may be defined by the hydrogeologic and/or geochemical conditions as well as the proposed statistical method for data analysis. For example, groundwater flow and contaminant characteristics (e.g., seepage velocity and contaminant loading) may dictate the sample frequency. Regardless of the factors, sampling frequency and duration will need to establish the range of natural chemical variability within the aquifer. After a sufficient amount of data has been collected and the geochemical conditions are understood, the frequency of sampling may be reduced. See Section 5.4 for additional information on sample collection and frequency.

5.3 Selection of Natural Attenuation Parameters

Natural attenuation via biodegradation depends on the nature of the organic contaminants and the oxidation-reduction (redox) environment within the aquifer. Simply stated, if the contaminants are fuels, biodegradation will be most effective if the redox conditions are aerobic or oxidizing. If the contaminants are chlorinated solvents, the biodegradation will be most effective (in the source and near source areas) if redox conditions in the aquifer are anaerobic or reducing.

Several parameters are needed to evaluate whether natural attenuation is taking place and, if so, the rate at which it may be occurring. The primary parameter providing direct evidence of natural attenuation is the aqueous concentrations of parent and daughter volatile organic compounds. More specifically, a decrease in percent products, an increase in daughter products, evidence that the plume is stable or shrinking in size, and overall decline in contaminant concentrations is direct evidence of natural attenuation. Natural attenuation or geochemical parameters that provide information about the redox conditions in the aquifer include:

- Dissolved oxygen
- Nitrate/nitrite
- Dissolved manganese
- Iron
- Sulfate/sulfide
- Methane
- Oxidation-reduction potential (ORP)

Secondary parameters that indicate biological activity in the aquifer and thereby support the natural attenuation evaluation include:

- Dissolved hydrogen
- Alkalinity
- Dissolved carbon dioxide

The concentrations of natural attenuation parameters are used to define the aquifer redox conditions. It is important to record and document the presence or absence (i.e., measurable or not measurable concentration) of certain natural attenuation parameters. The presence or absence of a certain substance may be sufficient to indicate the redox condition within the aquifer. By reference to Attachment B, which illustrates the typical sequence of biologically mediated redox reactions in natural systems, it is apparent that, for example, sulfate reduction (producing dissolved sulfide in groundwater) does not operate in an aerobic environment. Therefore, measurable sulfide should not be present if there is also dissolved oxygen at concentrations indicating an aerobic environment. Attachment B also illustrates the redox potential (measured in millivolts) associated with the redox reactions. ORP readings, also in millivolts, measured during well purging, may be compared with the range of values in Attachment B but with caution. Redox potentials measured with a platinum electrode in natural water samples may be misleading, especially when biologically mediated reactions are important, because many of the critical

reactions in Attachment B do not generate a response in the electrode. Dissolved hydrogen concentration ranges associated with important redox reactions are also indicated in Attachment B. Because dissolved hydrogen is actually used by microbiota during redox reactions, its concentration may provide an additional indicator of the overall redox condition in the aquifer.

Attachments C and D tabulate the natural attenuation parameters for chlorinated volatile organic compound and petroleum hydrocarbon plumes, respectively. The parameters listed in these tables are organized in order of importance. Parameters selected for analysis shall be determined based on site conditions, project-specific plans, and/or other criteria established for the project. Based on these criteria, it is possible that all of the parameters may be selected.

5.4 Selection of Natural Attenuation Analytical Methods and Procedures

There are many analytical methods available to measure concentrations of the natural attenuation parameters discussed in the previous sections. Attachment E summarizes the sample methodologies, sampling equipment needed, sample volume, container, preservation, and holding time requirements. This table also summarizes the detection limits and the detection ranges for each method. A number of factors should be considered when selecting the appropriate sample analytical methodology including the required parameters, appropriate detection ranges for each compound, cost, and ease of use in the field. For example, when determining the correct methodology for measuring concentrations of total sulfide, the metabolic byproduct of sulfate reducing conditions, it is important to analyze for each of the forms of sulfide (H_2S, S^{-2}, and HS^-). Also, when the detection limit of the selected method is exceeded, another method may be considered, or the sampler may be able to dilute the sample (per manufacturer's instructions) to quantify it within the detected range. In terms of cost, some parameters are very time consuming when performed in the field. Without sacrificing sample integrity it may be more appropriate to select a methodology performed in a fixed-base laboratory. Finally, in terms of ease of use, certain field methods are generally easier compared to other methods. Using simpler methods may result in better quality sample results and increased sample repeatability without sacrificing sample integrity. For example, in some cases CHEMetrics Titret® Titration Ampule kits may be a good alternative to other hand digital titration methods.

The sample technicians should be aware that based on geochemical conditions recorded in the field, certain geochemical parameters may not have positive detections. For example, if dissolved oxygen concentrations indicate aerobic conditions then it is unlikely that dissolved hydrogen is present (see Section 5.10 for additional information). Another example is alkalinity. If the pH of the groundwater sample is less than 4.5, then it is unlikely that alkalinity will be measurable. Despite the potential for non-detect results, in cases such as those described above, all parameters should be collected in the field based upon project plans. The value in collecting the parameters in the future shall be determined by the project hydrogeologist and/or geochemist in accordance with the projects planning documents data quality objectives (DQO) and the items discussed in Section 5.2.

5.5 Procedures for Sample Collection

Groundwater sample collection for natural attenuation sampling should be performed using low flow purging and sampling techniques. These techniques are described in detail in SOP SA-1.1. Low flow purging and sampling procedures should be used to ensure the collection of a sample that is "representative" of the water present in the aquifer formation. Minimizing stress on the aquifer formation during low flow purging and sample collection ensures that there are minimal alternations to the water chemistry of the sample. The criteria used in the purging process should include minimization of drawdown in the well, stabilization of applicable indicator parameters, and evacuation of a sufficient amount of purge volume in accordance with SOP SA-1.1, project plans, and/or applicable regulatory guidance.

Groundwater purging and sampling for natural attenuation should be performed using submersible pumps (e.g., bladder pumps) in accordance with SOP SA-1.1. However, in accordance with project plans and applicable regulatory guidance, peristaltic pumps may also be used for this purpose. Limitations of and factors associated with using these devices should be considered (see SOP SA-1.1 for more information). As a result of difficulties in collecting "representative" groundwater samples, bailers should not be used for the collection of natural attenuation samples.

It is critical that disturbance and aeration of samples monitored and collected at the well head are minimized. As a result, a flow-through sampling cell and a direct reading meter shall be used for the measurement of well stabilization indicator parameters (e.g., pH, conductivity, temperature, dissolved oxygen, turbidity, and ORP) at the well head. The pump effluent tubing should be placed at the bottom of the flow-through cell allowing effluent water from the cell to discharge at the top of the meter (above the detector probes) to minimize the agitation of water in the cell.

Documentation of the purging process shall be recorded during and at the completion of purging as discussed in Section 5.8. Immediately following the purging process and before sampling, all applicable indicator parameters must be measured and recorded on the appropriate sample log sheets as discussed in Section 5.8.

After all of the purging requirements have been met, groundwater sampling and natural attenuation data collection can begin. Monitoring wells will be sampled using the same pump and tubing used during well purging.

5.6 Procedures for Field Sample Analysis

Each of the field and fixed-base laboratory sample parameters requires different sampling procedures and holding times. Attachment E presents parameter-specific requirements for sampling, analysis, and storage of all of the parameters and methods sampled as part of natural attenuation analysis.

Due to parameter procedure and holding times, it is important to consider the sequence of sample collection and analysis. Generally speaking, with the exception of volatile organic compounds, field parameters shall be analyzed first followed by fixed-base laboratory sample collection. All samples will be collected in a sequence and manner that minimizes volatilization, oxidation, and/or chemical transformation of compounds. As a result, the following sample and analysis order should be followed:

1. Volatile organic compounds
2. Dissolved oxygen
3. Alkalinity
4. Dissolved carbon dioxide
5. Dissolved ferrous iron
6. Dissolved sulfide (hydrogen sulfide and sulfide)
7. Dissolved hydrogen, methane, ethene, and ethane
8. Nitrate / Nitrite
9. Dissolved manganese
10. Semivolatile organic compounds
11. Other dissolved metals
12. Total metals
13. All other constituents

Field-analyzed parameters should be collected and immediately analyzed directly from the pump effluent per the requirements on Attachment E and manufacturer's recommendations. Care should be taken to minimize any unnecessary disturbance, aeration, or agitation of the sample prior to analysis. It is not acceptable to collect and store samples that are to be analyzed immediately at the well head in a temporary holding container (e.g., open topped pitcher) to be analyzed at a later time.

The manufacturer's procedure manual for each of the field-based analyses shall be maintained in the field during the entire sampling program. The procedures give a detailed explanation of how to perform each particular method and include information on sampling, storage, accuracy checks, interferences, reagents, and apparatus needed to perform each analysis.

5.7 Procedures for Quality Assurance and Quality Control Field Sample Analysis

Accuracy and precision checks shall be performed to check the performance of the reagents, apparatus, and field analytical procedures per the manufacturer's recommendations. The accuracy checks should include the use of standard solutions (i.e., standard addition), as appropriate. The manufacturer's field test kit manual provides details on how to perform each of the accuracy checks for each parameter where applicable. Refer to Section 6.0 for manufacturer contact information.

Precision checks must include the performance of duplicate analysis. When using a colorimeter, precision checks may also include reagent blank corrections and standard curve adjustments as recommended by the manufacturer. Field duplicate results shall be performed and evaluated for relative percent difference (RPD) at a rate of 1 per 10 samples or as determined by the project plans. The RPD can be calculated as follows:

$$RPD = \left| \frac{\text{First result - Second result}}{\text{Mean arithmetic (average) of first and second result}} \right| \times 100$$

If the RPD exceeds 50 percent, it is required that the test be performed again to verify the result. The duplicate results shall be documented in the 'Notes' section for that specific parameter on the appropriate sample logsheet (see Section 5.8).

If a colorimeter (e.g., HACH DR-890 or equivalent) is used for parameter analysis, an instrument performance verification test using absorbance standards may also be performed to ensure the meter is providing accurate measurements.

The following table lists examples of the types and frequencies of accuracy checks required for each parameter. Refer to the manufacturer's instructions for information regarding other analyses.

Parameter	Method	Standard Solution	Field Duplicate	Reagent Blank Correction
Alkalinity	CHEMetrics K-9810, -15, -20	None	1 per 10	None
Carbon dioxide	CHEMetrics K-1910, -20, -25	None	1 per 10	None
Dissolved oxygen	CHEMetrics K-7501, -12	None	1 per 10	None
Ferrous iron	HACH DR-890	None	1 per 10	None
Nitrite	HACH DR-890	1 per round	1 per 10	1 per lot
Nitrate	HACH DR-890	1 per round	1 per 10	1 per lot
Sulfide	HACH DR-890	None	1 per 10	None
Hydrogen sulfide	HACH HS-C	None	1 per 10	None

Prior to analysis, the expiration dates of reagents shall be checked. If the reagents have exceeded their expiration date or shelf life, the reagents shall be replaced. If deviations from the applicable analytical procedure are identified, the deviations shall be corrected and the associated samples re-analyzed. If problems are identified with the reagents, apparatus, or procedures, data interferences may be present. Interferences may also be due to other factors (e.g., pH, presence or concentration of other ions, turbidity, temperature, etc.) that may interfere with the sample result. The manufacturer's procedures (e.g., Hach, 1999) should be reviewed prior to analysis to avoid or minimize such interferences. Associated problems

or suspected interferences shall be documented in the 'Notes' section of the sample logsheet. Often, interferences cannot be avoided. In these cases, the sampler should be aware of these potential interferences and document them properly.

5.8 Documentation Procedures for Field Sample Analysis

Field results shall be properly documented in the field as noted in SOP SA-6.3. The sample log sheet titled "Field Analytical Log Sheet, Geochemical Parameters" shall be prepared for each sample collected and analyzed in the field. A copy of this form can be found as Attachment F of this SOP. Other field log sheets (e.g., low flow purge log sheet, groundwater sample logsheet, etc.) shall also be completed in accordance with SOP SA-6.3.

Specific information shall also be recorded in the project logbook. This information shall include, but is not limited to, the test kit name and model number, lot number and expiration date of the test kit and reagents used, serial number of the instrument (e.g., colorimeter) used for the analysis, and results of the quality assurance and quality control field sample analysis. Because environmental conditions and changes in those conditions may affect the field analytical results, it is important to document the site conditions (weather, temperature, etc.) at the time of sampling in the logbook in accordance with SOP SA-6.3.

5.9 Waste Handling and Disposal

Several of the test kits listed in Attachment E require the use of chemicals and materials that must be properly handled and disposed of in a proper and responsible manner. Refer to specific manufacturer's guidance for handling and disposal practices. See also Section 6.0 for more detailed and complete information. Handling and disposal of these items should be conducted in accordance with all local, state, and federal guidelines.

5.10 Understanding Field Sample Analytical Results

Natural attenuation data interpretation is complicated by the complex inter-relationships of various parameters. The complexity reflects the myriad of biochemical processes. Real-time evaluation of field analytical data can be misleading because a full interpretation often requires combining the field analytical results with fixed-base laboratory results. Regardless, some simple observations and data interpretations in the field may provide insights about the monitoring system or early warnings about sample collection and handling problems.

Data collected from the designated upgradient monitoring well is the baseline from which other interpretations are made. Field analytical data will indicate that the upgradient environment is either oxidizing or reducing. The redox condition within the upgradient area of the aquifer may be natural or impacted by other contaminant source areas (see Section 5.2 for upgradient well selection). Regardless, the redox condition of the upgradient groundwater will influence the source area. Changes in field analytical results from the upgradient well to the source area well will be reflected in samples from monitoring wells further downgradient.

The general characteristics of the two redox environments are summarized in the following table.

Aerobic/Oxidizing	Anaerobic/Reducing
• Measurable dissolved oxygen (>1 to 2 ppm)	• No measurable dissolved oxygen (<1 ppm)
• Measurable nitrate	• No measurable nitrate
• No measurable dissolved manganese	• Measurable dissolved manganese
• No measurable dissolved ferrous iron	• Measurable dissolved ferrous iron
• Measurable dissolved sulfate	• No measurable dissolved sulfate
• No measurable dissolved sulfide	• Measurable dissolved sulfide
• No measurable dissolved methane	• Measurable dissolved methane
• No measurable dissolved hydrogen	• Measurable dissolved hydrogen

Transitional environments between these two extremes may have intermediate characteristics and are actually quite common. Because reactions are mediated by biological systems, equilibrium (the basis for the figure in Attachment B) conditions within the aquifer should not be expected. For example, sulfate reduction environments may occur in close proximity to methanogenic environments, and this natural attenuation data may be difficult to interpret. Carefully collected and analyzed field measurements and sample collections for fixed-base laboratory analyses are designed to characterize the aquifer environment along the continuum between strongly aerobic and strongly anaerobic. Because the land surface environment is generally more oxidizing than any groundwater environment, sample handling at the point of collection and analysis is extremely important in preserving the chemical integrity of the groundwater sample.

6.0 REFERENCES

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USEPA, 1997. Draft EPA Region 4 Suggested Practices for Evaluation of a Site for Natural Attenuation (Biological Degradation) of Chlorinated Solvents; Version 3.0. November.

USEPA, 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites, USEPA OSWER Directive 9200.4-17P, April 21, 1999

ATTACHMENT A

HYPOTHETICAL LONG-TERM MONITORING STRATEGY

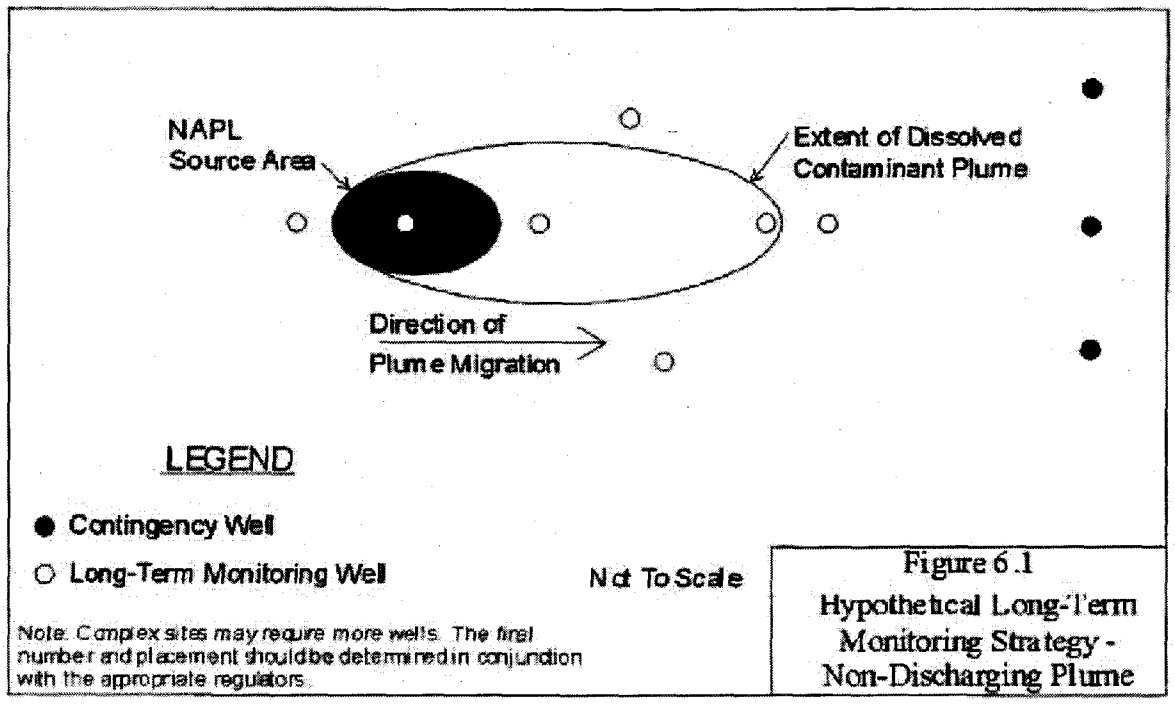
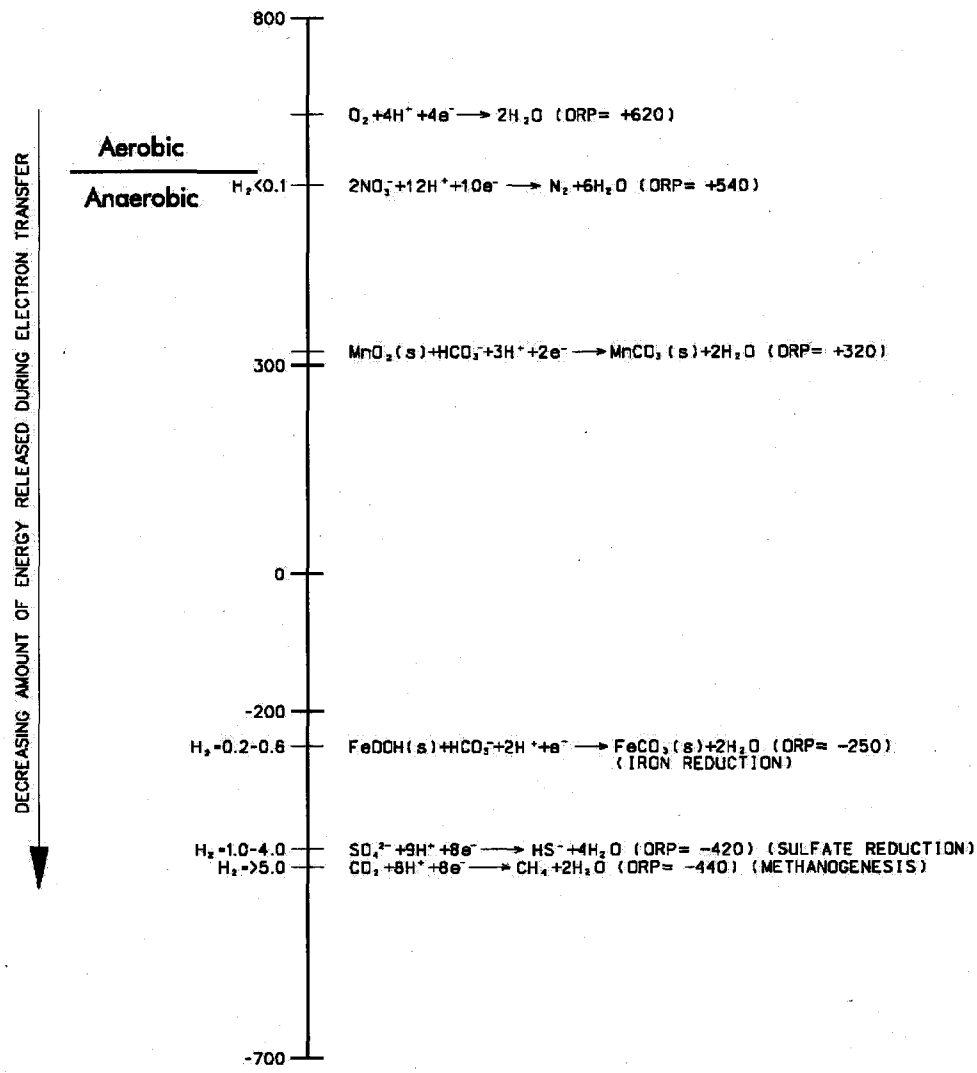


Figure 6.1
Hypothetical Long-Term Monitoring Strategy - Non-Discharging Plume

Taken from: Department of the Navy, 1998, Technical Guidelines for Evaluating Monitored Natural Attenuation of Petroleum Hydrocarbons and Chlorinated Solvents in Ground Water at Naval and Marine Corps Facilities, Prepared by Todd Weidemeier and Francis Chappelle.

ATTACHMENT B

REDOX POTENTIALS FOR VARIOUS ELECTRON ACCEPTORS



Dissolved hydrogen (H_2) concentration in nanomoles per liter (nM)
Oxidation Reduction Potential (ORP vs Ag/AgCl) in millivots @ pH=7, T=25° c

FIGURE B
REDOX POTENTIALS
FOR VARIOUS ELECTRON ACCEPTORS

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ATTACHMENT C

NATURAL ATTENUATION PARAMETERS FOR CHLORINATED VOLATILE ORGANIC COMPOUND PLUMES SCREENING PROCESS SUMMARY FOR REDUCTIVE (ANAEROBIC) DECHLORINATION

Potential Electron Donors	Electron Acceptors:		Reduced Species:		Related Dechlorination Pathway:
Native total organic carbon (TOC)	Dissolved Oxygen	⇒	Carbon Dioxide (CO_2)	~	DCE → VC → CO_2
Anthropogenic carbon (e.g., leachate)	Manganese (Mn^{4+})	⇒	Manganese (Mn^{2+})	~	DCE → VC
Fuel hydrocarbons (e.g., BTEX)	Nitrate (NO_3)	⇒	Nitrite (NO_2)	~	DCE → VC
Lightly chlorinated solvents (DCE/VC)	Ferric Iron (Fe^{3+})	⇒	Ferrous Iron (Fe^{2+})	~	DCE → VC → CO_2
	Sulfate (SO_4)	⇒	Sulfide (S^{2-}, HS^-, H_2S)	~	TCE → DCE → VC → Ethene
	Carbon Dioxide (CO_2)	⇒	Methane (CH_4)	~	PCE → TCE → DCE → VC → Ethene

Geochemical Parameter List:

Parameter	Field or Lab	Rationale	Importance
Volatile organic compounds	L	Source products; daughter products; electron donors (e.g., benzene, toluene, ethylbenzene, and xylene; BTEX)	1
Dissolved oxygen	F	Primary electron acceptor (respiration); an/aerobic indicator	1
Nitrate (and nitrite), dissolved	F or L	Anaerobic electron acceptor (product of nitrate reduction)	1
Manganese, dissolved	F or L	Anaerobic electron acceptor	1
Ferrous Iron (Fe^{2+})	F	Product of iron reduction	1
Sulfate [and sulfide (S^{-2})]	F or L	Common anaerobic electron acceptor (product of sulfate reduction)	1
Sulfide (H_2S)	F	Common product of sulfate reduction	1
Methane, ethane, ethene	L	Product of methanogenesis; daughter products of reductive dechlorination	1
Chloride	L	Ultimate daughter product of reductive dechlorination	1
TOC - upgradient groundwater	L	Electron donor	1
ORP, pH, specific conductance, temperature, turbidity	F	General water quality determination	1
Carbon dioxide (CO_2)	F	Anaerobic electron acceptor (methanogenesis); biotic respiration indicator	2
Alkalinity/DIC	F	Buffering capacity; biotic respiration indicator	2
Hydrogen, dissolved	L	Fingerprint for characterizing electron acceptor pathway - indicator of what redox is occurring	2
TOC - upgradient soil	L	Input to analytical NA models; quantifies soil-water distribution coefficient and retardation factor	2
Volatile fatty acids	L	Determination of anthropogenic carbon used as an electron donor	3

Importance: 1=Most important; 3=Least important (depending on DQOs, all may be recommended).
See Attachment E for details regarding analytical methods.

ATTACHMENT D

NATURAL ATTENUATION PARAMETERS FOR PETROLEUM HYDROCARBON PLUMES SCREENING PROCESS SUMMARY FOR OXIDATIVE (AEROBIC) DEGRADATION

Parameter	Field or Lab	Rationale	Importance
Volatile organic compounds	L	Source products; daughter products; electron donors (BTEX)	1
Dissolved oxygen	F	Primary electron acceptor (respiration); an/aerobic indicator	1
Nitrate (and nitrite), dissolved	F or L	Anaerobic electron acceptor (and product of nitrate reduction)	1
Manganese, dissolved	F or L	Anaerobic electron acceptor	1
Ferrous Iron (Fe^{2+})	F	Product of iron reduction	1
Sulfate [and Sulfide (S^{-2})]	F or L	Common anaerobic electron acceptor (product of sulfate reduction)	1
Sulfide (H_2S)	F	Common product of sulfate reduction	1
TOC - upgradient groundwater	L	Electron donor	1
ORP, pH, specific conductance temperature, turbidity	F	General water quality determination	1
Dissolved methane (CH_4)	L	Product of methanogenesis	1
Anions: chloride (Cl), nitrate (NO_3), nitrite (NO_2), phosphate (PO_4), sulfate (SO_4)	L		1
TOC - Upgradient soil	L	Input to analytical NA models; quantifies soil-water distribution coefficient and retardation factor	2
Biological oxygen demand (BOD)	L	Understanding of aquifer oxygen demand	3
Chemical oxygen demand (COD)	L	Understanding of aquifer oxygen demand	3

Importance: 1=Most important; 3=Least important (depending on DQOs, all may be recommended).

See Attachment E for details regarding analytical methods.

ATTACHMENT E
GEOCHEMICAL SAMPLING PARAMETERS - METHODS, EQUIPMENT, VOLUMES, CONTAINERS, PRESERVATION, HOLDING TIMES, AND DETECTION RANGES
PAGE 1 OF 4

Parameter	Method / Reference	Equipment / Method Chemistry	Sample Volume, Container, Preservation, & Holding Time	Range (mg/L)	Precision (mg/L)	Estimated Detection Limit (mg/L)
Alkalinity	CHEMetrics K-9810, K-9815, K-9820 -ASTM D 1067-92 -EPA 310.1	Titret® Titration Ampules / Hydrochloric Acid, Phenolphthalein	Field. Follow test kit instructions. Avoid agitation and analyze at well head to determine total alkalinity. Filter if turbid (>10 NTU).	10-100 (K-9810) 50-500 (K-9815) 100-1000 (K-9820)	N/A	10 50 100-
Alkalinity	Fixed-base lab -EPA 310.1	N/A	100 to 250 mL in glass or plastic container. Cool to 4°C. Analyze within 14 days. Filter if turbid.	N/A	N/A	N/A
Alkalinity / Dissolved Inorganic Carbon	HACH AL-DT -HACH 8203 -SM 2320 / SM 403	Digital Titration / Hydrochloric Acid, Phenolphthalein (P) and Total (M)	Field. Follow test kit instructions. Avoid agitation and analyze at well head to determine carbonate, bicarbonate, and hydroxide ions. *Filter if turbid as recommended by manufacture.* May use a pH meter for colored samples.	10-4000	N/A	10
Arsenic	Fixed-base lab -SW-6010 B	N/A	1 liter glass or polyethylene container, HNO_3 to pH ≤ 2, 6 months.	N/A	N/A	N/A
Biochemical Oxygen Demand	Fixed-base lab -EPA 410.1	N/A	2 liter HDPE. Cool to 4°C. Analyze within 48 hours.	N/A	N/A	N/A
Carbon Dioxide, dissolved	CHEMetrics K-1910, K-1920, K-1925 -ASTM D 513.82 -SM 4500-CO_2-C	Titret® Titration Ampules / Sodium Hydroxide, Phenolphthalein	Field. Follow test kit instructions. Avoid agitation and analyze at well head.	10-100 (K-1910) 100-1000 (K-1920) 250-2500 (K-1925)	N/A	10 100 250
Carbon Dioxide, dissolved	Fixed-base lab - VOA water sample (Vaportech)	GC-ECD/RGD/FID Detector	*40 mL in VOA vial. 2 to 3 vials by (Vaportech).*	N/A	N/A	N/A
Carbon Dioxide, dissolved	Fixed-base lab -Microseeps gas stripping cell	GC-ECD/RGD/FID Detector	Field bubble-strip sampling required. Ship in glass septum vial (Microseeps only).	N/A	N/A	N/A
Carbon Dioxide, dissolved	HACH CA-DT -HACH 8205 -Mod. SM 406	Digital Titration / Sodium Hydroxide, Phenolphthalein	Field. Follow test kit instructions. Do not aerate or agitate. Analyze at well head.	10-1000	N/A	10
Chemical Oxygen Demand	Fixed-base lab -EPA 410.1	N/A	125 mL HDPE. H_2SO_4 to pH <2.0. Cool to 4°C. Analyze within 28 days.	N/A	N/A	N/A
Chloride (Cl)	Fixed-base lab -EPA 300	N/A	100 to 250 mL in glass or plastic container. Cool to 4°C. Analyze within 28 days.	N/A	N/A	N/A
Chlorine - Total (Cl_2)	HACH DR-850 -HACH 8167 -SM 4500-Cl	Colorimeter / DPD Method	Field. Follow test kit instructions.	*0.02-2.00*	$\pm$ *0.01* mg/L with a 1.00 mg/L chlorine solution.	*1*
Conductance, Specific	Field Meter -SW-9050 A	Direct Reading Meter	100 to 250 mL in glass or plastic container. Analyze immediately.	N/A	N/A	N/A
Ethane, dissolved	Fixed-base lab -VOA water sample, Vaportech -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	40 mL in VOA vial. 2 toi 3 vials by (Vaportech).	N/A	N/A	N/A
Ethane, dissolved	Fixed-base lab -Microseeps gas stripping cell -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	Field bubble-strip sampling required. Ship in glass septum vial (Microseeps only).	N/A	N/A	N/A

ATTACHMENT E

GEOCHEMICAL SAMPLING PARAMETERS - METHODS, EQUIPMENT, VOLUME, CONTAINER, PRESERVATION, HOLDING TIME, AND DETECTION RANGES

PAGE 2 OF 4

Parameter	Method / Reference	Equipment / Method Chemistry	Sample Volume, Container, Preservation, & Holding Time	Range (mg/L)	Precision (mg/L)	Estimated Detection Limit (mg/L)
Ethene, dissolved	Fixed-base lab -VOA water sample, Vaportech -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	40 mL in VOA vial. 2 to 3 vials by (Vaportech).	N/A	N/A	N/A
Ethene, dissolved	Fixed-base lab -Microseeps gas stripping cell -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	Field bubble-strip sampling required. Ship in glass septum vial (Microseeps only).	N/A	N/A	N/A
Fraction Organic Carbon (foc) -Soil Upgradient Saturated Soil	Fixed-base lab -Walk-Black -SW-846 9060	N/A	200 gram glass jar. Cool to 4°C. Analyze within 14 days.	N/A	N/A	N/A
Hydrogen, dissolved	Fixed-base lab -Microseeps or Vapor Tech gas stripping cell -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	Field bubble-strip sampling required. Ship in glass septum vial.	N/A	N/A	N/A
Iron, ferrous (Fe^{+2})	HACH DR-850 -HACH 8146 -Mod. SM 315 B	Colorimeter 1, 10 Phenanthrolein	Field. Follow test kit instructions. Analyze immediately at well head. Filter if turbid (>10 NTU) as recommended by the manufacture.	0-3.00	±0.017 mg/L with a 2.00 mg/L Fe^{2+} solution.	0.03
Iron, ferrous (Fe^{+2})	HACH IR-18C -Mod. SM 315 B	Color Disc 1, 10 Phenanthrolein	Field. Follow test kit instructions. Analyze immediately at well head. Filter if turbid (>10 NTU) as recommended by the manufacture.	0-10	N/A	0.2
Iron, total dissolved (Filtered)	Fixed-base lab -SW-846 6010B	N/A	250 mL in plastic container. Field filter to 0.45 µ. HCl to pH <2. Cool to 4°C. Analyze within 6 months.	N/A	N/A	N/A
Manganese (Mn^{+2})	HACH DR-850 -HACH 8034 -CFR 44(116) 34193	Colorimeter / Cold Periodate Oxidation	Field. Follow test kit instructions. Avoid agitation and analyze at well head. Filter if turbid as recommended by the manufacture.	0-20.0	± 0.18 mg/L with a 10.00 mg/L Mn solution.	0.12
Manganese (Mn^{+2})	HACH MN-5 -Mod. SM 319 B -CFR 44(116) 34193	Color Disc / Cold Periodate Oxidation	Field. Follow test kit instructions. Avoid agitation and analyze at well head. Filter if turbid as recommended by the manufacture.	0-3	N/A	0.1
Manganese, total dissolved (Filtered)	Fixed-base lab -SW-846 6010B	N/A	250 mL in plastic container. Field filter to 0.45 µ. HCl to pH <2. Cool to 4°C. Analyze within 6 months.	N/A	N/A	N/A
Methane, dissolved	Fixed-base lab -VOA water sample, Vaportech -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	40 mL in VOA vial. 2 to 3 vials by (Vaportech).	N/A	N/A	N/A
Methane, dissolved	Fixed-base lab -Microseeps gas stripping cell -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	Field bubble-strip sampling required. Ship in glass septum vial (Microseeps only).	N/A	N/A	N/A
Nitrate (NO_3^-)	Fixed-base lab -EPA 300	N/A	250 mL plastic container. Cool to 4°C. Analyze within 48 hours.	N/A	N/A	N/A
Nitrate (NO_3^-)	HACH DR-850 -HACH 8192 -Mod. EPA 353.2	Colorimeter / Cadmium Reduction	Field. Follow test kit instructions. Avoid agitation and analyze at well head. Pretreatment required if nitrite is present.	0-0.50	± 0.03 mg/L with a 0.25 mg/L of nitrate nitrogen (NO_3^- N) solution.	0.01
Nitrite (NO_2^-)	Fixed-base lab -EPA 300	N/A	250 mL plastic container. Cool to 4°C. Analyze within 48 hours. Filter if turbid as recommended by the manufacture.	N/A	N/A	N/A

ATTACHMENT E

GEOCHEMICAL SAMPLING PARAMETERS - METHODS, EQUIPMENT, VOLUME, CONTAINER, PRESERVATION, HOLDING TIME, AND DETECTION RANGES

PAGE 3 OF 4

Parameter	Method / Reference	Equipment / Method Chemistry	Sample Volume, Container, Preservation, & Holding Time	Range (mg/L)	Precision (mg/L)	Estimated Detection Limit (mg/L)
Nitrite (NO_2^-)	HACH DR-850 -HACH 8507 -Mod. EPA 354.1 -Mod. SM 419 -CFR 44(85) 25595	Colorimeter / Diazotization	Field. Follow test kit instructions. Avoid agitation and analyze at well head. Filter if turbid as recommended by the manufacture.	0-0.350	± 0.001 mg/L with a 0.250 mg/L nitrite nitrogen solution.	0.005
Nitrogen, dissolved	Fixed-base lab -Microseeps gas stripping cell - Vaportech VOA water sample	GC-ECD/RGD/FID Detector	Field bubble-strip sampling required for Microseeps. Ship in glass septum vial (Microseeps) or VOA vial (Vaportech).	N/A	N/A	N/A
Nitrogen, Total Kjeldahl	Fixed-base lab -EPA 351.2	N/A	500 mL plastic/glass container. Cool to 4°C. H_2SO_4 to pH ≤ 2. Analyze within 28 days.	N/A	N/A	N/A
Oxidation Reduction Potential	Field Meter - ASTM D-1498	Direct Reading Meter	Field. Do not aerate. Gently agitate probe using flow over ot flow-through method. Analyze immediately at well head.	N/A	N/A	N/A
Oxygen, dissolved	CHEMetrics K-7501, K-7512 -ASTM D 5543-94 -ASTM D 887-92	CHEMets® Vacuum Vials / Rhodazine D and Indigo Carmine	Field. Follow test kit instructions. Avoid agitation and analyze immediately at well head.	0-1 (K-7501) 1-12 (K-7512)	N/A	0.025 1
Oxygen, dissolved	Fixed-base lab -VOA water sample, Vaportech -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	40 mL in VOA vial. 2 to 3 vials by (Vaportech).	N/A	N/A	N/A
Oxygen, dissolved	Fixed-base lab -Microseeps gas stripping cell -RSK SOP-147 & 175	GC-ECD/RGD/FID Detector	Field bubble-strip sampling required. Ship in glass septum vial (Microseeps only).	N/A	N/A	N/A
Oxygen, dissolved	HACH OX-DT -HACH 8215 -SM 4500-O-G	Digital Titration / Azide Modification of Winkler Digital Titration Method	Field. Follow test kit instructions. Avoid agitation and analyze immediately at well head.	1-10	N/A	1
Oxygen, dissolved	HACH DR-850 (AccuVac Ampules) LR HRDO Method	-Indigo Carmine Method -Rhadazine D Method	Field. Follow test kit instructions. Avoid agitation and analyze immediately at well head.	0-0.8 ppm 0-10 ppm	0.01 ppm 0.1 ppm	N/A
Oxygen, dissolved	Field Meter	Direct Reading Meter	Analyze immediately at well head. Avoid agitation and analyze immediately at well head. Used for well stabilization measurement parameter only.	N/A	N/A	N/A
pH	Field Meter -SW 9040B	Direct Reading Meter	Analyze immediately at well head.	N/A	N/A	N/A
Phosphate (ortho)	Fixed-base lab -EPA 300	Ion Chromatography	250 mL plastic container. Cool to 4°C. Analyze within 48 hours. Filter if turbid as recommended by the manufacture.	N/A	N/A	N/A
Phosphate, potassium	Fixed-base lab -SW-846 6010B	Inductively Coupled Plasma	250 mL plastic container. Cool to 4°C. Analyze within 48 hours. Filter if turbid as recommended by the manufacture.	N/A	N/A	N/A
Salinity	Field Meter	Direct Reading Meter	Analyze immediately.	N/A	N/A	N/A
Sulfate (SO_4^{-2})	Fixed-base lab	N/A	250 mL plastic container. Cool to 4°C. Analyze within 48 hours. Filter if turbid as recommended by the manufacture.	N/A	N/A	N/A
Sulfate (SO_4^{-2})	HACH DR-850 -HACH 8051 -EPA 375.4	Colorimeter / Turbimetric SulfaVer 4	Field. Follow test kit instructions. Filter if turbid as recommended by the manufacture.	0-70	± 0.5 mg/L with a 50 mg/L sulfate solution.	4.9
Sulfide (Hydrogen Sulfide, H_2S)	HACH HS-C -HACH Proprietary -Mod. SM 426 C	Color Chart / Effervescence of H_2S through sulfide reactive paper.	Field. Follow test kit instructions. Avoid agitation and analyze immediately at well head.	0-5	N/A	0.1
Sulfide (S^{-2})	CHEMetrics K-9510 -SM 4500-S^2	CHEMets® Vacuum Vials / Methylene Blue	Field. Follow test kit instructions. Avoid agitation and analyze immediately at well head.	0-1 1-10	N/A	0.1 1

ATTACHMENT E

GEOCHEMICAL SAMPLING PARAMETERS - METHODS, EQUIPMENT, VOLUME, CONTAINER, PRESERVATION, HOLDING TIME, AND DETECTION RANGES

PAGE 4 OF 4

Parameter	Method / Reference	Equipment / Method Chemistry	Sample Volume, Container, Preservation, & Holding Time	Range (mg/L)	Precision (mg/L)	Estimated Detection Limit (mg/L)
Sulfide (S^{-2})	Fixed-base lab -EPA 376.1/376.2	N/A	1 liter in plastic container, no headspace. NaOH to pH >9. Cool to 4°C. Avoid agitation and analyze within 7 days.	N/A	N/A	N/A
Sulfide (S^{-2})	HACH DR-850 -HACH 8131 -SM 4500-S^2	Colorimeter / Methylene Blue	Field. Follow test kit instructions. Avoid agitation and analyze immediately at well head. Pretreatment required for turbid samples as recommended by the manufacture.	0-0.70	± 0.02 mg/L with a 0.73 mg/L sulfide solution.	0.01
Sulfide (S^{-2})	HACH HS-WR -SM 4500-S^2	Color Disc / Methylene Blue	Field. Follow test kit instructions. Avoid agitation and analyze immediately at well head. Pretreatment required for turbid samples as recommended by the manufacture.	0-11.25	N/A	0.1-2.5
Temperature	Field Meter / Thermometer - E170.1	Direct Reading Meter / Thermometer	Analyze immediately.	N/A	N/A	N/A
Total Organic Carbon (TOC)-Groundwater	Fixed-base lab -E 415.1	N/A	125 mL HDPE. H_2SO_4 to pH < 2.0. Cool to 4°C. Analyze within 28 days.	N/A	N/A	N/A
Turbidity	Field Meter - E 180.1	Direct Reading Meter	Analyze immediately.	N/A	N/A	N/A

N/A = Not applicable.

ATTACHMENT F

FIELD ANALYTICAL LOG SHEET, GEOCHEMICAL PARAMETERS
PAGE 1 OF 3

Note: Analyte, method, and/or equipment may be deleted from form if not being performed.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: _____ **Sample ID No.:** _____

Project No.: _____ **Sample Location:** _____

Sampled By: _____ **Duplicate:** ☐

Field Analyst: _____ **Blank:** ☐

Field Form Checked as per QA/QC Checklist (initials): _____

SAMPLING DATA:

Date:	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

ORP (Eh) (+/- mv) Electrode Make & Model: _____

Reference Electrode (circle one): Silver-Silver Chloride / Calomel / Hydrogen

Dissolved Oxygen:

Equipment: Chemetrics Test Kit

Concentration: _____ *ppm*

Range Used:	Range	Method	Concentration ppm
☐	0 to 1 ppm	K-7510	
☐	1 to 12 ppm	K-7512	

Analysis Time: _____

Equipment: HACH Digital Titrator OX-DT

Analysis Time: _____

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier		Concentration
_____	x 0.01	=	mg/L
_____	x 0.02	=	mg/L

Notes:

Carbon Dioxide:

Equipment: Chemetrics Test Kit

Concentration: _____ ppm

Range Used:	Range	Method	Concentration ppm
☐	10 to 100 ppm	K-1910	
☐	100 to 1000 ppm	K-1920	
☐	250 to 2500 ppm	K-1925	

Analysis Time: _____

Equipment: HACH Digital Titrator CA-DT

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☐	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count			Concentration
_____	x 0.1	=	mg/L
_____	x 0.2	=	mg/L
_____	x 1.0	=	mg/L
_____	x 2.0	=	mg/L

Standard Additions: ☐ Titrant Molarity: _____ Digits Required: 1st.: _____ 2nd.: _____ 3rd.: _____

Notes:

Hydrogen, dissolved

Equipment: Bubble strip sampling field method

Start stripper at _____ (time)

End stripper at _____ (time)

Total stripper time _____

Pump rate _____ milliliters/minute

ATTACHMENT F

FIELD ANALYTICAL LOG SHEET, GEOCHEMICAL PARAMETERS
PAGE 2 OF 3

Note: Analyte, method, and/or equipment may be deleted from form if not being performed.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: _____ **Sample ID No.:** _____

Project No.: _____ **Sample Location:** _____

Sampled By: _____ **Duplicate:** ☐

Field Analyst: _____ **Blank:** ☐

Alkalinity:

Equipment: Chemetrics Test Kit — Concentration: _____ ppm

Range Used:	Range	Method	Concentration ppm
☐	10 to 100 ppm	K-9810	
☐	50 to 500 ppm	K-9815	
☐	100 to 1000 ppm	K-9820	

Analysis Time: _____

Filtered: ☐

Equipment: HACH Digital Titrator AL-DT

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	___ & ___	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	___ & ___	x 0.4	= mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	___ & ___	x 1.0	= mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	___ & ___	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	___ & ___	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	___ & ___	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:			

Standard Additions: ☐ Titrant Molarity: _____ Digits Required: 1st.: _____ 2nd.: _____ 3rd.: _____

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-850 DR-8 _ _ Range: 0 - 3.00 mg/L — Concentration: _____ ppm

Program/Module: 500nm 33

Analysis Time: _____

Equipment: IR-18C Color Wheel Range: 0 - 10 mg/L

Notes: Filtered: ☐

Hydrogen Sulfide (H_2S): Range: 0 - 5 mg/L

Equipment: HS-C Other: _____ Concentration: _____ ppm

Exceeded 5.0 mg/L range on color chart: ☐ Analysis Time: _____

Notes:

Sulfide (S^{2-}):

Equipment: Chemetrics Test Kit Range: 0 - 10 mg/L — Concentration: _____ ppm

Range Used:	Range	Method	Concentration ppm
☐	0 to 1 ppm	K-9510	
☐	1 to 10 ppm	K-9510	

Analysis Time: _____

Filtered: ☐

Equipment: DR-850 DR-8 _ _ Range: 0 - 0.70 mg/L

Program/Module: 610nm 93

Notes:

ATTACHMENT F

FIELD ANALYTICAL LOG SHEET, GEOCHEMICAL PARAMETERS
PAGE 3 OF 3

Note: Analyte, method, and/or equipment may be deleted from form if not being performed.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: _____ **Sample ID No.:** _____
Project No.: _____ **Sample Location:** _____
Sampled By: _____ **Duplicate:** ☐
Field Analyst: _____ **Blank:** ☐

Sulfate (SO_4^{2-}):

Equipment: DR-850 DR-8 _ _ Range: 0 - 70 mg/L Concentration: _____ ppm
Program/Module: _____ 91 Analysis Time: _____

Standard Solution: ☐ Results: _____ Filtered: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Notes:

Nitrate (NO_3^--N):

Equipment: DR-850 DR-8 _ _ Range: 0 - 0.50 mg/L(1) Concentration: _____ ppm
Program/Module: 55 Analysis Time: _____ Filtered: ☐

Standard Solution: ☐ Results: _____ Nitrite Interference Treatment: ☐ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____
Alternate forms: NO_2 _____ $NaNO_2$ _____ mg/L

Notes (1): If results are over limit use dilution method at step 3, 5ml sample 10ml DI result X3, range upto 1.5mg/L

Notes:

Nitrite (NO_2^--N): Concentration: _____ ppm
Equipment: DR-850 DR-8 _ _ Range: 0 - 0.350 mg/L Analysis Time: _____ Filtered: ☐
Program/Module: 62
Standard Solution: ☐ Results: _____ Reagent Blank Correction: ☐
Notes:

Manganese (Mn^{2+}): Concentration: _____ ppm
Equipment: DR-850 DR-8 _ _ Range: 0 - 20.0 mg/L Analysis Time: _____ Filtered: ☐
Program/Module: 525nm 41
Standard Solution: ☐ Results: _____ Digestion: ☐ Reagent Blank Correction: ☐
Standard Additions: ☐ Digits Required: 0.1ml:_____ 0.2ml:_____ 0.3ml:_____

Equipment: HACH MN-5 Range: 0 - 3 mg/L
Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐
Correct measurement units are cited in the SAMPLING DATA block: ☐
Values cited in the SAMPLING DATA block are consistent with the Groundwater Sample Log Sheet: ☐
Mulitplication is correct for each *Multiplier* table: ☐
Final calulated concentration is within the appropriate *Range Used* block: ☐
Alkalinity *Relationship* is determined appropriatly as per manufacturer (HACH) instructions: ☐
QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐
Nitrite Interference treatment was used for Nitrate test if Nitrite was detected: ☐
Title block on each page of form is initialized by person who performed this QA/QC Checklist: ☐

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1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the process to be used for purging groundwater monitoring wells prior to sampling, for collecting groundwater samples, and for measuring groundwater quality parameters.

2.0 SCOPE

This document provides information on proper sampling equipment, onsite water quality testing, safety measures to ensure the safety of the field technician(s), and techniques for groundwater sampling. All personnel are encouraged to review the information contained herein to facilitate planning of the field sampling effort. The techniques described shall be followed whenever applicable, noting that site-specific conditions or project-specific plans may require modifications to methodology.

3.0 GLOSSARY

Conductivity – Conductivity is a numerical expression of the ability of an aqueous solution to carry an electric current. This ability depends on the presence of ions and their total concentration, mobility, valence, and relative concentrations and on temperature. Conductivity is highly dependent on temperature and should be reported at a particular temperature, i.e., 20.2 microSiemens per centimeter (mS/cm) at 14°C.

Dissolved Oxygen (DO) – DO levels in natural and wastewater depend on the physical, chemical, and biochemical activities in the water sample.

Groundwater Sample – A quantity of water removed from the ground, usually via a monitoring well that may or may not be lined with a well casing.

Oxidation-Reduction Potential (ORP) - A measure of the activity ratio of oxidizing and reducing species as determined by the electromotive force developed by a noble metal electrode immersed in water, as referenced against a reference electrode. A reference electrode commonly used in the field is the silver/silver chloride electrode, which has a voltage offset of about 210 mV from the standard hydrogen electrode (SHE). To convert field ORP measurements to equivalent SHE values, approximately 210 mV must be added to the ORP values obtained using the silver/silver chloride electrode. The actual offset depends on the concentration of the potassium chloride (KCl) in the field reference electrode and the temperature. Offsets typically range from 199 (saturated KCl) to 205 (3.5 Molar KCl) to 222 mV (1 Molar KCl) at 25°C and are greater at lower temperatures.

pH - The negative logarithm (base 10) of the hydrogen ion activity. The hydrogen ion activity is related to the hydrogen ion concentration, and, in a relatively weak solution, the two are nearly equal. Thus, for all practical purposes, pH is a measure of the hydrogen ion concentration.

~~pH Paper - Indicator paper that turns different colors depending on the pH of the solution to which it is exposed. Comparison with color standards supplied by the manufacturer will then give an indication of the solution's pH.~~

Representativeness – A qualitative description of the degree to which an individual sample accurately reflects population characteristics or parameter variations at a sampling point. It is therefore an important characteristic not only of assessment and quantification of environmental threats posed by the site, but also for providing information for engineering design and construction. Proper sample location selection and proper sample collection methods are important to ensure that a truly representative sample has been collected.

~~Salinity – The measurement of dissolved salts in a given mass of solution. Note: most field meters determined salinity automatically from conductivity and temperature. The value will be displayed in either parts per thousand (ppt) or percent (e.g., 35 ppt equals 3.5 percent). The parts per thousand symbol ($^0/_{00}$) is not the same as the percent symbol (%).~~

Turbidity – Turbidity in water is caused by suspended matter such as clay, silt, and fine organic and inorganic matter. Turbidity is an expression of the optical property that causes light to be scattered and absorbed rather than transmitted in a straight line through the sample.

4.0 RESPONSIBILITIES AND PERSONNEL QUALIFICATIONS

Project Manager - The Project Manager is responsible for determining the sampling objectives, initial sampling locations, and field procedures used in the collection of groundwater samples. Additionally, in consultation with other project personnel (geologist, hydrogeologist, etc.), the Project Manager identifies sampling locations.

Site Safety Officer (SSO) - The SSO (or a qualified designee) is responsible for providing the technical support necessary to implement the project Health and Safety Plan (HASP). This includes but is not be limited to performing air quality monitoring during sampling, boring and excavation activities, and ensuring that workers and offsite (downwind) individuals are not exposed to hazardous levels of airborne contaminants. The SSO or SSO designee may also be required to advise the FOL on other safety-related matters regarding sampling, such as mitigative measures to address potential hazards from hazardous objects or conditions.

Project Geologist/Sampler - The project geologist/sampler is responsible for the proper acquisition of samples in accordance with this SOP or other project-specific documents. In addition, this individual is responsible for the completion of all required paperwork (e.g., sample log sheets, field notebook, boring logs, container labels, custody seals, and chain-of-custody forms) associated with the collection of those samples.

Project Hydrogeologist – This individual is responsible for selecting and detailing the specific groundwater sampling techniques, onsite water quality testing (type, frequency, and location), equipment to be used, and providing detailed input in this regard to the project planning documents. The project hydrogeologist is also responsible for properly briefing and overseeing the performance of site sampling personnel.

Field Operations Leader (FOL) – This individual is primarily responsible for the execution of the planning document containing the Sampling and Analysis Plan (SAP). This is accomplished through management of a field sampling team for the proper acquisition of samples. He or she is responsible for the supervision of onsite analyses; ensuring proper instrument calibration, care, and maintenance; sample collection and handling; the completion and accuracy of all field documentation; and making sure that custody of all samples obtained is maintained according to proper procedures. When appropriate and as directed by the FOL, such responsibilities may be performed by other qualified personnel (e.g., field technicians) where credentials and time permit. The FOL is ultimately responsible for adherence to Occupational Safety and Health Administration (OSHA) regulations during these operations through self acquisition or through the management of a field team of samplers.
General personnel qualifications for groundwater sample collection and onsite water quality testing include the following:

- Occupational Safety and Health Administration (OSHA) 40-hour and applicable refresher training.
- Capability of performing field work under the expected physical and environmental (i.e., weather) conditions.
- Familiarity with appropriate procedures for sample documentation, handling, packaging, and shipping.

5.0 HEALTH AND SAFETY

Specific safety and health precautions are identified throughout this SOP. In addition to those precautions, the following general hazards may be incurred during sampling activities:

- Knee injuries from kneeling on hard surfaces
- Slips, trips, and falls
- Cuts and lacerations
- Traffic hazards associated with sampling in parking areas and roadways and along highways.

Methods of avoiding these hazards are provided below.

Knee injuries – Many monitoring wells are installed as flush mounts. Personnel are required to kneel to open these wells and to take groundwater level measurements, etc. This could result in knee injuries from kneeling on stones/foreign objects and general damage due to stress on the joints. To combat this hazard:

- Clear any foreign objects from the work area.
- Wear hard-sided knee pads.

Slips, Trips, and Falls – These hazards exist while traversing varying terrains carrying equipment to sample wells. To minimize these hazards:

- Pre-survey well locations. Eliminate, barricade, or otherwise mark physical hazards leading to the locations.
- Carry small loads that do not restrict the field of vision.
- Travel the safest and clearest route (not necessarily the shortest).

Cuts and Lacerations - To prevent cuts and lacerations associated with groundwater sampling, the following provisions are required:

- Always cut away from yourself and others when cutting tubing or rope. This will prevent injury to yourself and others if the knife slips.

- Do not place items to be cut in your hand or on your knee.

- Change blades as necessary to maintain a sharp cutting edge. Many accidents result from struggling with dull cutting attachments.

- Whenever practical, wear cut-resistant gloves (e.g., leather or heavy cotton work gloves) at least on the hand not using the knife.

- Keep cutting surfaces clean and smooth.

- Secure items to be cut -- do not hold them against the opposing hand, a leg, or other body part.

- When transporting glassware, keep it in a hard-sided container such as a cooler so that if there is a fall, you will be less likely to get cut by broken glass.

- DO NOT throw broken glass or glass ampoules into garbage bags. Place broken glass and glass ampoules in hard-sided containers such as a cardboard box or directly into a dumpster. DO NOT reach into garbage bags to retrieve any item accidentally thrown away. Empty the contents onto a flat surface to avoid punctures and lacerations from reaching where you cannot see.

Vehicular and Foot Traffic Hazards – When sampling along the roadway or near traffic patterns, follow the following precautions:

- Motorists may be distracted by onsite activities – ASSUME THEY DO NOT SEE YOU OR MEMBERS OF YOUR FIELD CREW.
- DO NOT place obstructions (such as vehicles) along the sides of the road that may cause site personnel to move into the flow of traffic to avoid your activities or equipment or that will create a blind spot.
- **Provide a required free space of travel**. Maintain at least 6 feet of space between you and moving traffic. Where this is not possible, use flaggers and/or signs to warn oncoming traffic of activities near or within the travel lanes.
- Face Traffic. Whenever feasible, if you must move within the 6 feet of the required free space or into traffic, attempt to face moving traffic at all times. Always leave yourself an escape route.
- Wear high-visibility vests to increase visual recognition by motorists.
- Do not rely on the vehicle operator's visibility, judgment, or ability. Make eye contact with the driver. Carefully and deliberately use hand signals so they will not startle or confuse motorists or be mistaken for a flagger's direction before moving into traffic.
- Your movements may startle a motorist and cause an accident, so move deliberately. Do not make sudden movements that might confuse a motorist.

6.0 PROCEDURES

6.1 General

For information derived from a groundwater sample to be useful and accurate, the sample must be representative of the particular zone being sampled. The physical, chemical, and bacteriological integrity of the sample must be maintained from the time of sampling to the time of analysis to keep any changes in water quality parameters to a minimum.

> ***CAUTION***
> A closed well may generate and accumulate gases due to biological degradation, evolution of volatile chemicals from groundwater into the air, or other chemical actions. These gases may also be artificially generated, such as in the case of air sparging or extraction wells, which may take several days to depressurize. See Section 6.6.2 for safety measures to be employed to protect sampling personnel.

Methods for withdrawing samples from completed wells include the use of pumps, compressed air or nitrogen, bailers, and various types of samplers. The primary considerations in obtaining a representative sample of groundwater are to avoid collection of stagnant (standing) water in the well and to avoid physical or chemical alteration of the water sample due to external influences of the sampling technique(s). In a non-pumping well, there will be little or no vertical mixing of water in the well pipe or casing, and stratification will occur. The well water in the screened section will mix with groundwater due to normal flow patterns, but the well water above the screened section will remain isolated and become stagnant. Concentration gradients resulting from mixing and dispersion processes, layers of variable geologic permeability, and the presence of separate-phase product (e.g., floating hydrocarbons) may cause stratification. Excessive pumping or improper sampling methods can dilute or increase

contaminant concentrations in the collected sample compared to what is representative of the integrated water column as it naturally occurs at that point, resulting in the collection of a non-representative sample. To safeguard against collecting non-representative samples, the following approach shall be followed prior to sample acquisition:

> ***CAUTION***
> Mechanical agitation of well water may cause off-gas generation of volatile contaminants, creating an inhalation exposure to the sampler(s). Where avoiding an inhalation exposure is not possible and mechanical agitation is possible, pump into closed-top containers to control potential air emissions.

1. If possible, position yourself (and the sampling equipment) upwind of the well head.

2. Purge the monitoring well to be sampled prior to obtaining any samples from it. Evacuation of three to five well volumes is recommended prior to sampling, unless low-flow purging and sampling methods are utilized as described in Section 6.7 (Consult the site-specific SAP for exact purging parameters). In a high-yielding groundwater formation and where there is no stagnant water in the well above the screened section, extensive evacuation prior to sample withdrawal is not as critical as it is in a low-yielding well or in wells containing stagnant water.

3. For wells with low yields that are purged dry during sampling, evacuate the well and allow it to recover to 75 percent of full capacity prior to sample acquisition. If the recovery rate is fairly rapid (generally 300 mL per minute or greater), attempt to continue evacuation until the number of well volumes specified in the SAP is achieved. If this cannot be accomplished, allow recovery to 75 percent of capacity and begin sampling.

> ***CAUTION***
> For moderate to high-yielding monitoring wells, an evacuation rate that does not cause excessive turbulence in the well should be selected. There is no absolute safeguard against contaminating the sample with stagnant water; hence, special techniques are required for purging to minimize the potential for sample contamination (see below).

4. For moderate to high-yielding monitoring wells, use one of the following purge techniques:

   - Place a submersible pump or the intake line of a surface pump or bailer just below the water surface when removing the stagnant water.

   - While purging and as the water level decreases, lower the pump or intake line as the water level drops in the well. Three to five volumes of water shall be removed to provide reasonable assurance that all stagnant water has been evacuated. After this is accomplished, a bailer or other approved device may be used to collect the sample for analysis.

   - Unless otherwise directed, place the intake line of the sampling pump (or the submersible pump itself) near the center of the screened section, and pump approximately one casing volume of water from the well at a low purge rate equal to the well's recovery rate (low-flow sampling).

6.2 Sampling, Monitoring, and Evacuation Equipment

Sample containers shall conform to the guidelines in SOP SA-6.1.

The following equipment shall be on hand when sampling groundwater wells (reference SOPs SA-6.1 and SA-7.1):

- Sample packaging and shipping equipment – Coolers for sample shipping and cooling, chemical preservatives, appropriate sampling containers and filler materials, ice, labels, and chain-of-custody documents.
- Field tools and instrumentation
  - Multi-parameter water quality meter with an in-line sample chamber capable of measuring ORP, pH, temperature, DO, specific conductance, turbidity, and salinity, or individual meters (as applicable)
  - pH Paper
  - Camera and film (if appropriate)
  - Appropriate keys (for locked wells)
  - Water level indicator and/or oil-water interface probe if separate-phase product is expected
- Pumps
  - Shallow-well pumps: Centrifugal, bladder, suction, or peristaltic pumps with drop lines and air-lift apparatus (compressor and tubing) where applicable.
  - Deep-well pumps: Submersible pump and electrical power-generating unit, or bladder pumps where applicable.
- Other sampling equipment – Bailers, graduated cylinder, stopwatch, and inert line with tripod-pulley assembly (if necessary).
- Pails – Plastic, graduated.
- Clean paper or cotton towels for cleaning equipment.
- Buckets with lids for collecting purge water.
- Decontamination solutions – Deionized water, potable water, phosphate-free laboratory-grade detergent, and analytical-grade solvent (e.g., pesticide-grade isopropanol), as required.

Ideally, sample withdrawal equipment shall be completely inert, economical, easily cleaned, cleaned prior to use, reusable, able to operate at remote sites in the absence of power sources, and capable of delivering variable rates for well purging and sample collection.

6.3 Calculations of Well Volume

To ensure that the proper volume of water has been removed from the well prior to sampling, it is first necessary to know the volume of standing water in the well pipe (including well screen where applicable). This volume can be easily calculated by the following method. Calculations shall be entered in the site logbook or field notebook or on a sample log sheet form or equivalent electronic form(s) (see SOP SA-6.3):

1. Obtain all available information on well construction (location, casing, screen, etc.).

2. Determine well or inner casing diameter.

3. Measure and record static water level (depth below ground level or top of casing reference point).

4. Determine depth of well by sounding using a clean, decontaminated, weighted tape measure or water level indicator.

5. Calculate number of linear feet of static water (total depth or length of well pipe minus the depth to static water level).

6. Calculate one static well volume in gallons $V = (0.163)(T)(r^2)$

where:	V	=	Static volume of well in gallons.
	T	=	Linear feet of water in the well.
	r	=	Inside radius of well casing in inches.
	0.163	=	Conversion factor (compensates for conversion of casing radius from inches to feet and cubic feet to gallons and pi.

7. Per evacuation volumes discussed above, determine the minimum amount to be evacuated before sampling.

Measuring devices may become contaminated when gathering the above information if they are submerged in contaminated water. Decontamination of the tape or water level indicator must be conducted between measurements in different wells as follows:

1. Saturate a paper towel or clean cotton towel with deionized water.
2. As the measuring device is extracted, wipe the tape, changing the cleaning surface frequently.
3. After it is extracted, rinse the probe or tape using a spray bottle of deionized water over a bucket or similar collection container.

Based on the contaminant (oily, etc), it may be necessary to use a soap and water wash and rinse to remove contaminants. Isopropanol can be used on the probe/tape. However, it is recommended that the use of solvents on the tape be minimized because they could degrade the protective covering or possibly remove the scale designations. If isopropanol (or some other solvent) is used, assure that the manufacturer/supplier Material Safety Data Sheet (MSDS) is obtained, kept on site at a readily available location with other MSDSs, and reviewed by personnel prior to the first usage of the solvent. Also, add the substance to the site-specific Hazardous Chemical Inventory list (see Section 5 of the TtNUS Health and Safety Guidance Manual [HSGM], Hazard Communication Program and OSHA Standard 29 CFR 1910.1200).

6.4 Evacuation of Static Water – Purging

6.4.1 General

The amount to be purged from each well will be determined prior to sample collection. This amount will depend on the intent of the monitoring program and the hydrogeologic conditions. Programs to determine overall quality of water resources may require long pumping periods to obtain a sample that is representative of a large volume of the aquifer. The pumped volume may be specified prior to sampling so that the sample can be a composite of a known volume of the aquifer. Alternately, the well can be pumped until parameters such as temperature, specific conductance, pH, and turbidity (as applicable)

have stabilized. Onsite measurements of these parameters shall be recorded in the site logbook or field notebook or on standardized data sheets or an equivalent electronic form(s).

6.4.2 Evacuation Devices

The following discussion is limited to those devices commonly used at hazardous waste sites. Attachment A provides guidance on the proper evacuation device to use for given sampling situations. All of these techniques involve equipment that is portable and readily available.

Bailers

Bailers are the simplest evacuation devices used and have many advantages. They generally consist of a length of tubing equipped with a base plate and ball check-valve at the bottom. Bailers are comprised of stainless steel and plastic. They come in a variety of sizes, but the two most often used are 2 inches and 4 inches in diameter. An inert non-absorbent line such as polyethylene rope is used to lower and then raise the bailer to retrieve the sample. As the bailer is lowered into the water column, the ball is pushed up allowing the tube to be filled. When the bailer is pulled upward, the ball seats in the base plate preventing water from escaping.

Advantages of bailers include the following:

- There are few limitations on size and materials used.
- No external power source is needed.
- Bailers are inexpensive and can be dedicated and hung in a well to reduce the chances of cross-contamination.
- Bailers are relatively easy to decontaminate.

Limitations on the use of bailers include the following:

- It is time consuming to remove stagnant water using a bailer.
- Splashing the bailer into the water or transfer of sample may cause aeration.
- The use of a bailer does not permit constant in-line monitoring of groundwater parameters.
- Use of bailers is physically demanding, especially in warm temperatures at personal protection equipment (PPE) levels above Level D.

Safety concerns using a bailer include the following:

- Muscle stress and strain, especially when using 4-inch bailers and when pulling from excessively deep wells.

- Entanglement, possible hand/finger injuries, and rope burns during a sudden release of the bailer back down the well.

- Direct contact with contaminants of concern and sample preservatives when discharging the bailer contents because there is not a high level of control during a direct pour, and splashing and indirect contact with contaminants/preservatives could occur.

Control measures for these hazards are provided in Section 6.6.2.

Suction Pumps

There are many different types of inexpensive suction pumps including centrifugal, diaphragm, and peristaltic pumps. Centrifugal and diaphragm pumps can be used for well evacuation at a fast pumping rate and for sampling at a low pumping rate. The peristaltic pump is a low-volume pump that uses rollers to squeeze flexible tubing to create suction. This tubing can be dedicated to a well to prevent cross-contamination from well to well. Suction pumps are all portable, inexpensive, and readily available. However, because they are based on suction, their use is restricted to areas with water levels within 20 to 25 feet of the ground surface. A significant limitation is that the vacuum created by these pumps can cause loss of dissolved gases and volatile organics. Another limitation of these pumps is that they require a secondary energy source to drive them. Electrically driven pumps may require portable generators as energy sources. Air diaphragm pumps require air compressors and/or compressed gas cylinders to drive them. The advantage of the peristaltic pump is that it will operate from a portable battery source. Safety measures associated with these pumps are provided below.

~~Air-Lift and Gas-Lift Samplers~~

~~This group of pump samplers uses gas pressure either in the annulus of the well or in a venturi to force groundwater up a sampling tube. These pumps are also relatively inexpensive. Air- or gas-lift samplers are more suitable for well development than for sampling because the samples may be aerated as a result of pump action. Aeration can cause pH changes and subsequent trace metal precipitation or loss of volatile organics.~~

Submersible Pumps

Submersible pumps take in water and push the sample up a sample tube to the surface. The power sources for these samplers may be compressed gas or electricity. Operation principles vary, and displacement of the sample can be by an inflatable bladder, sliding piston, gas bubble, or impeller. Pumps are available for 2-inch-diameter wells and larger. These pumps can lift water from considerable depths (several hundred feet).

Limitations of this class of pumps include the following:

- They may have low delivery rates.
- Many models are expensive.
- Compressed gas or electric power is needed.
- Sediment in water may cause clogging of the valves or eroding of the impellers with some of these pumps.
- Decontamination of internal components can be difficult and time consuming.

~~Compressed Gases~~

~~Safety concerns using compressed gases as an energy source in these pumps are numerous. The nitrogen gas or compressed air is provided in a compressed gas cylinder at a pressure of approximately 2,000 psi. If damaged, these cylinders can become dangerous projectiles. Additionally, a sudden release of a cylinder's contents can involve considerable force that could cause significant damage to the eyes and/or skin. Protective measures include the following:~~

- ~~Always wear safety impact glasses when handling compressed gases.~~
- ~~Always administer compressed gases through an appropriate pressure-reducing regulator.~~

- When clearing the cylinder connection port, open the cylinder valve only enough to clear foreign debris. During this process, always position the cylinder valve so that it faces away from you and others.

- If the cylinder is designed to accept a valve protection cap, always keep that protection cap in place, except the cylinder is connected for use.

- When using the cylinder, lay the cylinder on its side to avoid the potential of it falling and knocking the valve off (and becoming a missile).

- DO NOT use the compressed nitrogen or air to clean clothing or to spray off the skin. Small cuts in the protective layer of the skin may permit the gas to enter into the bloodstream, presenting the potential danger of an embolism.

See the project-specific HASP for additional direction concerning cylinder safe handling procedures pertaining to the safe handling, transportation, and storage of compressed gas cylinders.

Electrical Shock

Even in situations where portable batteries are used, the potential for electrical shock exists. This potential risk is increased in groundwater sampling activities because of the presence of groundwater near the batteries. This potential is also increased in (prohibited) situations where jury-rigging of electrical connections is performed. Other potential hazards occur when field samplers open the hood of a running car to access the battery as a power source. To control these hazards:

- If you are unfamiliar with electrical devices, do not experiment, get help, and get the proper equipment necessary to power your device.

- Use the proper portable power inverters for cigarette lighter connections to minimize the need to access the battery under the hood of your vehicle.

- Use of electrical generators may pose a number of hazards including noise, those associated with fueling, and indirect sample influence.

To minimize or eliminate electrical generator hazards:

- Inspect the generator before use. Ensure that the generator and any extension cords are rated for the intended operation and have a Ground Fault Circuit Interrupter (GFCI) in line to control potential electrical shock.

- Fuel the generator before purging and sampling to avoid loss of power during sampling.

- Fuel engines only when they are turned OFF and have cooled sufficiently to prevent a fire hazard.

- Place the generator and any fuel source at least 50 feet from the well to be sampled to avoid indirect influence to the sample from fuel vapors or emission gases.

Lifting Hazards

This hazard may be experienced when moving containers of purge water, equipment, cylinders, etc. To control these potential hazards:

- Do not fill purge buckets to more than 80 percent of their capacity.

- Obtain a gas cylinder of sufficient size to complete the designated task but not too large to handle. K-size cylinders weigh approximately 135 pounds and are difficult to handle. M-size cylinders weigh approximately 50 pounds and are easier to handle and move.

- When necessary, get help lifting and moving gas cylinders and other heavy objects. Minimize twisting and turning while lifting. If it is necessary to move these cylinders or generators over significant distance, use mechanical means (carts, etc.).

- Use proper lifting techniques as described in Section 4.4 of the HSGM.

6.5 Onsite Water Quality Testing

This section describes the procedures and equipment required to measure the following parameters of an aqueous sample in the field:

- pH
- Specific conductance
- Temperature
- DO
- ORP
- Turbidity
- Salinity

This section is applicable for use in an onsite groundwater quality monitoring program to be conducted at a hazardous or nonhazardous waste site. The procedures and equipment described are applicable to groundwater samples and are not, in general, subject to solution interferences from color, turbidity, or colloidal material or other suspended matter.

This section provides general information for measuring the parameters listed above with instruments and techniques in common use. Because instruments from different manufacturers may vary, review of the manufacturer's literature pertaining to the use of a specific instrument is required before use. Most meters used to measure field parameters require calibration on a daily basis. Refer to SOP SA-6.3 for an example equipment calibration log.

6.5.1 Measurement of pH

6.5.1.1 General

Measurement of pH is one of the most important and frequently used tests in water chemistry. Practically every phase of water supply and wastewater treatment such as acid-base neutralization, water softening, and corrosion control is pH dependent. Likewise, the pH of leachate can be correlated with other chemical analyses to determine the probable source of contamination. It is therefore important that reasonably accurate pH measurements be taken and recorded on the groundwater sample log sheet (Attachment B) or equivalent electronic form.

Two methods are given for pH measurement: the pH meter ~~and pH indicator pap~~er. Indicator paper is used when only an approximation of the pH is required or when pH meter readings need to be verified, and the pH meter is used when a more accurate measurement is needed. The response of a pH meter can be affected by high levels of colloidal or suspended solids, but the effect is generally of little significance. Consequently, specific methods to overcome this interference are not described. The

response of pH paper is unaffected by solution interferences from color, turbidity, or colloidal or suspended materials unless extremely high levels capable of coating or masking the paper are encountered. In such cases, use of a pH meter is recommended.

6.5.1.2 Principles of Equipment Operation

Use of pH papers for pH measurement relies on a chemical reaction caused by the acidity or alkalinity of the solution created by the addition of the water sample reacting with the indicator compound on the paper. Various types of pH papers are available, including litmus (for general acidity or alkalinity determination) and specific, or narrower range, pH range paper.

Use of a pH meter relies on the same principle as other ion-specific electrodes. Measurement relies on establishment of a potential difference across a glass or other type of membrane in response to (in this instance, hydrogen) ion activity (which is usually similar to concentration) across that membrane. The membrane is conductive to ionic species and, in combination with a standard or reference electrode, a potential difference proportional to the ion concentration is generated and measured.

6.5.1.3 Equipment

The following equipment is to be used for obtaining pH measurements:

- A stand-alone portable pH meter or combination meter equipped with an in-line sample chamber (e.g., YSI 600 series and Horiba U-22).
- Combination electrode with polymer body to fit the above meter. Alternately, a pH electrode and a reference electrode can be used if the pH meter is equipped with suitable electrode inputs.
- Buffer solutions, as specified by the manufacturer. If the buffer solutions are considered hazardous per 29 Code of Federal Regulations (CFR) 1910.1200 (Hazard Communication) or the volumes used are greater than consumer commodity levels, the SSO shall obtain MSDSs from the manufacturer for the specific buffer solutions (see Section 4 of the HSGM regarding the Hazard Communication Program)
- pH indicator paper to cover the pH range 2 through 12.
- Manufacturer's operation manual. All personnel must be familiar with the equipment operation to ensure that the integrity of samples is preserved and that the equipment is operated safely.

6.5.1.4 Measurement Techniques for Field Determination of pH

pH Meter

The following procedure shall be used for measuring pH with a pH meter (meter standardization is according to manufacturer's instructions):

1. Inspect the instrument and batteries prior to initiation of the field effort.
2. Check the integrity of the buffer solutions used for field calibration. Buffer solutions need to be changed often as a result of degradation upon exposure to the atmosphere.
3. If applicable, make sure all electrolyte solutions within the electrode(s) are at their proper levels and that no air bubbles are present within the electrode(s).

4. Calibrate the meter and electrode(s) on a daily use basis (or as recommended by manufacturer) following manufacturer's instructions. Record calibration data on a water quality meter calibration log sheet (Attachment C) or equivalent electronic form.

5. Immerse the electrode(s) in the sample. Stabilization may take several seconds to minutes. If the pH continues to drift, the sample temperature may not be stable, a physical reaction (e.g., degassing) may be taking place in the sample, or the meter or electrode may be malfunctioning. The failure of the measurements to stabilize must be clearly noted in the logbook or equivalent electronic form.

6. Read and record the pH of the sample. pH shall be recorded to the nearest 0.01 pH standard unit. Also record the sample temperature (unless otherwise specified in the SAP, record temperatures to the nearest whole degree Fahrenheit or 0.5 degree Celsius).

7. Rinse the electrode(s) with deionized water.

8. Store the electrode(s) in an accordance with manufacturer's instructions when not in use.

Any visual observation of conditions that may interfere with pH measurement, such as oily materials or turbidity, shall be noted and avoided as much as possible.

pH Paper

Use of pH paper is very simple and requires no sample preparation, standardization, etc. pH paper is available in several ranges, including wide-range (indicating approximately pH 1 to 12), mid-range (approximately pH 0 to 6, 6 to 9, 8 to 14) and narrow-range (many available, with ranges as narrow as 1.5 pH units). The appropriate range of pH paper shall be selected. If the pH is unknown the investigation shall start with wide-range paper and proceed with successively narrower range paper until the sample pH is determined. To measure the pH with pH paper:

1. Collect a small portion of sample into a clean container.

2. Dip the pH paper into this small portion of sample.

3. Compare the color of the paper to the color chart that is provided with the pH paper and read the corresponding pH from the chart.

4. Record the pH value from the chart on the sampling log sheet.

5. Discard the used pH paper as trash.

6. Discard the small volume of sample that was used for the pH measurement with the other investigative derived waste.

6.5.2 Measurement of Specific Conductance

6.5.2.1 General

Conductance provides a measure of dissolved ionic species in water and can be used to identify the direction and extent of migration of contaminants in groundwater or surface water. It can also be used as a measure of subsurface biodegradation or to indicate alternate sources of groundwater contamination.

Conductivity is a numerical expression of the ability of a water sample to carry an electric current. This value depends on the total concentration of ionized substances dissolved in the water and the temperature at which the measurement is made. The mobility of each of the various dissolved ions, their valences, and their actual and relative concentrations affect conductivity.

It is important to obtain a specific conductance measurement soon after taking a sample because temperature changes, precipitation reactions, and absorption of carbon dioxide from the air all affect specific conductance. Most conductivity meters in use today display specific conductance in units of mS/cm, which is the conductivity normalized to a temperature of 25°C. These are the required units to be recorded on the groundwater sample log field form or equivalent electronic form.

6.5.2.2 Principles of Equipment Operation

An aqueous system containing ions will conduct an electric current. In a direct-current field, the positive ions migrate toward the negative electrode, and the negatively charged ions migrate toward the positive electrode. Most inorganic acids, bases, and salts such as hydrochloric acid, sodium carbonate, and sodium chloride, respectively, are relatively good conductors. Conversely, organic compounds such as sucrose or benzene, which do not dissociate in aqueous solution, conduct a current very poorly if at all.

A conductance cell and a Wheatstone Bridge (for the measurement of potential difference) may be used for measurement of electrical resistance. The ratio of current applied to voltage across the cell may also be used as a measure of conductance. The core element of the apparatus is the conductivity cell containing the solution of interest. Depending on the ionic strength of the aqueous solution to be tested, a potential difference is developed across the cell, which can be converted directly or indirectly (depending on instrument type) to a measurement of specific conductance.

6.5.2.3 Equipment

The following equipment is needed for taking specific conductance measurements:

- Stand-alone portable conductivity meter or combination meter equipped with an in-line sample chamber (e.g., YSI 600 series and Horiba U-22).
- Calibration solution, as specified by the manufacturer.
- Manufacturer's operation manual.

A variety of conductivity meters are available that may also be used to monitor salinity and temperature. Probe types and cable lengths vary, so equipment must be obtained to meet the specific requirements of the sampling program.

6.5.2.4 Measurement Techniques for Specific Conductance

The steps involved in taking specific conductance measurements are as follows (calibration shall be conducted according to manufacturer's instructions):

1. Check batteries and calibrate instrument before going into the field.

2. Calibrate on a daily use basis (or as recommended by manufacturer), according to the manufacturer's instructions and record all pertinent information on a water quality meter calibration log sheet or equivalent electronic form. Potassium chloride solutions with a specific conductance closest to the values expected in the field shall be used for calibration.

3. Rinse the cell with one or more portions of the sample to be tested or with deionized water and shake excess water from the cell.

4. Immerse the electrode in the sample and measure the conductivity.

5. Read and record the results in a field logbook or on a sample log sheet or equivalent electronic form.

6. Rinse the electrode with deionized water.

If the specific conductance measurements become erratic, recalibrate the instrument and see the manufacturer's instructions for troubleshooting assistance.

6.5.3 Measurement of Temperature

6.5.3.1 General

In combination with other parameters, temperature can be a useful indicator of the likelihood of biological action in a water sample. It can also be used to trace the flow direction of contaminated groundwater. Temperature measurements shall be taken in situ, or as quickly as possible in the field because collected water samples may rapidly equilibrate with the temperature of their surroundings.

6.5.3.2 Equipment

Temperature measurements may be taken with alcohol-toluene, mercury-filled, dial-type thermometers or combination meters equipped with an in-line sample chamber (e.g., YSI 600 series and Horiba U-22). In addition, various meters such as specific conductance or DO meters that have temperature measurement capabilities may also be used. Using such instrumentation along with suitable probes and cables, in-situ measurements of temperature at great depths can be performed.

6.5.3.3 Measurement Techniques for Water Temperature

If a thermometer is used to determine the temperature for a water sample, use the following procedure:

1. Immerse the thermometer in the sample until temperature equilibrium is obtained (1 to 3 minutes). To avoid the possibility of cross-contamination, the thermometer shall not be inserted into samples that will undergo subsequent chemical analysis.
2. Record values in a field logbook or on a sample log sheet or equivalent electronic form.

If a temperature meter or probe is used:

1. Calibrate the instrument according to manufacturer's recommendations prior to use.
2. Immerse the meter/probe in the sample until temperature equilibrium is obtained (1 to 3 minutes). To avoid the possibility of cross-contamination, the meter/probe shall not be inserted into samples that will undergo subsequent chemical analysis.
3. Record values in a field logbook or on a sample log sheet or equivalent electronic form.

6.5.4 Measurement of Dissolved Oxygen

6.5.4.1 General

DO levels in natural water and wastewater depend on the physical, chemical and biochemical activities in the water body. In addition, the growth of many aquatic organisms and the rate of corrosivity are dependent on DO concentrations. Thus, analysis for DO is a key test in water pollution and waste

treatment process control. If at all possible, DO measurements shall be taken in situ because concentrations may show a large change in a short time if the sample is not adequately preserved.

The monitoring method discussed herein is limited to the use of DO meters. Chemical methods of analysis (i.e., Winkler methods) are available but require more equipment and greater sample manipulation. Furthermore, DO meters using a membrane electrode are suitable for highly polluted waters because the probe is completely submersible and is not susceptible to interference caused by color, turbidity, or colloidal material or suspended matter.

6.5.4.2 Principles of Equipment Operation

DO probes are normally electrochemical cells that have two solid metal electrodes of different nobility immersed in an electrolyte. The electrolyte is retained by an oxygen-permeable membrane. The metal of highest nobility (the cathode) is positioned at the membrane. When a suitable potential exists between the two metals, reduction of oxygen to hydroxide ion (OH^-) occurs at the cathode surface. An electrical current is developed that is directly proportional to the rate of arrival of oxygen molecules at the cathode. This rate is proportional to the oxygen concentration in the water being measured.

Because the current produced in the probe is directly proportional to the rate of arrival of oxygen at the cathode, it is important that a fresh supply of sample always be in contact with the membrane. Otherwise, the oxygen in the aqueous layer along the membrane is quickly depleted and false low readings are obtained. It is therefore necessary to stir the sample (or the probe) constantly to maintain fresh solution near the membrane interface. Stirring, however, shall not be so vigorous that additional oxygen is introduced through the air-water interface at the sample surface. To avoid this possibility, some probes are equipped with stirrers to agitate the solution near the probe, leaving the surface of the solution undisturbed.

DO probes are relatively unaffected by interferences. Interferences that can occur are reactions with oxidizing gases such as chlorine or with gases such as hydrogen sulfide that are not easily depolarized from the indicating electrode. If a gaseous interference is suspected, it shall be noted in the field logbook and checked if possible. Temperature variations can also cause interference because probes exhibit temperature sensitivity. Automatic temperature compensation is normally provided by the manufacturer. This compensation can counteract some of the temperature effects but not all of them.

6.5.4.3 Equipment

The following equipment is needed to measure DO concentrations:

- A stand-alone portable DO meter or combination meter equipped with an in-line sample chamber (e.g., YSI 600 series and Horiba U-22).
- Sufficient cable to allow the probe to contact the sample.
- Manufacturer's operation manual.

6.5.4.4 Measurement Techniques for Dissolved Oxygen Determination

DO probes differ as to instructions for use. Follow the manufacturer's instructions to obtain an accurate reading. The following general steps shall be used to measure DO concentrations:

1. Check the DO meter batteries before going to the field.

2. Condition the probe in a water sample for as long a period as practical before use in the field. Long periods of dry storage followed by short periods of use in the field may result in inaccurate readings.

3. Calibrate the instrument in the field according to manufacturer's recommendations or in a freshly air-saturated water sample of known temperature.

4. Record all pertinent information on a water quality meter calibration log sheet or equivalent electronic form.

5. Rinse the probe with deionized water.

6. Immerse the probe in the sample. Be sure to provide for sufficient flow past the membrane by stirring the sample. Probes without stirrers placed in wells may be moved up and down to achieve the required mixing.

7. Record the DO content and temperature of the sample in a field logbook or on a sample log sheet or equivalent electronic form.

8. Rinse the probe with deionized water.

9. Recalibrate the probe when the membrane is replaced, or as needed. Follow the manufacturer's instructions.

Note that in-situ placement of the probe is preferable because sample handling is not involved. This however may not always be practical.

Special care shall be taken during sample collection to avoid turbulence that can lead to increased oxygen solubilization and positive test interferences.

6.5.5 Measurement of Oxidation-Reduction Potential

6.5.5.1 General

ORP provides a measure of the tendency of organic or inorganic chemicals to exist in an oxidized state. The ORP parameter therefore provides evidence of the likelihood of anaerobic degradation of biodegradable organics or the ratio of activities of reduced to oxidized species in the sample.

6.5.5.2 Principles of Equipment Operation

When an inert metal electrode, such as platinum, is immersed in a solution, a potential is developed at that electrode depending on the ions present in the solution. If a reference electrode is placed in the same solution, an ORP electrode pair is established. This electrode pair allows the potential difference between the two electrodes to be measured and is dependent on the concentration of the ions in solution. By this measurement, the ability to oxidize or reduce species in solution may be determined. Supplemental measurements, such as DO, may be correlated with ORP to provide knowledge of the quality of the solution, water, or wastewater.

6.5.5.3 Equipment

The following equipment is needed for measuring the ORP of a solution:

- A combination meter with an in-line sample chamber (e.g., YSI 600 series and Horiba U-22).
- Reference solution as specified by the manufacturer.
- Manufacturer's operation manual.

6.5.5.4 Measurement Techniques for Oxidation-Reduction Potential

The following procedure is used for measuring ORP:

1. Check the equipment using the manufacturer's recommended reference solution and check its batteries before going to the field.

2. Thoroughly rinse the electrode with deionized water.

3. If the probe does not respond properly to the recommended reference solution, verify the sensitivity of the electrodes by noting the change in millivolts when the pH of a test solution is altered. The ORP will increase when the pH of a test solution decreases, and the ORP will decrease when the test solution pH is increased. Place the sample in a clean container and agitate the sample. Insert the electrodes and note that the ORP drops sharply when the caustic is added (i.e., pH increases) thus indicating that the electrodes are sensitive and operating properly. If the ORP increases sharply when the caustic is added, the polarity is reversed and must be corrected in accordance with the manufacturer's instructions or the probe should be replaced.

4. Record all pertinent information on a water quality meter calibration log sheet or equivalent electronic form.

6.5.6 Measurement of Salinity

6.5.6.1 General

Salinity is a unitless property of industrial and natural waters. It is the measurement of dissolved salts in a given mass of solution. Most field meters determine salinity automatically from conductivity and temperature. The displayed value will be displayed in either parts per thousand (ppt) or percent (e.g., 35 ppt equals 3.5 percent).

6.5.6.2 Principles of Equipment Operation

Salinity is determined automatically from the meter's conductivity and temperature readings according to algorithms (such as are found in Standard Methods for the Examination of Water and Wastewater). Depending on the meter, the results are displayed in either ppt or percent. The salinity measurements are carried out in reference to the conductivity of standard seawater (corrected to salinity = 35 ppt).

6.5.6.3 Equipment

The following equipment is needed for salinity measurements:

- A multi-parameter water quality meter capable of measuring conductivity and temperature and converting them to salinity (e.g., Horiba U-22 or YSI 600 series).
- Calibration solution as specified by the manufacturer.
- Manufacturer's operation manual.

6.5.6.4 Measurement Techniques for Salinity

The steps involved in taking salinity measurements are as follows (standardization shall be conducted according to manufacturer's instructions):

1. Check the expiration date of the solutions used for field calibration and replace them if they are expired.

2. Check batteries and calibrate the meter before going into the field.

3. Calibrate on a daily use basis, according to the manufacturer's instructions and record all pertinent information on a water quality meter calibration log sheet or equivalent electronic form.

4. Rinse the cell with the sample to be tested. This is typically accomplished as the probe is placed in line during the collection of the purge water up to the time of sample acquisition.

5. Immerse the multi-probe in the sample and measure the salinity. Read and record the results in a field logbook or on a sample log sheet or equivalent electronic form.

6. Rinse the probes with deionized water.

6.5.7 Measurement of Turbidity

6.5.7.1 General

Turbidity is an expression of the optical property that causes light to be scattered and absorbed rather than transmitted in a straight line through the sample. Turbidity in water is caused by suspended matter such as clay, silt, or other finely divided organic and inorganic matter and microscopic organisms including plankton.

It is important to obtain a turbidity reading immediately after taking a sample because irreversible changes in turbidity may occur if the sample is stored too long.

6.5.7.2 Principles of Equipment Operation

Turbidity is measured by the Nephelometric Method, which is based on a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. The higher the scattered light intensity, the higher the turbidity.

Formazin polymer is used as the reference turbidity standard suspension because of its ease of preparation combined with a higher reproducibility of its light-scattering properties than clay or turbid natural water. The turbidity of a specified concentration of formazin suspension is defined as 40 nephelometric units. This same suspension has an approximate turbidity of 40 Jackson units when measured on the candle turbidimeter. Therefore, nephelometric turbidity units (NTUs) based on the formazin preparation will approximate units derived from the candle turbidimeter but will not be identical to them.

6.5.7.3 Equipment

The following equipment is needed for turbidity measurements:

- A turbidity meter (e.g., LaMotte 2020) that calibrates easily using test cells with standards of 0.0, 1.0, and 10 NTUs, or a combination meter equipped with an in-line sample chamber (e.g., YSI 600 series and Horiba U-22).
- Calibration solution and sample tubes, as specified by the manufacturer.
- Manufacturer's operation manual.

6.5.7.4 Measurement Techniques for Turbidity

The steps involved in taking turbidity measurements utilizing an electrode (e) or light meter (l) are listed below (standardization shall be done according to manufacturer's instructions):

1. Check the expiration date of the solutions used for field calibration and replace them if they are expired.

2. Check batteries and calibrate the instrument before going into the field.

3. Calibrate on a daily basis according to the manufacturer's instructions, and record all pertinent information on a turbidity meter calibration log sheet (Attachment C) or equivalent electronic form.

4. When using the YSI and/or Horiba U-22, rinse the electrode with one or more portions of the sample to be tested or with deionized water.

5. When using the Lamotte 2020, fill the light meter's glass test cell with approximately 5 mL of sample, screw on the cap, wipe off glass to remove all residue that could intercept the instrument's light beam, place the test cell in the light meter, and close the lid.

6. Immerse the electrode in the sample and measure the turbidity.

7. The reading must be taken immediately because suspended solids will settle over time resulting in a lower, inaccurate turbidity reading.

8. Read and record the results in a field logbook or on a sample log sheet or equivalent electronic form. Include a physical description of the sample, including color, qualitative estimate of turbidity, etc.

9. Rinse the electrode or test cell with deionized water.

6.6 Sampling

6.6.1 Sampling Plan

The sampling approach consisting of the following shall be developed as part of the project planning documents approved prior to beginning work in the field:

- Background and objectives of sampling.

- Brief description of area and waste characterization.

- Identification of sampling locations, with map or sketch, and applicable well construction data (well size, depth, screened interval, reference elevation).

- Intended number, sequence, volumes, and types of samples. If the relative degree of contamination between wells is insignificant, a sampling sequence that facilitates sampling logistics may be followed. Where some wells are known or strongly suspected of being highly contaminated, these shall be sampled last to reduce the risk of cross-contamination between wells. In situations where the well is not well-characterized and the nature or extent of airborne contamination is unknown, it is recommended that head space analysis using a photoionization detector (PID) or flame ionization detector (FID) is performed to rate the wells, sampling from least contaminated to most contaminated. Refer to the project-specific HASP for appropriate information and direction on air monitoring requirements.

- Sample preservation requirements.
- Work schedule.
- List of team members.
- List of observers and contacts.
- Other information, such as the necessity for a warrant or permission of entry, requirements for split samples, access problems, location of keys, etc.
- The FOL shall ensure that the sampling method(s) to be employed is accurately represented in the HASP, indicating the types of sampling to be employed and the hazards. If the methods are not accurately represented, the FOL should rectify this with the HASP author.
- The FOL shall ensure that sampling teams understand the sampling approach that they are to follow. Where sampling teams are made up of personnel from multiple locations, personal sampling experiences may vary. Therefore the FOL shall review project-specific requirements, SOPs, and protocol to be followed. The FOL will conduct periodic surveys to ensure that these methods are being completed per his/her direction.

6.6.2 Sampling Methods as Related to Low-Flow Sampling

The collection of a groundwater sample consists of the following steps:

1. Ensure the safety of the sample location. Take a few minutes to evaluate the area for physical hazards (trip hazards, uneven ground, overhanging branches, etc.) and natural hazards (snakes, bees, spiders, etc.) that may exist in the area or that may have constructed nests in the well head. Snakes often like to sun themselves on concrete well pads. Follow provisions in the project-specific HASP and/or HSGM for addressing natural hazards.

2. As indicated earlier, some monitoring wells have the potential to contain pressurized headspace (e.g., through the generation of gases form contaminated groundwater, due to biological processes, degradation of contaminants, or simply based on location such as near a landfill or in areas that intersect lithological abnormalities) or through intentional artificial means such as those associated with air sparging systems. Injection or extraction wells may be artificially pressurized and may remain so for several days after the system has been turned off. This presents a hazard to people opening these wells. The Field Sampling Technician shall employ the following practices to minimize these hazards:

   - Wear safety glasses to protect the eyes. If site-specific observations and conditions indicate that the wells may be pressurized, wear a full-face shield over the safety impact eye protection.
   - DO NOT place your face or any other part of your body over the well when opening because this may place you in a strike zone.
   - Open the well cover at arms length, then step away and allow the well to off gas and stabilize.

   Follow directions provided in the project-specific HASP, Work Plan and/or Sampling Plan pertaining to the use of volatile chemical detection equipment (PID or FID) within the breathing zone of the sampler during sampling to determine the need to retreat from the work area and/or for the use of respiratory protection (as specified in the HASP).

3. When proper respiratory protection has been donned, sound the well for total depth and water level (using clean equipment) and record these data on a groundwater sampling log sheet or equivalent electronic form; then calculate the fluid volume in the well pipe (as previously described in this SOP). It is imperative that downhole equipment be adequately decontaminated between wells to prevent cross-contamination. Just as sampling occurs from the least contaminated to the most contaminated, it is also recommended that groundwater level measurements be taken in this manner.

4. Calculate volume of well water to be removed as described in Section 6.3.

5. Select the appropriate purging equipment (see Attachment A to this SOP) or as designated within your Work Plan/Sampling Plan. If an electric submersible pump with packer is chosen, go to Step 10.

6. Lower the purging equipment or intake into the well to a short distance below the water level or mid-screen as indicated in project-specific documentation and begin water removal. Remember that some contaminants are "bottom dwellers," and in these cases, project-specific direction may specify placing the intake just above (1 to 2 feet) the well bottom. Secure the pump intake at the well and secure the effluent at the collection container and begin pumping. The pumping rate will be determined based on the decrease in the water level (see Section 6.7) or as directed in your project-specific documents or this SOP. Purge water is generally collected in a 5-gallon bucket or similar open- or closed-top container. To minimize the potential for spills and back injuries, do not fill 5-gallon buckets beyond approximately 80 percent of their capacity. Dispose of purge water was as indicated in the planning document(s). Where necessary, slow the pumping rate or lower the pump intake as required to maintain submergence.

7. Estimate the approximate rate of discharge frequently and record it on the Low Flow Purge Data Sheet (see Attachment D). Estimate flow rate by noting the amount of discharge in a bucket or graduated cylinder per unit time using a watch with a second hand or a stopwatch.

8. Observe the peristaltic pump tubing intake for degassing "bubbles." If bubbles are abundant and the intake is fully submerged, this pump is not suitable for collecting samples for volatile organics.

9. Purge a minimum of three to five casing volumes before sampling (or as directed by the site-specific SAP). In low-permeability strata (i.e., if the well is pumped to dryness), one volume will suffice. Allow the well to recover to 75 percent of initial water level before sampling. Do not overfill purge containers because this increases the potential for spills and lifting injuries.

10. If sampling using a submersible pump, lower the pump intake to mid-screen (or the middle of the open section in uncased wells) and collect the sample. If sampling with a bailer, lower the bailer to just below the water surface.

11. For pump and packer assemblies only: Lower the assembly into the well so that the packer is positioned just above the screen or open section. Inflate the packer. Purge a volume equal to at least twice the screened interval (or unscreened open section volume below the packer) before sampling. Packers shall always be tested in a casing section above ground to determine proper inflation pressures for good sealing.

12. If the recovery time of the well is very slow (e.g., 24 hours or greater), sample collection can be delayed until the following day. If the well has been purged early in the morning, sufficient water may be standing in the well by the day's end to permit sample collection. If the well is incapable of producing a sufficient volume of sample at any time, take the largest quantity available and record this occurrence in the site logbook or equivalent electronic form. When this occurs, contact the analytical laboratory to alert them that a reduced sample volume(s) will be submitted for analysis.

13. Fill sample containers and preserve and label them as described in SOP SA-6.1. Many sample bottles will contain preservative when they are shipped to the field. In those cases, do not add preservative.

14. Replace the well cap and lock it as appropriate. Make sure the well is readily identifiable as the source of the sample.

15. Process sample containers as described in SOP SA-6.1.

16. Decontaminate equipment as described in SOP SA-7.1.

6.7 Low-Flow Purging and Sampling

6.7.1 Scope and Application

Low-flow purging and sampling techniques may be required for groundwater sampling activities. The purpose of low-flow purging and sampling is to collect groundwater samples that contain "representative" amounts of mobile organic and inorganic constituents in the vicinity of the selected open well interval, at or near natural flow conditions. This minimum-stress procedure emphasizes negligible water level drawdown and low pumping rates to collect samples with minimal alterations in water chemistry. This procedure is designed primarily to be used in wells with a casing diameter of 1 inch or more and a saturated screen length, or open interval, of 10 feet or less. Samples obtained are suitable for analyses of common types of groundwater contaminants (volatile and semivolatile organic compounds, pesticides, polychlorinated biphenyls [PCBs], metals and other inorganic ions [cyanide, chloride, sulfate, etc.]). This low-flow procedure is not designed for collection of non-aqueous phase liquid samples from wells containing light or dense non-aqueous phase liquids (LNAPLs or DNAPLs).

This procedure is flexible for various well construction types and groundwater yields. The goal of the procedure is to obtain a turbidity level of less than 10 NTUs and to achieve a water level drawdown of less than 0.3 foot during purging and sampling. If these goals cannot be achieved, sample collection can take place provided that the remaining criteria in this procedure are met.

6.7.2 Equipment

The following equipment is required (as applicable) for low-flow purging and sampling:

- Adjustable rate submersible pump (e.g., centrifugal or bladder pump constructed of stainless steel or Teflon).
- Disposable clear plastic bottom-filling bailers to be used to check for and obtain samples of LNAPLs or DNAPLs.
- Tubing – Teflon, Teflon-lined polyethylene, polyethylene, polyvinyl chloride (PVC), Tygon, or stainless steel tubing can be used to collect samples for analysis, depending on the analyses to be performed and regulatory requirements.
- Water level measuring device with 0.01-foot accuracy (electronic devices are preferred for tracking water level drawdown during all pumping operations).
- Interface probe.
- Flow measurement supplies.

- Power source (generator, nitrogen tank, etc.). If a gasoline generator is used, it must be located downwind and at a safe distance from the well so that the exhaust fumes do not contaminate the samples.

- Indicator parameter monitoring instruments – pH, turbidity, specific conductance, and temperature. Use of a flow-through cell is recommended. Optional indicators - ORP, salinity, and DO. A flow-through cell (also referred to as an in-line sample chamber) is required.

- Standards to perform field calibration of instruments.

- Decontamination supplies.

- Logbook(s) and other forms (see Attachments B through D) or equivalent electronic form(s).

- Sample bottles.

- Sample preservation supplies (as required by the analytical methods).

- Sample tags and/or labels.

- Well construction data, location map, field data from last sampling event (if available).

- Field Sampling Plan.

- PID or FID instrument for measuring volatile organic compounds (VOCs) per the HASP.

6.7.3 Purging and Sampling Procedure

1. Open the monitoring well as stated earlier and step away. Prepare sampling equipment while allowing 3 to 5 minutes to allow the water level to reach equilibrium. In situations where VOCs are the primary contaminants of concern, air monitoring of the samplers' breathing zone areas may be required by the HASP (typically with a PID or FID).

2 Measure the water level immediately prior to placing the pump in the well and record the water level on the Low-Flow Purge Data Form or equivalent electronic form immediately prior to placing the pump or tubing into the well.

3. Lower the measuring device further into the well to collect the total depth measurement. Again wait 3 to 5 minutes to allow the well to equilibrate to the initial water level prior to placing the pump or pump intake in the well.

4. Record the total well depth on the Low-Flow Purge Data Form or equivalent electronic form immediately prior to placing the pump or tubing into the well

5. Lower the pump or tubing slowly into the well so that the pump intake is located at the center of the saturated screen length of the well. If possible, keep the pump intake at least 2 feet above the bottom of the well to minimize mobilization of sediment that may be present in the bottom of the well. Collection of turbidity-free water samples may be difficult if there is 3 feet or less of standing water in the well.

6. Start with the initial pump rate set at approximately 0.1 liter per minute. Use a graduated cylinder and stopwatch to measure the pumping rate. Adjust the pumping rates as necessary to prevent drawdown from exceeding 0.3 foot during purging. If no drawdown is noted, the pump rate may be increased (to

a maximum of 0.4 liter per minute) to expedite the purging and sampling event. The pump rate will be reduced if turbidity is greater than 10 NTUs after all other field parameters have stabilized. If groundwater is drawn down below the top of the well screen, purging shall cease or the well shall be pumped to dryness and then allowed to recover before purging continues. Well recovery to 75 percent is necessary prior to sampling. Slow-recovering wells should be identified and purged at the beginning of the workday to maximize field work efficiency. If possible, samples should be collected from these wells within the same workday and no later than 24 hours after the end of purging.

7. Measure the water level in the well every 5 to 10 minutes using the water level meter. Record the well water level on the Low Flow Purge Data Form (Attachment D) or equivalent electronic form.
8. Record on the Low Flow Purge Data Form every 5 to 10 minutes the water quality parameters (pH, specific conductance, temperature, turbidity, ORP, DO, and salinity or as specified by the approved site-specific planning document) measured by the water quality meter and turbidity meter. If the cell needs to be cleaned during purging operations, continue pumping (allow the pump to discharge into a container) and disconnect the cell. Rinse the cell with distilled/deionized water. After cleaning is completed, reconnect the flow-through cell and continue purging. Document the cell cleaning on the Low-Flow Purge Data Form or equivalent electronic form.

9. Estimate the flow rate by noting the amount of discharge in a graduated cylinder per unit time using a watch with a second hand. Remeasure the flow rate any time the pump rate is adjusted and periodically during purging. This will determine if a reduction in rate has occurred due to possible battery depletion.

10. During purging, check for the presence of bubbles in the flow-through cell. The presence of bubbles is an indication that connections are not tight. If bubbles are observed, check for loose connections and tighten, repair, or replace them as necessary to achieve a tight connection.

11. Wait until stabilization is achieved, or a minimum of two saturated screen volumes have been removed and three consecutive readings, taken at 5 to 10 minute intervals, are within the following limits, then begin sampling:

    - pH ±0.2 standard units
    - Specific conductance ±10%
    - Temperature ±10%
    - Turbidity less than 10 NTUs
    - DO ±10%

12. If the above conditions have not been met after the well has been purged for 4 hours, purging will be considered complete and sampling can begin. Record the final well stabilization parameters from the Low-Flow Purge Data Form onto the Groundwater Sample Log Form or equivalent electronic form.

NOTE: VOC samples are preferably collected first, directly into pre-preserved sample containers. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

13. If the water column in the pump tubing collapses (water does not completely fill the tubing) before exiting the tubing, use one of the following procedures to collect VOC samples:

    - Collect samples for non-VOC analyses first, then increase the flow rate incrementally until the water column completely fills the tubing, collect the sample for VOCs, and record the new flow rate.

- Reduce the diameter of the existing tubing until the water column fills the tubing either by adding a connector (Teflon or stainless steel) or clamp, which should reduce the flow rate by constricting the end of the tubing. Proceed with sample collection.

- Insert a narrow-diameter Teflon tube into the pump's tubing so that the end of the tubing is in the water column and the other end of the tubing protrudes beyond the pump's tubing, then collect the sample from the narrow diameter tubing.

- Prepare samples for shipping as per SOP SA-6.1.

7.0 REFERENCES

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ATTACHMENT A

PURGING EQUIPMENT SELECTION

Diameter Casing		Bailer	Peristaltic Pump	Vacuum Pump	Air-lift	Diaphragm "Trash" Pump	Submersible Diaphragm Pump	Submersible Electric Pump	Submersible Electric Pump w/Packer
1.25-Inch	Water level <25 feet	X	X	X	X	X			
	Water Level >25 feet	X			X				
2-Inch	Water level <25 feet	X	X	X	X	X	X		
	Water Level >25 feet	X			X		X		
4-Inch	Water level <25 feet	X	X	X	X	X	X	X	X
	Water Level >25 feet	X			X		X	X	X
6-Inch	Water level <25 feet				X	X		X	X
	Water Level >25 feet				X			X	X
8-Inch	Water level <25 feet				X	X		X	X
	Water Level >25 feet				X			X	X

ATTACHMENT A

PURGING EQUIPMENT SELECTION

PAGE 2

Manufacturer	Model Name/Number	Principle of Operation	Maximum Outside Diameter/Length (Inches)	Construction Materials (w/Lines and Tubing)	Lift Range (ft)	Delivery Rates or Volumes	1982 Price (Dollars)	Comments
BarCad Systems, Inc.	BarCad Sampler	Dedicated; gas drive (positive displacement)	1.5/16	PE, brass, nylon, aluminum oxide	0-150 with std. tubing	1 liter for each 10-15 feet of submergence	$220-350	Requires compressed gas; custom sizes and materials available; acts as piezometer.
Cole-Parmer Inst. Co.	Master Flex 7570 Portable Sampling Pump	Portable; peristaltic (suction)	<1.0/NA	(not submersible) Tygon®, silicone Viton®	0-30	670 mL/min with 7015-20 pump head	$500-600	AC/DC; variable speed control available; other models may have different flow rates.
ECO Pump Corp.	SAMPLifier	Portable; venturi	<1.5 or <2.0/NA	PP, PE, PVC, SS, Teflon®, Tefzel®	0-100	0-500 mL/min depending on lift	$400-700	AC, DC, or gasoline-driven motors available; must be primed.
Geltek Corp.	Bailer 219-4	Portable; grab (positive displacement)	1.66/38	Teflon®	No limit	1,075 mL	$120-135	Other sizes available.
GeoEngineering, Inc.	GEO-MONITOR	Dedicated; gas drive (positive displacement)	1.5/16	PE, PP, PVC, Viton®	Probably 0-150	Approximately 1 liter for each 10 feet of submergence	$185	Acts as piezometer; requires compressed gas.
Industrial and Environmental Analysts, Inc. (IEA)	Aquarius	Portable; bladder (positive displacement)	1.75/43	SS, Teflon®, Viton®	0-250	0-2,800 mL/min	$1,500-3,000	Requires compressed gas; other models available; AC, DC, manual operation possible.
IEA	Syringe Sampler	Portable; grab (positive displacement)	1.75/43	SS, Teflon®	No limit	850 mL sample volume	$1,100	Requires vacuum and/or pressure from hand pump.
Instrument Specialties Co. (ISCO)	Model 2600 Well Sampler	Portable; bladder (positive displacement)	1.75/50	PC, silicone, Teflon®, PP, PE, Detrin®, acetal	0-150	0-7,500 mL/min	$990	Requires compressed gas (40 psi minimum).
Keck Geophysical Instruments, Inc.	SP-81 Submersible Sampling Pump	Portable; helical rotor (positive displacement)	1.75/25	SS, Teflon®, PP, EPDM, Viton®	0-160	0-4,500 mL/min	$3,500	DC operated.
Leonard Mold and Die Works, Inc.	GeoFilter Small Diameter Well Pump (#0500)	Portable; bladder (positive displacement)	1.75/38	SS, Teflon®, PC, Neoprene®	0-400	0-3,500 mL/min	$1,400-1,500	Requires compressed gas (55 psi minimum); pneumatic or AC/DC control module.
Oil Recovery Systems, Inc.	Surface Sampler	Portable; grab (positive displacement)	1.75/12	acrylic, Detrin®	No limit	Approximately 250 mL	$125-160	Other materials and models available; for measuring thickness of "floating" contaminants.
Q.E.D. Environmental Systems, Inc.	Well Wizard® Monitoring System (P-100)	Dedicated; bladder (positive displacement)	1.66/36	PVC	0-230	0-2,000 mL/min	$300-400	Requires compressed gas; piezometric level indicator; other materials available.

ATTACHMENT A

PURGING EQUIPMENT SELECTION

PAGE 3

Manufacturer	Model Name/Number	Principle of Operation	Maximum Outside Diameter/Length (Inches)	Construction Materials (w/Lines and Tubing)	Lift Range (ft)	Delivery Rates or Volumes	1982 Price (Dollars)	Comments
Randolph Austin Co.	Model 500 Vari-Flow Pump	Portable; peristaltic (suction)	<0.5/NA	(Not submersible) Rubber, Tygon®, or Neoprene®	0-30	See comments	$1,200-1,300	Flow rate dependent on motor and tubing selected; AC operated; other models available.
Robert Bennett Co.	Model 180	Portable; piston (positive displacement)	1.8/22	SS, Teflon®, Delrin® PP, Viton®, acrylic, PE	0-500	0-1,800 mL/min	$2,600-2,700	Requires compressed gas; water level indicator and flow meter; custom models available.
Slope Indicator Co. (SINCO)	Model 514124 Pneumatic Water Sampler	Portable; gas drive (positive displacement)	1.9/18	PVC, nylon	0-1,100	250 mL/flushing cycle	$250-350	Requires compressed gas; SS available; piezometer model available; dedicated model available.
Solinst Canada Ltd.	5W Water Sampler	Portable; grab (positive displacement)	1.9/27	PVC, brass, nylon, Neoprene®	0-330	500 mL	$1,300-1,800	Requires compressed gas; custom models available.
TIMCO Mfg. Co., Inc.	Std. Bailer	Portable; grab (positive displacement)	1.66/Custom	PVC, PP	No limit	250 mL/ft of bailer	$20-60	Other sizes, materials, models available; optional bottom-emptying device available; no solvents used.
TIMCO	Air or Gas Lift Sampler	Portable; gas drive (positive displacement)	1.66/30	PVC, Tygon®, Teflon®	0-150	350 mL/flushing cycle	$100-200	Requires compressed gas; other sizes, materials, models available; no solvents used.
Tole Devices Co.	Sampling Pump	Portable; bladder (positive displacement)	1.38/48	SS, silicone, Delrin®, Tygon®	0-125	0-4,000 mL/min	$800-1,000	Compressed gas required; DC control module; custom built.

Construction Material Abbreviations:

PE	Polyethylene
PP	Polypropylene
PVC	Polyvinyl chloride
SS	Stainless steel
PC	Polycarbonate
EPDM	Ethylene-propylene diene (synthetic rubber)

Other Abbreviations:

NA	Not applicable
AC	Alternating current
DC	Direct current

NOTE: Other manufacturers market pumping devices which could be used for groundwater sampling, though not expressly designed for this purpose. The list is not meant to be all-inclusive and listing does not constitute endorsement for use. Information in the table is from sales literature and/or personal communication. No skimmer, scavenger-type, or high-capacity pumps are included.

Source: Barcelona et al., 1983.

ATTACHMENT B

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: _____
Project No.: _____

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type: _____
[ ] QA Sample Type: _____

Sample ID No.: _____
Sample Location: _____
Sampled By: _____
C.O.C. No.: _____
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date:	Color	pH	S.C.	Temp.	Turbidity	DO	ORP	Other
Time:	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	NA
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	ORP	Other
Method:								
Monitor Reading (ppm):			SEE LOW FLOW PURGE DATA SHEET					
Well Casing Diameter & Material								
Type:								
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):

ATTACHMENT C

EQUIPMENT CALIBRATION LOG

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : _____ INSTRUMENT NAME/MODEL: _____

SITE NAME: _____ MANUFACTURER: _____

PROJECT No.: _____ SERIAL NUMBER: _____

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		

ATTACHMENT D

LOW FLOW PURGE DATA SHEET

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: _____ WELL ID.: _____

PROJECT NUMBER: _____ DATE: _____

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	pH (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments

SIGNATURE(S): _____ PAGE___OF___

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1.0 PURPOSE

This Standard Operating Procedure (SOP) describes procedures and equipment commonly used for collecting environmental samples of surface water and aquatic sediment for either onsite examination and chemical testing or for offsite laboratory analysis.

2.0 SCOPE

The information presented in this document is applicable to all environmental sampling of surface waters (Section 5.3) and aquatic sediments (Section 5.5), except where the analyte(s) may interact with the sampling equipment. The collection of concentrated sludges or hazardous waste samples from disposal or process lagoons often requires methods, precautions, and equipment different from those described herein.

3.0 GLOSSARY

Analyte – Chemical or radiochemical material whose concentration, activity, or mass is measured.

Composite Sample – A sample representing a physical average of grab samples.

Environmental Sample – A quantity of material collected in support of an environmental investigation that does not require special handling or transport considerations as detailed in SOP SA-6.1.

Grab Sample – A portion of material collected to represent material or conditions present at a single unit of space and time.

Hazardous Waste Sample – A sample containing (or suspected to contain) concentrations of contaminants that are high enough to require special handling and/or transport considerations per SOP SA-6.1.

Representativeness – A qualitative description of the degree to which an individual sample accurately reflects population characteristics or parameter variations at a sampling point. It is therefore an important characteristic not only of assessment and quantification of environmental threats posed by the site, but also for providing information for engineering design and construction. Proper sample location selection and proper sample collection methods are important to ensure that a truly representative sample has been collected.

4.0 RESPONSIBILITIES AND PERSONNEL QUALIFICATIONS

Project Manager - The Project Manager is responsible for determining the sampling objectives, initial sampling locations, and field procedures used in the collection of soil samples. The Project Manager also has the overall responsibility for seeing that all surface water and sediment sampling activities are properly conducted by appropriately trained personnel in accordance with applicable planning documents.

Field Operations Leader - This individual is primarily responsible for the execution of the planning document containing the Sampling and Analysis Plan (SAP). This is accomplished through management of a field sampling team for the proper acquisition of samples. He or she is responsible for the supervision of onsite analyses; ensuring proper instrument calibration, care, and maintenance; sample collection and handling; the completion and accuracy of all field documentation; and making sure that custody of all samples obtained is maintained according to proper procedures. When appropriate and as directed by the FOL, such responsibilities may be performed by other qualified personnel (e.g., field

technicians) where credentials and time permit. The FOL is responsible for finalizing the locations for collection of surface water and sediment samples. The FOL is ultimately responsible for adherence to Occupational Safety and Health Administration (OSHA) regulations during these operations through self acquisition or through the management of a field team of samplers.

Site Safety Officer (SSO) - The SSO (or a qualified designee) is responsible for providing the technical support necessary to implement the project Health and Safety Plan (HASP). This includes but is not be limited to performing air quality monitoring during sampling and boring and excavation activities, and ensuring that workers and offsite (downwind) individuals are not exposed to hazardous levels of airborne contaminants. The SSO or SSO designee may also be required to advise the FOL on other safety-related matters regarding boring and sampling, such as mitigative measures to address potential hazards from hazardous objects or conditions.

Project Geologist/Sampler - The project geologist/sampler is responsible for the proper acquisition of samples in accordance with this SOP and other project-specific documents. In addition, this individual is responsible for the completion of all required paperwork (e.g., sample log sheets, field notebook, , container labels, custody seals, and chain-of-custody forms) associated with the collection of those samples.

General personnel qualifications for groundwater sample collection and onsite water quality testing include the following:

- Occupational Safety and Health Administration (OSHA) 40-hour and applicable refresher training.
- Capability of performing field work under the expected physical and environmental (i.e., weather) conditions.
- Familiarity with appropriate procedures for sample documentation, handling, packaging, and shipping.

5.0 HEALTH AND SAFETY

Precautions to preserve the health and safety of field personnel implementing this SOP are distributed throughout. The following general hazards may also exist during field activities, and the means of avoiding them must be used to preserve the health and safety of field personnel:

Bridge/Boat Sampling – Potential hazards associated with this activity include:

- Traffic – one of the primary concerns as samplers move across a bridge because free space of travel is not often provided. Control measures should include:
  - When sampling from a bridge, if the samplers do not have at least 6 feet of free travel space or physical barriers separating them and the traffic patterns, the HASP will include a Traffic Control Plan.
  - The use of warning signs and high-visibility vests are required to warn oncoming traffic and to increase the visibility of sample personnel.
- Slips, trips, and falls from elevated surfaces are a primary concern. Fall protection shall be worn when or if samplers must lean over a rail to obtain sample material. A Fall Protection Competent Person (in accordance with Occupational safety and Health Administration [OSHA] fall protection standards) must be assigned to ensure that fall protection is appropriately and effectively employed
- Water hazards/drowning – if someone enters the water from an elevated surface (such as a bridge or dock) and when sampling from a boat. To minimize this potential, personnel shall wear United states Coast Guard (USCG)-approved floatation devices, and the sampling crew must also have on hand a

Type IV Throwable Personal Floatation Device with at least 90 feet of 3/8-inch rope. See Section 5.5.2 of this SOP.

- Within the HASP, provisions will also be provided concerning the requirement of a Safe Vessel Certification or the necessity to conduct a boat inspection prior to use. In addition, the HASP shall also specify requirements as to whether the operator must be certified as a commercial boat operator and whether members of the sampling team must have a state-specific safe boating certification.

Entering Water to Collect Samples – Several hazards are associated with this activity and can be mitigated as follows:

- Personnel must wear a USCG-approved Floatation Device (selected and identified in the HASP). The SSO shall ensure that the device selected is in acceptable condition and suitable for the individual using it. This includes consideration of the weight of the individual.

- Lifelines shall be employed from a point on the shore. This activity will always be conducted with a Buddy. See Section 6.5.2.

- Personnel shall carry a probe to monitor the bottom ahead of them for drop offs or other associated hazards.

- The person in the water shall exercise caution concerning the path traveled so that the lifeline does not become entangled in underwater obstructions such as logs, branches, stumps, etc., thereby restricting its effectiveness in extracting the person from the water.

- Personnel shall not enter waters on foot in situations where natural hazards including alligators, snakes, as well as sharks, gars, and other predators within inland waterways may exist.

- In all cases, working along and/or entering the water during high currents or flood conditions shall be prohibited.

- Personnel shall not enter bodies of water where known debris exists that could result in injuries from cuts and lacerations.

Sampling in marshes or tidal areas in some instances can be accomplished using an all-terrain vehicle (ATV). This is not the primary recommended approach because the vehicle may become disabled, or weather conditions or tidal changes could result in environmental damage as well as loss of the vehicle. The primary approach is recommended to be on foot where minimal disturbance would occur. The same precautions specified above with regard to sediment disturbance apply as well as the previously described safety concerns associated with natural hazards. The natural hazards include alligators, bees (nests in dead falls and tree trunks), snakes, etc. In addition, moving through and over this terrain is difficult and could result in muscle strain and slips, trips, and falls. Common sense dictates that the sampler selects the most open accessible route over moderate terrain. Move slowly and deliberately through challenging terrain to minimize falls. Mud boots or other supportive PPE should be considered and specified in the HASP to permit samplers to move over soft terrain with the least amount of effort. In these situations, it is also recommended, as the terrain allows, that supplies be loaded and transported in a sled over the soft ground.

Working in these areas, also recognize the following hazards and means of protection against them:

Insects are also a primary concern. These include mosquitoes, ticks, spiders, bees, ants, etc. The HASP will identify those particular to your area. Typical preventative measures include:

- Use insect repellant. Approval of various repellants should be approved by the Project Chemist or Project Manager.

- Wearing light-colored clothing to control heat load due to excessive temperatures. In addition, it makes it easier to detect crawling insects on your clothing.

- Taping pants to boots to deny access. Again, this is recommended to control access to the skin by crawling insects. Consultation with the Project Health and Safety OfficerSSO/Health and Safety Manager is recommended under extreme heat loads because this will create conditions of heat stress.

- Performing a body check to remove insects. The quicker you remove ticks, the less likely they will become attached and transfer bacteria to your bloodstream. Have your Buddy check areas inaccessible to yourself. This includes areas such as the upper back and between shoulder blades where it is difficult for you to examine and even more difficult for you to remove.

Safety Reminder

If you are allergic to bee or ant stings, it is especially critical that you carry your doctor-recommended antidote with you in these remote sampling locations due to the extended time required to extract incapacitated individuals as well as the effort required to extract them. In these scenarios, instruct your Buddy in the proper administration of the antidote. In all cases, if you have received a sting, administer the antidote regardless of the immediate reaction, evacuate, and seek medical attention as necessary. The FOL and/or SSO will determine when and if you may return to the field based on the extent of the immune response and hazards or potential hazards identified in these locations. To the FOL and SSO, this is a serious decision you have to make as to whether to take someone vulnerable to these hazards into a remote location where you may not be able to carry them out. Consider it wisely.

Poisonous Plants – To minimize the potential of encountering poisonous plants in the field, at least one member of the field team needs to have basic knowledge of what these plants look like so that they can be recognized, pointed out to other field personnel, and avoided if at all possible. If the field team cannot avoid contact and must move through an area where these plants exist, the level of personal protective equipment (PPE) shall include Tyvek coveralls and enhanced decontamination procedures for the removal of oils from the tooling and/or equipment.

Temperature-Related Stress – Excessively cold temperatures may result in cold stress, especially when entering the water either intentionally or by accident. Provisions for combating this hazard should be maintained at the sample location during this activity. Excessively hot temperatures may result in heat stress especially in scenarios where equipment is packed through the marsh.

Because all of these activities are conducted outside, electrical storms are a significant concern. The following measures will be incorporated to minimize this hazard:

- Where possible, utilize commercial warning systems and weather alerts to detect storms moving into the area.

- If on or in the water, get out of the water. Move to vehicles or preferably into enclosed buildings with plumbing and wiring.

- Where warning systems are not available, follow the 30/30 Rule (*if there are less than 30 seconds between thunder and lightning, go inside for at least 30 minutes after the last thunder).*

See Section 4.0 of the Health and Safety Guidance Manual (HSGM) for additional protective measures.

6.0 PROCEDURES

6.1 Introduction

Collecting a representative sample of surface water or sediment may be difficult because of water movement, stratification, or heterogeneous distribution of the targeted analytes. To collect representative samples, one must standardize sampling methods related to site selection, sampling frequency, sample collection, sampling devices, and sample handling, preservation, and identification. Regardless of quality control applied during laboratory analyses and subsequent scrutiny of analytical data packages, reported data are no better than the confidence that can be placed in the representativeness of the samples. Consult Appendix C for guidance on sampling that should be considered during project planning and that may be helpful to field personnel.

6.3.4 Surface Water Sampling Equipment

The selection of sampling equipment depends on the site conditions and sample type to be acquired. In general, the most representative samples are obtained from mid-channel at a stream depth of 0.5 foot in a well-mixed stream; however, project-specific planning documents will address site-specific sampling requirements including sample collection points and sampling equipment. The most frequently used samplers include the following:

- Peristaltic pump
- ~~Bailer~~
- Dip sampler
- ~~Weighted bottle~~
- ~~Hand pump~~
- ~~Kemmerer~~
- Depth-integrating sampler

The dip sampler and weighted bottle sampler are used most often, and detailed discussions for these devices and the Kemmerer sampler are addressed subsequently in this section.

The criteria for selecting a sampler include:

1. Disposability and/or easy decontamination.
2. Inexpensive cost (if the item is to be disposed).
3. Ease of operation.
4. Non-reactive/non-contaminating properties - Teflon-coated, glass, stainless-steel or polyvinyl chloride (PVC) sample chambers are preferred (in that order).

Measurements collected for each sample (grab or each aliquot collected for compositing) shall include but not be limited to:

- Specific conductance
- Temperature
- pH
- Dissolved oxygen

Sample measurements shall be conducted as soon as the sample is acquired. Measurement techniques described in SOP SA-1.1 shall be followed. All pertinent data and results shall be recorded in a field notebook or on sample log sheets (see Attachment A) or an equivalent electronic form(s). These analyses may be selected to provide information on water mixing/stratification and potential contamination. Various types of water bodies have differing potentials for mixing and stratification.

In general, the following equipment if necessary for obtaining surface water samples:

- Required sampling equipment, which may include a remote sampling pole, weighted bottle sampler, Kemmerer sampler, or other device.
- Real-time air monitoring instrument (e.g., PID, FID) as directed in the project-specific planning document.
- Required PPE as directed in the project-specific planning document, which may include:
  - Nitrile surgeon's or latex gloves (layered as necessary).
  - Safety glasses.
  - Other items identified on the Safe Work Permit that may be required based on location-specific requirements (e.g., hearing protection, steel-toed work boots, hard hat). These provisions will be listed in the HASP or addressed by the FOL and/or SSO.

> ***Safety Reminder***
> The use of latex products may elicit an allergic reaction in some people. Should this occur, remove the latex gloves, treat for an allergic reaction, and seek medical attention as necessary.

  - Required paperwork (see SOP SA-6.3 and Attachments A and B to this SOP).
  - Required decontamination equipment.
  - Required sample containers.
  - Sealable polyethylene bags (e.g., Ziploc® baggies).
  - Heavy-duty cooler.
  - Ice.
  - Paper towels and garbage bags.
  - Chain-of-custody records and custody seals.

Dip Sampling

Specific procedures for collecting a dip or grab sample of surface water can vary based on site-specific conditions (e.g., conditions near the shore and how closely a sampler can safely get to the shore). The general procedure for collecting a sample using a pole or directly from the water body is as follows:

1. If using a remote sampling pole, securely attach the appropriate sample container to a pole of sufficient length to reach the water to be sampled. Samples for volatile analysis should be collected

first. Use PPE as described in the HASP. When sample containers are provided pre-preserved or if the pole cannot accommodate a particular sample container, use a dedicated, clean, unpreserved bottle/container for sampling and transfer to an appropriately preserved container.

2. Remove the cap. Do not place the cap on the ground or elsewhere where it might become contaminated.

3. Carefully dip the container into the water just below the surface (or as directed by project-specific planning documents), and allow the bottle to fill. Sample bottles for volatile analysis must be filled with no headspace. Avoid contacting the bottom of the water body because this will disturb sediment that may interfere with the surface water sample.

4. Retrieve the container and carefully replace the cap securely. If using a container other than the sample bottle, pour the water from that container into the sample bottle and replace the cap securely.

5. Use a clean paper towel to clean and dry the outside of the container.

6. Affix a sample label to each container, ensuring that each label is completely carefully, clearly, and completely, addressing all of the categories described in SOP SA-6.3.

7. Proceed with the handling and processing of each sample container as described in SOP SA-6.2.

Constituents measured in grab samples collected near the water surface are only indicative of conditions near the surface of the water and may not be a true representation of the total concentration distributed throughout the water column and in the cross section. Therefore, as possible based on site conditions, the sampler may be required to augment dip samples with samples that represent both dissolved and suspended constituents and both vertical and horizontal distributions.

CAUTION

In areas prone to natural hazards such as alligators and snakes, etc., always use a buddy as a watch. Always have and use a lifeline or throwable device to extract persons who could potentially fall into the water. Be attentive to the signs, possible mounds indicating nests, and possible slides into the water. Remember that although snakes are typically encountered on the ground, it is not unheard of to see them on low-hanging branches. Be attentive to your surroundings because these may indicate that hazards are nearby.

Weighted Bottle Sampling

A grab sample can also be collected using a weighted holder that allows a bottle to be lowered to any desired depth, opened for filling, closed, and returned to the surface. This allows discrete sampling with depth. Several of these samples can be combined to provide a vertical composite. Alternatively, an open bottle can be lowered to the bottom and raised to the surface at a uniform rate so that the bottle collects sample throughout the total depth and is just filled on reaching the surface. The resulting sample using either method will roughly approach what is known as a depth-integrated sample.

A closed weighted bottle sampler consists of glass or plastic bottle with a stopper, a weight and/or holding device, and lines to open the stopper and lower or raise the bottle. The general procedure for sampling with this device is as follows:

1. Gently lower the sampler to the desired depth so as not to remove the stopper prematurely (watch for bubbles).

2. When the desired depth is reached, pull out the stopper with a sharp jerk of the stopper line.

3. Allow the bottle to fill completely, as evidenced by the absence of air bubbles.

4. Raise the sampler and cap the bottle.

5. Use a paper towel to clean and dry the outside of the container. This bottle can be used as the sample container as long as the bottle is an approved container type.

6. Affix a sample label to each container, ensuring that each label is completely carefully, clearly, and completely, addressing all of the categories described in SOP SA-6.3.

7. Proceed with the handling and processing of each sample container as described in SOP SA-6.2.

Kemmerer Sampler

If samples are desired at a specific depth, and the parameters to be measured do not require a Teflon-coated sampler, a standard Kemmerer sampler may be used. The Kemmerer sampler is a brass, stainless steel or acrylic cylinder with rubber stoppers that leave the ends open while it is lowered in a vertical position (thus allowing free passage of water through the cylinder). A "messenger" is sent down the line when the sampler is at the designated depth to cause the stoppers to close the cylinder, which is then raised. Water is removed through a valve to fill sample bottles. The general procedure for sampling with this device is as follows:

1. Gently lower the sampler to the desired depth.

2. When the desired depth is reached, send down the messenger to close the cylinder and then raise the sampler.

3. Open the sampler valve to fill each sample bottle (filling bottles for volatile analysis first).

4. Use a paper towel to clean and dry the outside of the container.

5. Affix a sample label to each container, ensuring that each label is completely carefully, clearly, and completely, addressing all of the categories described in SOP SA-6.3.

6. Proceed with the handling and processing of each sample container as described in SOP SA-6.2.

6.3.5 Surface Water Sampling Techniques

Samples collected during site investigations may be grab samples or composite samples. The following general procedures apply to various types of surface water collection techniques:

- If a clean, pre-preserved sample container is not used, rinse the sample container least once with the water to be sampled before the sample is collected. This is not applicable when sample containers are provided pre-preserved because doing so will wash some or all of the preservative out of the bottle.

- For sampling moving water, collect the farthest downstream sample first, and continue sample collection in an upstream direction. In general, work from zones suspected of low contamination to zones of high contamination.

- Take care to avoid excessive agitation of the water because loss of volatile constituents could result.

- When obtaining samples in 40 mL vials with septum-lined lids for volatile organics analysis, fill the container completely (with a meniscus) to exclude any air space in the top of the bottle and to be sure that the Teflon liner of the septum faces in after the vial is filled and capped. Turn the vial upside down and tap gently on your wrist to check for air bubbles. If air bubbles rise in the bottle, add additional sample volume to the container.

- Do not sample at the surface, unless sampling specifically for a known constituent that is immiscible and on top of the water. Instead, invert the sample container, lower it to the approximate depth, and hold it at about a 45-degree angle with the mouth of the bottle facing upstream.

6.4 Onsite Water Quality Testing

Onsite water quality testing shall be conducted as described in SOP SA-1.1.

6.5 Sediment Sampling

6.5.1 General

If composite surface water samples are collected, sediment samples are usually collected at the same locations as the associated surface water samples. If only one sediment sample is to be collected, the sampling location shall be approximately at the center of the water body, in a depositional area if possible based on sample location restraints (see below), unless the SAP states otherwise.

Generally, coarser-grained sediments are deposited near the headwaters of reservoirs. Bed sediments near the center of a water body will be composed of fine-grained materials that may, because of their lower porosity and greater surface area available for adsorption, contain greater concentrations of contaminants. The shape, flow pattern, bathymetry (i.e., depth distribution), and water circulation patterns must all be considered when selecting sediment sampling sites. In streams, areas likely to have sediment accumulation (e.g., bends, behind islands or boulders, quiet shallow areas or very deep, low-velocity areas) shall be sampled, in general, and areas likely to show net erosion (i.e., high-velocity, turbulent areas) and suspension of fine solid materials shall be generally avoided. Follow instructions in the SAP, as applicable.

Chemical constituents associated with bottom material may reflect an integration of chemical and biological processes. Bottom samples reflect the historical input to streams, lakes, and estuaries with respect to time, application of chemicals, and land use. Bottom sediments (especially fine-grained material) may act as a sink or reservoir for adsorbed heavy metals and organic contaminants (even if water column concentrations are less than detection limits). Therefore, it is important to minimize the loss of low-density "fines" during any sampling process.

Samples collected for volatile organic compound (VOC) analysis must be collected prior to any sample homogenization. Regardless of the method used for collection, the aliquot for VOC analysis must be collected directly from the sampling device (hand auger bucket, scoop, trowel), to the extent practical. If a device such as a dredge is used, the aliquot should be collected after the sample is placed in the mixing container prior to mixing.

In some cases, the sediment may be soft and not lend itself to collection by plunging Encore™ or syringe samplers into the sample matrix. In these cases, it is appropriate to open the sampling device, (Encore™ barrel or syringe) prior to sample collection, and carefully place the sediment in the device, filling it fully with the required volume of sample.

On active or former military sites, ordnance items may be encountered in some work areas. Care should be exercised when handling site media (such as if unloading a dredge as these materials may be scooped up). If suspected ordnance items are encountered, stop work immediately, move to shore and notify the Project Manager and Health and Safety Manager.

All relevant information pertaining to sediment sampling shall be documented as applicably described in SOP SA-6.3 and Attachment B or an equivalent electronic form.

6.5.2 Sampling Equipment and Techniques for Bottom Materials

A bottom-material sample may consist of a single scoop or core, or may be a composite of several individual samples in the cross section. Sediment samples may be obtained using onshore or offshore techniques.

SAFETY REMINDER

The following health and safety provisions apply when working on/over/near water:

- At least two people are required to be present at the sampling location in situations where the water depth and/or movement deem itnecessary, each wearing a USCG-approved Personal Flotation Devices

- A minimum of three people are required if *any* of the following conditions are anticipated or observed:

  - Work in a waterway that is turbulent *or* swift that could sweep a sampler down stream should he or she fall in accidentally.

  - The underwater walking surface (e.g., stream/river bed) is suspected or observed to involve conditions that increase the potential for a worker to fall into the water. Examples include large/uneven rocks or boulders, dense mud or sediment that could entrap worker's feet, etc.

  - Waterway is tidal, and conditions such as those listed above could rapidly change.

The third person in the above condition must be equipped and prepared to render emergency support [e.g., lifeline, tethered Personal Flotation Device (Throwable Type IV, life saver), skiff, means to contact external emergency response support, etc.]

The following samplers may be used to collect sediment samples:

- Scoop sampler
- Dredge samplers
- ~~Coring samplers~~

Each type of sampler is discussed below.

In general, the following equipment if necessary for obtaining sediment samples:

- Required sampling equipment, which may include a scoop sampler, dredge sampler, coring sampler, or stainless steel or pre-cleaned disposable trowel.

- Stainless bowl or pre-cleaned disposable bowl to homogenize sample.
- Real-time air monitoring instrument (e.g., PID, FID) as directed in the project-specific planning document.
- Required PPE as directed in the project-specific planning document, which may include:
  - Nitrile surgeon's or latex gloves (layered as necessary).
  - Safety glasses.
  - Other items identified on the Safe Work Permit that may be required based on location-specific requirements (e.g., hearing protection, steel-toed work boots, hard hat). These provisions will be listed in the HASP or addressed by the FOL and/or SSO.
  - Required paperwork (see SOP SA-6.3 and Attachments A and B to this SOP).
  - Required decontamination equipment.
  - Required sample containers.
  - Sealable polyethylene bags (e.g., Ziploc® baggies).
  - Heavy-duty cooler.
  - Ice.
  - Paper towels and garbage bags.
  - Chain-of-custody records and custody seals.

Scoop Sampler

A scoop sampler consists of a pole to which a jar or scoop is attached. The pole may be made of bamboo, wood, PVC, or aluminum and be either telescoping or of fixed length. The scoop or jar at the end of the pole is usually attached using a clamp.

If the water body can be sampled from the shore or if the sampler can safely wade to the required location, the easiest and best way to collect a sediment sample is to use a scoop sampler. Scoop sampling also reduces the potential for cross-contamination. The general scoop sampling procedure is as follows:

1. Reach over or wade into the water body.
2. While facing upstream (into the current), scoop the sampler along the bottom in an upstream direction. Although it is very difficult not to disturb fine-grained materials at the sediment-water interface when using this method, try to keep disturbances to a minimum.

Dredge Samplers

Dredges are generally used to sample sediments that cannot easily be obtained using coring devices (e.g., coarse-grained or partially cemented materials) or when large quantities of sample are required. Dredges generally consist of a clam shell arrangement of two buckets. The buckets may either close upon impact or be activated by use of a "messenger." Some dredges are heavy and may require use of a winch and crane assembly for sample retrieval. The three major types of dredges are Peterson, Eckman and Ponar.

The Peterson dredge is used when the bottom is rocky, in very deep water, or when the flow velocity is high. The Peterson dredge shall be lowered very slowly as it approaches bottom, because it can force out and miss lighter materials if allowed to drop freely.

The Eckman dredge has only limited usefulness. It performs well where bottom material is unusually soft, as when covered with organic sludge or light mud. It is unsuitable, however, for sandy, rocky, and hard bottoms and is too light for use in streams with high flow velocities.

The Ponar dredge is a Peterson dredge modified by the addition of side plates and a screen on the top of the sample compartment. The screen over the sample compartment permits water to pass through the sampler as it descends, thus reducing the "shock wave." The Ponar dredge is easily operated by one person in the same fashion as the Peterson dredge. The Ponar dredge is one of the most effective samplers for general use on all types of substrates.

The general procedure for using dredge samplers is as follows:

1. Gently lower the dredge to the desired depth.
2. When the desired depth is reached, send the messenger down to cable to close the cylinder and then carefully raise the sampler.
3. Open the sampler to retrieve the sediment.
4. Transfer the sediment to the bowl in which it will be homogenized. Fill the sample bottle(s) for volatile analysis *prior to* homogenization. Homogenize the remainder of the sediment collected.
5. Fill the containers for all analyses other and VOCs.
6. Use a paper towel to clean and dry the outside of each container.
7. Affix a sample label to each container, ensuring that each label is completely carefully, clearly, and completely, addressing all of the categories described in SOP SA-6.3.
8. Proceed with the handling and processing of each sample container as described in SOP SA-6.2.

SAFETY REMINDER

Safety concerns using these dredges include lifting hazards, pinches, and compressions (several pinch points exist within the jaws and levers). In all cases, handle the dredge by the rope to avoid capturing fingers/hands.

Coring Samplers

Coring samplers are used to sample vertical columns of sediment. Many types of coring devices have been developed depending on the depth of water from which the sample is to be obtained, the nature of the bottom material, and the length of core to be collected. They vary from hand-push tubes to electronic vibrational core tube drivers.

Coring devices are particularly useful in pollutant monitoring because turbulence created by descent through the water is minimal, thus the fines at the sediment-water interface are only minimally disturbed. The sample is withdrawn intact, permitting the removal of only those layers of interest.

In shallow, wadeable waters, the use of a core liner or tube manufactured of Teflon or plastic is recommended for the collection of sediment samples. Caution should be exercised not to disturb the bottom sediments when the sample is obtained by wading in shallow water. The general procedure to collecting a sediment sample with a core tube is as follows:

1. Push the tube into the substrate until 4 inches or less of the tube is above the sediment-water interface. When sampling hard or coarse substrates, a gentle rotation of the tube while it is being pushed will facilitate greater penetration and decrease core compaction.

2. Cop the top of the tube to provide suction and reduce the chance of losing the sample.

3. Slowly extract the tube so as not to lose sediment from the bottom of the tube. Cap the bottom of the tube before removing it from the water. This will also help to minimize loss of sample.

4. Transfer the sediment to the bowl in which it will be homogenized. Fill the sample bottle(s) for volatile analysis *prior to* homogenization. Homogenize the remainder of the sediment collected.

5. Fill the containers for all analyses other and VOCs.

6. Use a paper towel to clean and dry the outside of each container.

7. Affix a sample label to each container, ensuring that each label is completely carefully, clearly, and completely, addressing all of the categories described in SOP SA-6.3.

8. Proceed with the handling and processing of each sample container as described in SOP SA-6.2.

In deeper, non-wadeable water bodies, sediment cores may be collected from a bridge or boat using different coring devices such as Ogeechee Sand Pounders, gravity cores, and vibrating coring devices. All three devices utilize a core barrel with a core liner tube system. The core liners can be removed from the core barrel and replaced with a clean core liner after each sample. Before extracting the sediment from the coring tubes, the clear supernatant above the sediment-water interface in the core should be decanted from the tube. This is accomplished by turning the core tube to its side and gently pouring the liquid out until fine sediment particles appear in the waste liquid. Post-retrieval processing of samples is the same as above.

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ATTACHMENT A

SURFACE WATER SAMPLE LOG SHEET

Tetra Tech NUS, Inc. **SURFACE WATER SAMPLE LOG SHEET**

Page___ of ___

Project Site Name: _____
Project No.: _____

[] Stream
[] Spring
[] Pond
[] Lake
[] Other: _____
[] QA Sample Type: _____

Sample ID No.: _____
Sample Location: _____
Sampled By: _____
C.O.C. No.: _____

Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA

Date:	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time:	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Depth:								
Method:								

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS/NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

ATTACHMENT B

SOIL & SEDIMENT SAMPLE LOG SHEET

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: _____
Project No.: _____

[] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other: _____
[] QA Sample Type: _____

Sample ID No.: _____
Sample Location: _____
Sampled By: _____
C.O.C. No.: _____

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

APPENDIX C

GUIDANCE ON SAMPLING DESIGN AND SAMPLE COLLECTION

C.1 Defining the Sampling Program

Many factors are considered in developing a sampling program for surface water and/or sediment, including study objectives, accessibility, site topography, physical characteristics of the water body (e.g., flow and mixing), point and diffuse sources of contamination, and personnel and equipment available to conduct the study. For waterborne constituents, dispersion depends on vertical and lateral mixing within the body of water. For sediment, dispersion depends on bottom current or flow characteristics, sediment characteristics (e.g., density, size), and geochemical properties (that affect adsorption/desorption). The hydrogeologist developing the sampling plan must therefore know not only the mixing characteristics of streams and lakes but must also understand the role of fluvial-sediment transport, deposition, and chemical sorption.

C.1.1 Sampling Program Objectives

The scope of the sampling program must consider the sources and potential pathways for transport of contamination to or within a surface water body. Sources may include point sources (leaky tanks, outfalls, etc.) or nonpoint sources (e.g., contaminated runoff). The major pathways for surface water contamination (not including airborne deposition) are overland runoff, leachate influx to the water body, direct waste disposal (solid or liquid) into the water body, and groundwater flow influx from upgradient. The relative importance of these pathways, and therefore the design of the sampling program, is controlled by the physiographic and hydrologic features of the site, the drainage basin(s) that encompasses the site, and the history of site activities.

Physiographic and hydrologic features to be considered include slopes and runoff direction, areas of temporary flooding or pooling, tidal effects, artificial surface runoff controls such as berms or drainage ditches (and when they were constructed relative to site operation), and locations of springs, seeps, marshes, etc. In addition, the obvious considerations such as the locations of man-made discharge points to the nearest stream (intermittent or flowing), pond, lake, estuary, etc. shall be considered.

A more subtle consideration in designing the sampling program is the potential for dispersion of dissolved or sediment-associated contaminants away from the source. The dispersion could lead to a more homogeneous distribution of contamination at low or possibly non-detectable concentrations. Such dispersion does not, however, always readily occur. For example, obtaining a representative sample of contamination from a main stream immediately below an outfall or a tributary is difficult because the inflow frequently follows a stream bank with little lateral mixing for some distance. Sampling alternatives to overcome this situation include: (1) moving the sampling location far enough downstream to allow for adequate mixing, or (2) collecting integrated samples in a cross section. Also, non-homogeneous distribution is a particular problem with regard to sediment-associated contaminants, which may accumulate in low-energy environments (coves, river bends, deep spots, or even behind boulders) near or distant from the source while higher-energy areas (main stream channels) near the source may show no contaminant accumulation.

The distribution of particulates within a sample itself is an important consideration. Many organic compounds are only slightly water soluble and tend to adsorb onto particulate matter. Nitrogen, phosphorus, and heavy metals may also be transported by particulates. Samples must be collected with a representative amount of suspended material; transfer from the sampling device shall include transferring a proportionate amount of the suspended material.

C.1.2 Location of Sampling Stations

Accessibility is the primary factor affecting sampling costs. The desirability and utility of a sample for analysis and consideration of site conditions must be balanced against the costs of collection as controlled by accessibility. Bridges or piers are the first choice for locating a sampling station on a stream because bridges provide ready access and also permit the sampling technician to sample any point across the stream. A boat or pontoon (with an associated increase in cost) may be needed to sample locations on lakes, reservoirs, or larger rivers. Frequently, however, a boat will take longer to cross a water body and will hinder manipulation of the sampling equipment. Wading for samples is not recommended unless it is known that contaminant levels are low so that skin contact will not produce adverse health effects. This provides a built in margin of safety in the event that wading boots or other protective equipment should fail to function properly. If it is necessary to wade into the water body to obtain a sample, the sampler shall be careful to minimize disturbance of bottom sediments and must enter the water body downstream of the sampling location. If necessary, the sampling technician shall wait for the sediments to settle before taking a sample.

Under ideal and uniform contaminant dispersion conditions in a flowing stream, the same concentrations of each contaminant would occur at all points along the cross section. This situation is most likely downstream of areas of high turbulence. Careful site selection is needed to ensure, as nearly as possible, that samples are taken where uniform flow or deposition and good mixing conditions exist.

The availability of stream flow and sediment discharge records can be an important consideration in choosing sampling sites in streams. Stream flow data in association with contaminant concentration data are essential for estimating the total contaminant loads carried by the stream. If a gaging station is not conveniently located on a selected stream, the project hydrogeologist shall explore the possibility of obtaining stream flow data by direct or indirect methods. Remember these locations are also where you may encounter natural hazards as these are areas where they hunt. Always exercise extreme caution.

C.1.3 Frequency of Sampling

The sampling frequency and objectives of the sampling event will be defined by the project planning documents. For single-event site or area characterization sampling, both bottom material and overlying water samples shall be collected at the specified sampling stations. If valid data are available on the distribution of a contaminant between the solid and aqueous phases, it may be appropriate to sample only one phase, although this is not often recommended. If samples are collected primarily for monitoring purposes (i.e., consisting of repetitive, continuing measurements to define variations and trends at a given location), water samples should be collected at a pre-established and constant interval as specified in the project plans (often monthly or quarterly and during droughts and floods). Samples of bottom material should generally be collected from fresh deposits at least yearly, and preferably seasonally, during both spring and fall.

The variability in available water quality data shall be evaluated before determining the number and collection frequency of samples required to maintain an effective monitoring program.

C.2 Surface Water Sample Collection

C.2.1 Streams, Rivers, Outfalls and Drainage Features

Methods for sampling streams, rivers, outfalls, and drainage features (ditches, culverts) at a single point vary from the simplest of hand-sampling procedures to the more sophisticated multi-point sampling techniques known as the equal-width-increment (EWI) method or the equal-discharge-increment (EDI) methods (see below).

Samples from different depths or cross-sectional locations in the watercourse taken during the same sampling episode shall be composited. However, samples collected along the length of the watercourse or at different times may reflect differing inputs or dilutions and therefore shall not be composited. Generally, the number and type of samples to be taken depend on the river's width, depth, and discharge and on the suspended sediment the stream or river transports. The greater the number of individual points that are sampled, the more likely that the composite sample will truly represent the overall characteristics of the water.

In small streams less than about 20 feet wide, a sampling site can generally be found where the water is well mixed. In such cases, a single grab sample taken at mid-depth in the center of the channel is adequate to represent the entire cross section.

For larger streams, at least one vertical composite shall be taken with one sample each from just below the surface, at mid-depth, and just above the bottom. The measurement of dissolved oxygen (DO), pH, temperature, conductivity, etc., shall be made on each aliquot of the vertical composite and on the composite itself. For rivers, several vertical composites shall be collected, as directed in the project planning documents.

C.2.2 Lakes, Ponds and Reservoirs

Lakes, ponds, and reservoirs have a much greater tendency to stratify than rivers and streams. The relative lack of mixing requires that more samples be obtained. The number of water sampling sites on a lake, pond, or impoundment will vary with the size and shape of the basin. In ponds and small lakes, a single vertical composite at the deepest point may be sufficient. Similarly, measurement of DO, pH, temperature, etc. is to be conducted on each aliquot of the vertical composite and on the composite itself. In naturally formed ponds, the deepest point may have to be determined empirically; in impoundments, the deepest point is usually near the dam.

In lakes and larger reservoirs, several vertical composites shall be composited to form a single sample if a sample representative of the water column is required. These vertical composites are often collected along a transect or grid. In some cases, it may be of interest to form separate composites of epilimnetic and hypolimnetic zones. In a stratified lake, the epilimnion is the thermocline that is exposed to the atmosphere. The hypolimnion is the lower, "confined" layer that is only mixed with the epilimnion and vented to the atmosphere during seasonal "overturn" (when density stratification disappears). These two zones may thus have very different concentrations of contaminants if input is only to one zone, if the contaminants are volatile (and therefore vented from the epilimnion but not the hypolimnion), or if the epilimnion only is involved in short-term flushing (i.e., inflow from or outflow to shallow streams). Normally, however, a composite consists of several vertical composites with samples collected at various depths.

In lakes with irregular shape and with bays and coves that are protected from the wind, separate composite samples may be needed to adequately represent water quality because it is likely that only poor mixing will occur. Similarly, additional samples are recommended where discharges, tributaries, land use characteristics, and other such factors are suspected of influencing water quality.

Many lake measurements are now made in situ using sensors and automatic readout or recording devices. Single and multi-parameter instruments are available for measuring temperature, depth, pH, oxidation-reduction potential (ORP), specific conductance, DO, some cations and anions, and light penetration.

C.2.3 Estuaries

Estuarine areas are, by definition, zones where inland freshwaters (both surface and ground) mix with oceanic saline waters. Knowledge of the estuary type may be necessary to determine sampling locations. Estuaries are generally categorized into one of the following three types dependent on freshwater inflow and mixing properties:

- Mixed Estuary - characterized by the absence of a vertical halocline (gradual or no marked increase in salinity in the water column) and a gradual increase in salinity seaward. Typically, this type of estuary is shallow and is found in major freshwater sheet flow areas. Because this type of estuary is well mixed, sampling locations are not critical.

- Salt Wedge Estuary - characterized by a sharp vertical increase in salinity and stratified freshwater flow along the surface. In these estuaries, the vertical mixing forces cannot override the density differential between fresh and saline waters. In effect, a salt wedge tapering inland moves horizontally back and forth with the tidal phase. If contamination is being introduced into the estuary from upstream, water sampling from the salt wedge may miss it entirely.

- Oceanic Estuary - characterized by salinities approaching full-strength oceanic waters. Seasonally, freshwater inflow is small, with the preponderance of the fresh-saline water mixing occurring near or at the shore line.

Sampling in estuarine areas is normally based on the tidal phase, with samples collected on successive slack tides (i.e., when the tide turns). Estuarine sampling programs shall include vertical salinity measurements at 1- to 5-foot increments, coupled with vertical DO and temperature profiles.

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1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures to be used to collect surface, near-surface, and subsurface soil samples. Additionally, it describes the methods for sampling of test pits and trenches to determine subsurface soil and rock conditions and for recovery of small-volume or bulk samples from pits.

2.0 SCOPE

This document applies to the collection of surface, near-surface, and subsurface soil samples exposed through hand digging, hand augering, drilling, or machine excavating at hazardous substance sites for laboratory testing, onsite visual examination, and onsite testing.

3.0 GLOSSARY

Composite Sample - A composite sample is a combination of more than one grab sample from various locations and/or depths and times that is homogenized and treated as one sample. This type of sample is usually collected when determination of an average waste concentration for a specific area is required. Composite samples shall not be collected for volatile organics analysis.

Confined Space - As stipulated in 29 Code of Federal Regulations (CFR) 1910.146, a confined space means a space that: (1) is large enough and so configured that an employee can bodily enter and perform assigned work; (2) has limited or restricted means for entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, pits, and excavations); and (3) is not designed for continuous employee occupancy. TtNUS considers all confined space as permit-required confined spaces.

Grab Sample - One sample collected at one location and at one specific time.

Hand Auger - A sampling device used to extract soil from the ground.

Representativeness – A qualitative description of the degree to which an individual sample accurately reflects population characteristics or parameter variations at a sampling point. It is therefore an important characteristic not only of assessment and quantification of environmental threats posed by the site, but also for providing information for engineering design and construction. Proper sample location selection and proper sample collection methods are important to ensure that a truly representative sample has been collected.

Sample for Non-Volatile Analyses - Includes all chemical parameters other than volatile organics (e.g., semivolatiles, pesticides/PCBs, metals, etc.) and those engineering parameters that do not require undisturbed soil for their analysis.

Split-Barrel Sampler - A steel tube, split in half lengthwise, with the halves held together by threaded collars at either end of the tube. Also called a split-spoon sampler, this device can be driven into resistant materials using a drive weight mounted in the drilling string. A standard split-barrel sampler is typically available in two common lengths, providing either 20-inch or 26-inch longitudinal clearance for obtaining 18-inch or 24-inch-long samples, respectively. These split-barrel samplers commonly range in size from 2 to 3.5 inches OD. The larger sizes are commonly used when a larger volume of sample material is required (see Attachment B).

Test Pit and Trench - Open, shallow excavations, typically rectangular (if a test pit) or longitudinal (if a trench), excavated to determine shallow subsurface conditions for engineering, geological, and soil chemistry exploration and/or sampling purposes. These pits are excavated manually or by machine (e.g., backhoe, clamshell, trencher, excavator, or bulldozer).

Thin-Walled Tube Sampler - A thin-walled metal tube (also called a Shelby tube) used to recover relatively undisturbed soil samples. These tubes are available in various sizes, ranging from 2 to 5 inches outside diameter (OD) and from 18 to 54 inches in length.

4.0 RESPONSIBILITIES AND PERSONNEL QUALIFICATIONS

Project Manager - The Project Manager is responsible for determining the sampling objectives, selecting proposed sampling locations, and selecting field procedures used in the collection of soil samples. Additionally, in consultation with other project personnel (geologist, hydrogeologist, etc.), the Project Manager establishes the need for test pits or trenches and determines their approximate locations and dimensions.

Site Safety Officer (SSO) - The SSO (or a qualified designee) is responsible for providing the technical support necessary to implement the project Health and Safety Plan. This will include (but not be limited to) performing air quality monitoring during sampling, boring, and excavation activities and to ensure that workers and offsite (downwind) individuals are not exposed to hazardous levels of airborne contaminants. The SSO/designee may also be required to advise the FOL on other safety-related matters regarding boring, excavation, and sampling, such as mitigative measures to address potential hazards from unstable trench walls, puncturing of drums or other hazardous objects, etc.

Field Operations Leader (FOL) - This individual is primarily responsible for the execution of the planning document containing the Sampling and Analysis Plan (SAP). This is accomplished through management of a field sampling team for the proper acquisition of samples. He or she is responsible for the supervision of onsite analyses; ensuring proper instrument calibration, care, and maintenance; sample collection and handling; the completion and accuracy of all field documentation; and making sure that custody of all samples obtained is maintained according to proper procedures. When appropriate and as directed by the FOL, such responsibilities may be performed by other qualified personnel (e.g., field technicians) where credentials and time permit. The FOL is responsible for finalizing the locations for collection of surface, near-surface, and subsurface (hand and machine borings, test pits/trenches) soil samples. He/she is ultimately responsible for the sampling and backfilling of boreholes, test pits, and trenches and for adherence to Occupational Safety and Health Administration (OSHA) regulations during these operations through self acquisition or through the management of a field team of samplers.

Project Geologist/Sampler - The project geologist/sampler is responsible for the proper acquisition of samples in accordance with this SOP and/or other project-specific documents. In addition, this individual is responsible for the completion of all required paperwork (e.g., sample log sheets, field notebook, boring logs, test pit logs, container labels, custody seals, and chain-of-custody forms) associated with the collection of those samples.

Competent Person - A Competent Person, as defined in 29 CFR 1929.650 of Subpart P - Excavations, means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

General personnel qualifications for groundwater sample collection and onsite water quality testing include the following:

- Occupational Safety and Health Administration (OSHA) 40-hour and applicable refresher training.
- Capability of performing field work under the expected physical and environmental (i.e., weather) conditions.
- Familiarity with appropriate procedures for sample documentation, handling, packaging, and shipping.

5.0 HEALTH AND SAFETY

Health and safety precautions are identified for individual sample collection procedures throughout this SOP. In addition to those precautions, the following general hazards may be incurred during sampling activities:

- Knee injuries from kneeling on hard or uneven surfaces
- Slips, trips, and falls
- Cuts and lacerations
- Traffic hazards associated with sampling in parking areas, along roadways and highways.

Methods of avoiding these hazards are provided below.

Knee injuries – If kneeling is required during soil sampling, this could result in knee injuries from stones/foreign objects and general damage due to stress on the joints. To minimize this hazard:

- Clear any foreign objects from the work area.
- Wear hard-sided knee pads.
- Stretch ligaments, tendons and muscles before, during and after. Take breaks as frequently as necessary.
- Report pre-existing conditions to the SSO if you feel this activity will aggravate an existing condition.

Slips, Trips, and Falls – These hazards exist while traversing varying terrains carrying equipment to sample locations. To minimize these hazards:

- Pre-survey sampling locations. Eliminate, barricade, or otherwise mark physical hazards leading to the locations.
- Carry small loads that do not restrict the field of vision.
- Travel the safest and clearest route (not necessarily the shortest).

Cuts and Lacerations - To prevent cuts and lacerations associated with soil sampling, the following provisions are required:

- Always cut away from yourself and others when cutting tubing or rope. This will prevent injury to yourself and others if the knife slips.
- Do not place items to be cut in your hand or on your knee.
- Change blades as necessary to maintain a sharp cutting edge. Many accidents result from struggling with dull cutting attachments.
- Whenever practical, wear cut-resistant gloves (e.g., leather or heavy cotton work gloves) at least on the hand not using the knife.
- Keep cutting surfaces clean and smooth.
- Secure items to be cut – do not hold them against the opposing hand, a leg, or other body part.
- When transporting glassware, keep it in a hard-sided container such as a cooler so that if there is a fall, you will be less likely to get cut by broken glass.

- DO NOT throw broken sample jars or glass ampoules into garbage bags. Place broken glass and glass ampoules in hard-sided containers such as a cardboard box or directly into a dumpster. DO NOT reach into garbage bags to retrieve any item accidentally thrown away. Empty the contents onto a flat surface to avoid punctures and lacerations from reaching where you cannot see.

Vehicular and Foot Traffic Hazards – When sampling along the roadway or near traffic patterns, follow the following precautions:

- Motorists may be distracted by onsite activities – ASSUME THEY DO NOT SEE YOU OR MEMBERS OF YOUR FIELD CREW.

- DO NOT place obstructions (such as vehicles) along the sides of the road that may cause site personnel to move into the flow of traffic to avoid your activities or equipment or that will create a blind spot.

- **Provide a required free space of travel**. Maintain at least 6 feet of space between you and moving traffic. Where this is not possible, use flaggers and/or signs to warn oncoming traffic of activities near or within the travel lanes.

- Face Traffic. Whenever feasible, if you must move within the 6 feet of the required free space or into traffic, attempt to face moving traffic at all times. Always leave yourself an escape route.

- Wear high-visibility vests to increase visual recognition by motorists.

- Do not rely on the vehicle operator's visibility, judgment, or ability. Make eye contact with the driver. Carefully and deliberately use hand signals so they will not startle or confuse motorists or be mistaken for a flagger's direction before moving into traffic.

- Your movements may startle a motorist and cause an accident, so move deliberately. Do not make sudden movements that might confuse a motorist.

6.0 PROCEDURES

The following procedures address surface and subsurface sampling.

> ***CAUTION***
> Each situation must be evaluated individually to determine the applicability and necessity for obtaining a utility clearance ticket/dig permit. Common sense dictates, prior to digging or boring with power equipment, no matter what the depth, or digging by hand in a manner that could damage unprotected underground utilities, that a dig permit is required. See SOP HS-1.0, Utility Locating and Excavation Clearance, for additional clarification. If you do not know or are unsure as to whether a ticket is necessary – **Get the Ticket**.

6.1 Overview

Soil sampling is an important adjunct to groundwater monitoring. Sampling of the soil horizons above the groundwater table can detect contaminants before they migrate to the water table, and can establish the amount of contamination absorbed or adsorbed on aquifer solids that have the potential of contributing to groundwater contamination.

Soil types can vary considerably on a hazardous waste site. These variations, along with vegetation, can affect the rate of contaminant migration through the soil. It is important, therefore, that a detailed record

be maintained during sampling operations, particularly noting sampling locations, depths, and such characteristics as grain size, color, and odor. Subsurface conditions are often stable on a daily basis and may demonstrate only slight seasonal variation especially with respect to temperature, available oxygen and light penetration. Changes in any of these conditions can radically alter the rate of chemical reactions or the associated microbiological community, thus further altering specific site conditions. Certain vegetation species can create degradation products that can alter contaminant concentrations in soil. This is why vegetation types and extent of degradation of this foliage must be recorded. To prevent degradation, samples must be kept at their at-depth temperature or lower, protected from direct light, sealed tightly in approved glass containers, and be analyzed as soon as possible after collection. In addition, to the extent possible, vegetation should be removed from the sample.

The physical properties of the soil, its grain size, cohesiveness, associated moisture, and such factors as depth to bedrock and water table, will limit the depth from which samples can be collected and the method required to collect them. It is the intent of this document to present the most commonly employed soil sampling methods used at hazardous waste sites.

6.2 Soil Sample Collection

6.2.1 Procedure for Preserving and Collecting Soil Samples for Volatile Organic Compound Analysis

Samples collected using traditional methods such as collection in a jar with no preservation have been known to yield non-representative samples due to loss of volatile organic compounds (VOCs). To prevent such losses, preservation of samples with methanol or sodium bisulfate may be used to minimize volatilization and biodegradation. This preservation may be performed either in the field or laboratory, depending on the sampling methodology employed. Because of the large number of sampling methods and associated equipment required, careful coordination between field and laboratory personnel is needed.

Soil samples to be preserved by the laboratory are currently being collected using Method SW-846, 5035. For samples preserved in the field, laboratories are currently performing low-level analyses (sodium bisulfate preservation) and high- to medium-level analyses (methanol preservation) depending on the needs of the end user.

The following procedures outline the necessary steps for collecting soil samples to be preserved at the laboratory, and for collecting soil samples to be preserved in the field with methanol or sodium bisulfate.

6.2.1.1 Soil Samples to be Preserved at the Laboratory

Soil samples collected for volatile organic analysis that are to be preserved at the laboratory shall be obtained using a hermetically sealed sample vial such as an EnCore™ sampler. Each sample shall be obtained using a reusable sampling handle (T-handle) that can be provided with the EnCore™ sampler when requested and purchased. Collect the sample in the following manner for each EnCore™ sampler:

1. Scene Safety - Evaluate the area where sampling will occur. Ensure that the area is safe from physical, chemical, and natural hazards. Clear or barricade those hazards that have been identified.

2. Wear the appropriate personal protective equipment (PPE). This will include, at a minimum, safety glasses and nitrile surgeon's gloves. If you must kneel on the ground or place equipment on the surface being sampled, cover the ground surface with plastic to minimize surface contamination of your equipment and clothing. Wear knee pads to protect your knees from kneeling on hard or uneven surfaces.

3. Load the Encore™ sampler into the T-handle with the plunger fully depressed.

4. Expose the area to be sampled using a hand trowel or similar device to remove surface debris.

5. Press the T-handle against the freshly exposed soil surface, forcing soil into the sampler. The plunger will be forced upward as the cavity fills with soil.

6. When the sampler is full, rotate the plunger and lock it into place. If the plunger does not lock, the sampler is not full. This method ensures there is no headspace. Soft soil may require several plunges or forcing soil against a hard surface such as a sample trowel to ensure that headspace is eliminated.

7. Use a paper towel to remove soil from the side of the sampler so a tight seal can be made between the sample cap and the rubber O-ring.

8. With soil slightly piled above the rim of the sampler, force the cap on until the catches hook the side of the sampler.

9. Remove any surface soil from the outside of the sampler and place in the foil bag provided with the sampler. Good work hygiene practices and diligent decontamination procedures prevents the spread of contamination even on the outside of the containers.

10. Label the bag with appropriate information in accordance with SOP SA-6.3.

11. Place the full sampler inside a lined cooler with ice and cool to 4°C ± 2 °C. Make sure any required trip blanks and temperature blanks are also in the cooler. Secure custody of the cooler in accordance with SOP SA-6.3.

12. Typically, collect three Encore™ samplers at each location. Consult the SAP or laboratory to determine the required number of Encore™ samplers to be collected.

13. The T-handle shall be decontaminated before moving to the next interval or location using a soap and water wash and rinse, and where applicable, the selected solvent as defined in the project planning documents.

Using this type of sampling device eliminates the need for field preservation and the shipping restrictions associated with preservatives. A complete set of instructions is included with each Encore™ sampler.

After the Encore™ samples are collected, they should be placed on ice immediately and delivered to the laboratory within 48 hours (following the chain-of-custody and documentation procedures outlined in SOP SA-6.1). Samples must be preserved by the laboratory within 48 hours of sample collection.

6.2.1.2 <u>Soil Samples to be Preserved in the Field</u>

Soil samples preserved in the field may be prepared for analyses using both the low-level (sodium bisulfate preservation) and high- to medium-level (methanol preservation) methods.

Safety Reminder

When using chemicals in the field to preserve samples, the FOL and/or SSO must ensure that Materials Safety Data Sheets (MSDSs) have been provided with the chemicals to be used. They also must ensure that these chemicals have been added to the Chemical Inventory List contained within Section 5.0, Hazard Communication, of your Health and Safety Guidance Manual (HSGM). Lastly, but most importantly, the FOL and/or SSO must review the hazards with personnel using these chemicals and ensure that provisions are available for recommended PPE and emergency measures (e.g., eyewash, etc.).

Methanol Preservation (High to Medium Level):

Bottles may be pre-spiked with methanol in the laboratory or prepared in the field. Soil samples to be preserved in the field with methanol shall utilize 40 to 60 mL glass vials with septum-lined lids. Each sample bottle shall be filled with 25 mL of demonstrated analyte-free purge-and-trap grade methanol. The preferred method for adding methanol to the sample bottle is by removing the lid and using a pipette or scaled syringe to add the methanol directly to the bottle.

CAUTION

NEVER attempt to pipette by mouth

In situations where personnel are required to spike the septum using a hypodermic needle, the following provisions for handling sharps must be in place:

- Training of personnel regarding methods for handling of sharps
- Hard-sided containers for the disposal of sharps
- Provisions for treatment in cases where persons have received a puncture wound

Soil shall be collected with the use of a decontaminated (or disposable), small-diameter coring device such as a disposable tube/plunger-type syringe with the tip cut off. The outside diameter of the coring device must be smaller than the inside diameter of the sample bottle neck.

A small electronic balance or manual scale will be necessary for measuring the volume of soil to be added to the methanol-preserved sample bottle. Calibration of the scale shall be performed prior to use and intermittently throughout the day according to the manufacturer's requirements.

The sample should be collected as follows:

1. Weigh the unused syringe and plunger to the nearest 0.01 gram.
2. Pull the plunger back and insert the syringe into the soil to be sampled.
3. Collect 8 to 12 grams of soil by pushing the syringe barrel into the soil.
4. Weigh the sample and adjust until obtaining the required amount of sample.
5. Record the sample weight to the nearest 0.01 gram in the field logbook and/or on the sample log sheet.
6. Extrude the weighed soil sample into the methanol-preserved sample bottle taking care not to contact the sample container with the syringe.

7. If dirty, wipe soil particles from the threads of the bottle and cap. Cap the bottle tightly.

8. After capping the bottle, swirl the sample (do not shake) in the methanol and break up the soil such that all of the soil is covered with methanol.

9. Place the sample on ice immediately and prepare for shipment to the laboratory as described in SOP SA-6.1.

Sodium Bisulfate Preservation (Low Level):

> ***CAUTION***
> Care should be taken when adding the soil to the sodium bisulfate solution. A chemical reaction of soil containing carbonates (limestone) may cause the sample to effervesce or the vial to possibly explode. To avoid this hazard or hazards of this type, a small sample aliquot should be subjected to the sample preservative. If it effervesces in an open air environment, utilize an alternative method such as Encore™ or 2-ounce jar.

Bottles may be prepared in the laboratory or in the field with sodium bisulfate solution. Samples to be preserved in the field using the sodium bisulfate method are to be prepared and collected as follows:

1. Add 1 gram of sodium bisulfate to 5 mL of laboratory-grade deionized water in a 40 to 60 mL glass vial with septum-lined lid.

2. Collect the soil sample and record the sample weight to the nearest 0.01 gram in the field logbook or on the sample log sheet as described for methanol preservation

3. Add the weighed sample to the sample vial.

4. Collect duplicate samples using the methanol preservation method on a one-for-one sample basis because it is necessary for the laboratory to perform both low-level and medium-level analyses.

5. Place the samples on ice immediately and prepare for shipment to the laboratory as described in SOP SA-6.1.

> ***NOTE***
> If lower detection limits are necessary, an option to field preserving with sodium bisulfate may be to collect EnCore™ samplers at a given sample location. Consult the planning documents to determine whether this is required. If it is, collect samples in accordance with the Encore™ sampling procedure above and then send all samplers to the laboratory to perform the required preservation and analyses.

6.2.2 Procedure for Collecting Soil Samples for Non-Volatile Analyses

Samples collected for non-volatile analyses may be collected as either grab or composite samples as follows:

1. With a stainless steel trowel or other approved tool, transfer a portion of soil to be sampled to a stainless steel bowl or disposable inert plastic tray.

2. Remove roots, vegetation, sticks, and stones larger than the size of a green pea.

3. Thoroughly mix the soil in the bowl or tray to obtain as uniform a texture and color as practicable. The soil type, moisture content, amount of vegetation, and other factors may affect the amount of time required to obtain a properly mixed sample. In some cases, it may be impossible to obtain a uniform sample appearance. Use the field logbook to describe any significant difficulties encountered in obtaining a uniform mixture.

4. Transfer the mixed soil to the appropriate sample containers and close the containers.

5. Label the sample containers in accordance with SOP SA-6.3.

6. Place the containers in a cooler of ice as soon after collection as possible.

7. Prepare the sample shipment and ship the samples in accordance with SOP SA-6.1.

> ***NOTE***
> Cooling may not be required for some samples depending on the scheduled analyses. Consult the planning documents if in doubt regarding correct sample preservation conditions. When in doubt – Cool to 4°C.

> ***NOTE***
> Head space is permitted in soil sample containers for non-volatile analyses to allow for sample expansion.

6.2.3 Procedure for Collecting Undisturbed Soil Samples

> ***NOTE***
> Use of thin-walled undisturbed tube samplers is restricted by the consistency of the soil to be sampled. Often, very loose and/or wet samples cannot be retrieved by the samplers, and soil with a consistency in excess of very stiff cannot be penetrated by the sampler. Devices such as Dennison or Pitcher core samplers can be used to obtain undisturbed samples of stiff soil. Using these devices normally increases sampling costs, and therefore their use should be weighed against the need for acquiring an undisturbed sample. These devices are not discussed in this SOP because they are not commonly used.

When it is necessary to acquire undisturbed samples of soil for purposes of engineering parameter analysis (e.g., permeability), a thin-walled, seamless tube sampler (Shelby tube) shall be employed using the following collection procedure:

1. In preparation for sampling utilizing a drill rig, field personnel must complete the following activities:

   - Ensure that all subsurface drilling activities are preceded by a utility clearance for the area to be investigated. This includes activities described in SOP HS-1.0, Utility Location and Excavation Clearance, as well as any location-specific procedures that may apply.

> ***REMEMBER***
> If you are digging near a marked utility (within the diameter of an underground utility that has been marked plus 18 inches), you must first locate the utility through vacuum extraction or hand digging to ensure that your activities will not damage the utility.

- Complete an Equipment Inspection Checklist for the drill rig or direct-push technology (DPT) rig. This checklist will be provided in the HASP.
- Review the Safe Work Permit prior to conducting the activity.
- Review the activity to be conducted.

2. Remove all surface debris (e.g., vegetation, roots, twigs, etc.) from the specific sampling location and drill and/or clean out the borehole to the desired sampling depth. Be careful to minimize potential disturbance of the material to be sampled. In saturated material, withdraw the drill bit slowly to prevent loosening of the soil around the borehole and to maintain the water level in the hole at or above groundwater level.

> ***CAUTION***
> The use of bottom-discharge bits or jetting through an open-tube sampler to clean out the borehole shall not be allowed. Only the use of side-discharge bits is permitted.

4. Determine whether a stationary piston-type sampler is required to limit sample disturbance and aid in retaining the sample. Either the hydraulically operated or control rod activated-type of stationary piston sampler may be used.

5. Prior to inserting the tube sampler into the borehole, check to ensure that the sampler head contains a check valve. The check valve is necessary to keep water in the rods from pushing the sample out the tube sampler during sample withdrawal. In addition, the check valve maintains a positive suction within the tube to help retain the sample.

6. A stainless steel tube sampler is typically used to minimize chemical reaction between the sample and the sampling tube.

7. With the sampling tube resting on the bottom of the hole and the water level in the boring at groundwater level or above, push the tube into the soil with a continuous and rapid motion, without impacting or twisting. If the soil is too hard to penetrate by pushing alone, careful hammering may be used by minimizing drop distance (tapping) of the hammer. Before pulling the tube, turn it at least one revolution to shear the sample off at the bottom. In no case shall the tube be pushed farther than the length provided for the soil sample. Allow about 3 inches in the tube for cuttings and sludge.

8. Upon removal of the sampling tube from the hole, measure the length of sample in the tube and also the length penetrated.

9. Remove disturbed material in the upper end of the tube and measure the length of sample again.

10. After removing at least 1 inch of soil from the lower end, place enough packing material (clean inert material such as paper or cloth) tightly in each end of the Shelby tube and then pour melted wax into each end to make at least a ½-inch wax plug and then add more packing material to fill the voids at both ends.

11. Place plastic caps on the ends, tape the caps in place, and dip the ends in wax to prevent loss of soil.

12. Affix label(s) to the tube as required and record sample number, depth, penetration, and recovery length on the label.

13. Mark the "up" direction on the side and upper end of the tube with indelible ink.

14. Complete a chain-of-custody form (see SOP SA-6.3) and other required forms (including Attachment A of this SOP).

15. Ship samples protected with suitable resilient packing material to reduce shock, vibration, and disturbance.

> ***CAUTION***
> To preserve sample integrity do not allow tubes to freeze, and store the samples vertically with the same orientation they had in the ground, (i.e., top of sample is up) in a cool place out of the sun at all times.

> ***CAUTION***
> A primary concern in the preparation of the wax plugs is the potential for the heat source and melted wax to cause a fire and/or burns. Follow the directions below to prevent injury or fire.
>
> **Electrical Heating**
>
> Using hot plates to melt the wax is acceptable. In an outdoor setting, make sure a Ground Fault Circuit Interrupter (GFCI) is employed within the electrical circuit. If a portable generator is used, ensure that the generator is an adequate distance from the sampling operation (at least 50 feet). Ensure that the extension cord is rated for the intended load and for outdoor use and is free from recognizable damage. Ensure flammable preservatives are not employed or stored near the hot plate. Although a Hot Work Permit is not required, scene safety evaluation by site personnel of the above elements is. As always, if a fire potential exists, the provisions for extinguishing must be immediately accessible as well as any provisions for first aid measures.
>
> **Open Flame**
>
> If an open flame is used, the following provisions are necessary:
>
> - Complete a Hot Work Permit and any local permit required for elevated temperature applications. The Hot Work Permit, provided in your HASP, will aid the FOL and/or the SSO in ensuring that fire protection provisions (extinguishers, fire watches, etc.) are in place as well as ensuring that local requirements have been addressed.
>
> - Ensure that water is available to address any wax splashes or contact. If possible, immerse the contacted area. Where this is not possible, run water over the area and apply cold compresses. The need for medical attention or first aid shall be determined on site under the direction of the SSO.

6.3 Surface Soil Sampling

The simplest, most direct method of collecting surface soil samples for subsequent analysis is by use of a stainless steel shovel, hand auger, soil corer, or stainless steel or disposable plastic trowel.

NOTE

Multiple depth intervals are used to describe surface soil. Sometimes surface soil is defined as soil from 0 to 2 inches below ground surface (bgs), and sometimes it is defined as soil from other depths such as 0 to 2 feet bgs. Ensure that the definition of surface soil depth is clear before collecting surface soil samples.

For the purposes of instruction, the terms "surface soil" and "near-surface soil" are used in this SOP as follows:

- Surface soil - 0 to 6 inches bgs
- Near-surface soil - 6 to 18 inches bgs

If these intervals are defined differently in the planning documents, substitute the appropriate depth ranges.

In general, the following equipment is necessary for obtaining surface soil samples:

- Stainless steel or pre-cleaned disposable trowel.
- Stainless steel hand auger, soil corer, or shovel.
- Real-time air monitoring instrument (e.g., PID, FID) as directed in project planning document.
- Required PPE.
  - Nitrile surgeon's or latex gloves may be used, layered as necessary.
  - Safety glasses
  - Other – Items identified on the Safe Work Permit may be required based on location-specific requirements such as hearing protection, steel-toed work boots, and a hard hat when working near a drill rig. These provisions will be listed in the HASP or directed by the FOL and/or SSO.

Safety Reminder

The use of latex products may elicit an allergic reaction in some people. Should this occur, remove the latex gloves, treat for an allergic reaction, and seek medical attention as necessary.

- Required paperwork (see SOP SA-6.3 and Attachment A of this SOP)
- Required decontamination equipment
- Required sample container(s)
- Wooden stakes or pin flags
- Sealable polyethylene bags (e.g., Ziploc® baggies)
- Heavy duty cooler

- Ice
- Chain-of-custody records and custody seals

When acquiring surface soil samples, use the following procedure:

1. Place padding or use knee pads when kneeling near the sample location. If necessary, place plastic sheeting to provide a clean surface for sample equipment to avoid possible cross- contamination.
2. Carefully remove vegetation, roots, twigs, litter, etc. to expose an adequate soil surface area to accommodate sample volume requirements.
3. Using a precleaned syringe or EnCore™ samplers, follow the procedure in Section 6.2.1 for collecting surface soil samples for volatile analysis. Surface soil samples for volatile organic analysis should be collected deeper than 6 inches bgs because shallower material has usually lost most of the volatiles through evaporation. Ensure that the appropriate surface soil depth is being analyzed in accordance with the planning document.
4. Using decontaminated sampling tools, thoroughly mix in place a sufficient amount of soil to fill the remaining sample containers. See Section 6.5 of this procedure for hand auger instruction, as needed.
5. Transfer the sample into those containers utilizing a stainless steel trowel.
6. Cap and securely tighten all sample containers.
7. Affix a sample label to each container. Be sure to fill out each label carefully and clearly, addressing all the categories described in SOP SA-6.3.
8. Proceed with the handling and processing of each sample container as described in SOP SA-6.2.
9. Site restoration – Whenever removing sample materials, always restore the surface. It is our intent to leave the area better than we found it. Do NOT create trip hazards in areas when pedestrian traffic may exist.

6.4 Near-Surface Soil Sampling

Collection of samples from near the surface (depth of 6 to 18 inches) can be accomplished with tools such as shovels, hand auger, soil corers, and stainless steel or pre-cleaned disposable trowels and the equipment listed under Section 6.5 of this procedure.

To obtain near-surface soil samples, the following protocol shall be used:

1. With a clean shovel, make a series of vertical cuts in the soil to the depth required to form a square approximately 1 foot by 1 foot.
2. Lever out the formed plug and scrape the bottom of the freshly dug hole with a decontaminated stainless steel or pre-cleaned disposable trowel to remove any loose soil.
3. Follow steps 1 through 9 of Section 6.3.

6.5 Subsurface Soil Sampling With a Hand Auger

A hand augering system generally consists of a variety of stainless steel bucket bits (approximately 6.5 inches long and 2, 2.75, 3.25, and 4 inches in diameter), series of extension rods (available in 2-, 3-, 4- and 5-inch lengths), and a T-handle connected to extension rods and to the auger bucket. A larger-diameter bucket bit is commonly used to bore a hole to the desired sampling depth and then it is withdrawn. The larger-diameter bit is then replaced with a smaller-diameter bit, lowered down the hole, and slowly turned into the soil to the completion depth (approximately 6 inches). The apparatus is then withdrawn and the soil sample collected.

The hand auger can be used in a wide variety of soil conditions. It can be used to sample soil either from the surface, or to depths in excess of 12 feet. However, the presence of subsurface rocks and landfill material and collapse of the borehole normally limit sampling depth.

To accomplish soil sampling using a hand augering system, the following equipment is required:

- Complete hand auger assembly (variety of bucket bit sizes)
- Stainless steel mixing bowls
- The equipment listed in Section 6.3
- Miscellaneous hand tools as required to assemble and disassemble the hand auger units

CAUTION

Potential hazards associated with hand augering include:

- Muscle strain and sprain due to over twisting and/or over compromising yourself.
- Equipment failure due to excessive stress on the T-handle or rods through twisting. Failure of any of these components will result in a sudden release and potential injury due to that failure.

As in all situations, any intrusive activities that could damage underground utilities shall be proceeded by a Dig/Excavation permit/ticket. Call the Utility Locating service in the area or your Project Health and Safety Officer for more information. When in doubt – **Get the Ticket!**

To obtain soil samples using a hand auger, use the following procedure:

1. Wearing designated PPE, attach a properly decontaminated bucket bit to a clean extension rod and attach the T-handle to the extension rod.
2. Clear the area to be sampled of any surface debris (vegetation, twigs, rocks, litter, etc.).
3. Twist the bucket into the ground while pushing vertically downward on the auger. The cutting shoes fill the bucket as it is advanced into the ground.
4. As the auger bucket fills with soil, periodically remove any unneeded soil.
5. Add rod extensions as necessary to extend the reach of the auger. Also, note (in a field notebook, boring log, and/or on a standardized data sheet) any changes in the color, texture or odor of the soil as a function of depth. The project-specific planning document (SAP, HASP, etc.) describe

requirements for scanning the soil with a real-time air monitoring instrument (e.g., PID, FID, etc.) and recording the measurements.

6. After reaching the desired depth (e.g., the top of the interval to be sampled), slowly and carefully withdraw the apparatus from the borehole to prevent or minimize movement of soil from shallower intervals to the bottom of the hole.

7. Remove the soiled bucket bit from the rod extension and replace it with another properly decontaminated bucket bit. The bucket bit used for sampling is to be smaller in diameter than the bucket bit employed to initiate the borehole.

8. Carefully lower the apparatus down the borehole. Care must be taken to avoid scraping the borehole sides.

9. Slowly turn the apparatus until the bucket bit is advanced approximately 6 inches.

10. Discard the top of the core (approximately 1 inch), which represents any loose material collected by the bucket bit before penetrating the sample material.

11. Using a precleaned syringe or EnCore™ samplers, follow the procedure in Section 6.2.1 for collecting a soil sample for volatile compound analysis directly from the bucket bit.
12. Utilizing a properly decontaminated stainless steel trowel or dedicated disposable trowel, remove the remaining sample material from the bucket bit and place into a properly decontaminated stainless steel mixing bowl.

13. Homogenize the sample material as thoroughly as practicable then fill the remaining sample containers. Refer to Section 6.2.2.

14. Follow steps 4 through 7 listed in Section 6.3.

6.5.1 Sampling Using Stainless Steel Soil Corers

A soil corer is a stainless steel tube equipped with a cutting shoe and sample window in the side. The soil corer is advanced into the soil by applying downward pressure (body weight). The soil is unloaded by then forcing a ram towards the cutting shoe, which results in the discharge of the soil core through a window in the sleeve.

Use, application, and sample protocol is the same as for hand augering provided above, but without necessarily rotating the corer while advancing it.

SAFETY REMINDER

Hand augering and soil corer sampling can be physically demanding based on the type of geology and subsurface encumbrances encountered. Soil coring has some added hazards such the corer collapsing under your weight. To reduce the potential for muscle strain and damage, the following measures will be incorporated:

- Stretch and limber your muscles before heavy exertion. This hazard becomes more predominant in the early morning hours (prior to muscles becoming limber) and later in the day (as a result of fatigue).

- Job rotation – Share the duties so that repetitive actions do not result in fatigue and injury.

- Increase break frequencies as needed, especially as ambient conditions of heat and/or cold stress may dictate.

- Do not force the hand tools or use cheater pipes or similar devices to bypass an obstruction. Move to another location near the sampling point. Exerting additional forces on the sampling devices can result in damage and/or failure that could potentially injure someone in the immediate vicinity.

- Do not over compromise yourself when applying force to the soil corer or hand auger. If there is a sudden release, it could result in a fall or muscle injury due to strain.

6.6 Subsurface Soil Sampling with a Split-Barrel Sampler

A split-barrel (split-spoon) sampler consists of a heavy carbon steel or stainless steel sampling tube that can be split into two equal halves to reveal the soil sample (see Attachment B). A drive head is attached to the upper end of the tube and serves as a point of attachment for the drill rod. A removable tapered nosepiece/drive shoe attaches to the lower end of the tube and facilitates cutting. A basket-like sample retainer can be fitted to the lower end of the split tube to hold loose, dry soil samples in the tube when the sampler is removed from the drill hole. This split-barrel sampler is made to be attached to a drill rod and forced into the ground by means of a 140-pound or larger casing driver.

Safety Reminder

It is intended through the Equipment Inspection for Drill Rigs form provided in the HASP that the hammer and hemp rope, where applicable, associated with this activity will be inspected (no physical damage is obvious), properly attached to the hammer (suitable knots or sufficient mechanical devices), and is in overall good condition.

Split-barrel samplers are used to collect soil samples from a wide variety of soil types and from depths greater than those attainable with other soil sampling equipment.

The following equipment is used for obtaining split-barrel samples:

- Drilling equipment (provided by subcontractor).
- Split-barrel samplers (2-inch OD, 1-3/8-inch ID, either 20 inches or 26 inches long); Larger OD samplers are available if a larger volume of sample is needed.
- Drive weight assembly, 140-pound weight, driving head, and guide permitting free fall of 30 inches.
- Stainless steel mixing bowls.
- Equipment listed in Section 6.3.

The following steps shall be followed to obtain split-barrel samples (Steps 1 through 4 are typically performed by the drilling subcontractor):

1. Attach the split-barrel sampler to the sampling rods.

2. Lower the sampler into the borehole inside the hollow stem auger bits.

3. Advance the split-barrel sampler by hammering the length (typically 18 or 24 inches) of the split-barrel sampler into the soil using 140-pound or larger hammer.

4. When the desired depth is achieved, extract the drill rods and sampler from the augers and/or borehole.

5. Detach the sampler from the drill rods.

6. Place the sampler securely in a vise so it can be opened using pipe wrenches.

> ***CAUTION***
> Pipe wrenches are used to separate the split spoon into several components. The driller's helper should not apply excessive force through the use of cheater pipes or push or pull in the direction where, if the wrench slips, hands or fingers will be trapped against an immovable object.

7. Remove the drive head and nosepiece with the wrenches, and open the sampler to reveal the soil sample.

8. Immediately scan the sample core with a real-time air monitoring instrument (e.g., FID, PID, etc.) (as project-specific planning documents dictate). Carefully separate (or cut) the soil core, with a decontaminated stainless steel knife or trowel, at about 6-inch intervals while scanning the center of the core for elevated readings. Also scan stained soil, soil lenses, and anomalies (if present), and record readings.

9. If elevated vapor readings were observed, collect the sample scheduled for volatile analysis from the center of the core where elevated readings occurred. If no elevated readings where encountered, the sample material should be collected from the core's center (this area represents the least disturbed area with minimal atmospheric contact) (refer to Section 6.2.1).

10. Using the same trowel, remove remaining sample material from the split-barrel sampler (except for the small portion of disturbed soil usually found at the top of the core sample) and place the soil into a decontaminated stainless steel mixing bowl.

11. Homogenize the sample material as thoroughly as practicable then fill the remaining sample containers (refer to Section 6.2.2).

12. Follow steps 4 through 7 in Section 6.3.

6.7 Subsurface Soil Sampling Using Direct-Push Technology

Subsurface soil samples can be collected to depths of 40+ feet using DPT. DPT equipment, responsibilities, and procedures are described in SOP SA-2.5.

~~6.8 Excavation and Sampling of Test Pits and Trenches~~

~~6.8.1 Applicability~~

~~This subsection presents routine test pit or trench excavation techniques and specialized techniques that are applicable under certain conditions.~~

CAUTION

During the excavation of trenches or pits at hazardous waste sites, several health and safety concerns arise from the method of excavation. No personnel shall enter any test pit or excavation over 4 feet deep except as a last resort, and then only under direct supervision of a Competent Person (as defined in 29 CFR 1929.650 of Subpart P - Excavations). Whenever possible, all required chemical and lithological samples should be collected using the excavator bucket or other remote sampling apparatus. If entrance is required, all test pits or excavations must be stabilized by bracing the pit sides using specifically designed wooden, steel, or aluminum support structures or through sloping and benching. Personnel entering the excavation may be exposed to toxic or explosive gases and oxygen-deficient environments; therefore, monitoring will be conducted by the Competent Person to determine if it is safe to enter. Any entry into a trench greater than 4 feet deep will constitute a Confined Space Entry and must be conducted in conformance with OSHA standard 29 CFR 1910.146. In all cases involving entry, substantial air monitoring, before entry, appropriate respiratory gear and protective clothing determination, and rescue provisions are mandatory. There must be at least three people present at the immediate site before entry by one of the field team members. This minimum number of people will increase based on the potential hazards or complexity of the work to be performed. The reader shall refer to OSHA regulations 29 CFR 1926.650, 29 CFR 1910.120, 29 CFR 1910.134, and 29 CFR 1910.146. High-hazard entries such as this will be supported by members of the Health Sciences Group professionally trained in these activities.

Excavations are generally not practical where a depth of more than about 15 to 20-feet is desired, and they are usually limited to a few feet below the water table. In some cases, a pumping system may be required to control water levels within the pit, providing that pumped water can be adequately stored or disposed. If soil data at depths greater than 15-feet are required, the data are usually obtained through test borings instead of test pits.

In addition, hazardous wastes may be brought to the surface by excavation equipment. This material, whether removed from the site or returned to the subsurface, must be properly handled according to any and all applicable federal, state, and local regulations.

6.8.2 Test Pit and Trench Excavation

Test pits or trench excavations are constructed with the intent that they will provide an open view of subsurface lithology and/or disposal conditions that a boring will not provide. These procedures describe the methods for excavating and logging test pits and trenches installed to determine subsurface soil and rock conditions. Test pit operations shall be logged and documented (see Attachment C).

Test pits and trenches may be excavated by hand or power equipment to permit detailed descriptions of the nature and contamination of the in-situ materials. The size of the excavation will depend primarily on the following:

- The purpose and extent of the exploration
- The space required for efficient excavation
- The chemicals of concern
- The economics and efficiency of available equipment

Test pits normally have a cross section that is 4 to 10 feet square; test trenches are usually 3 to 6 feet wide and may be extended for any length required to reveal conditions along a specific line. The following table provides guidelines for design consideration based on equipment efficiencies.

Equipment	Typical Widths, in Feet
Trenching machine	0.25 to 1.0
Backhoe/Track Hoe	2 to 6

The lateral limits of excavation of trenches and the position of test pits shall be carefully marked on area base maps. If precise positioning is required to indicate the location of highly hazardous materials, nearby utilities, or dangerous conditions, the limits of the excavation shall be surveyed. Also, if precise determination of the depth of buried materials is needed for design or environmental assessment purposes, the elevation of the ground surface at the test pit or trench location shall also be determined by survey. If the test pit/trench will not be surveyed immediately, it shall be backfilled and its position identified with stakes placed in the ground at the margin of the excavation for later surveying.

The construction of test pits and trenches shall be planned and designed in advance as much as possible. However, the following field conditions may necessitate revisions to the initial plans:

- Subsurface utilities
- Surface and subsurface encumbrances
- Vehicle and pedestrian traffic patterns
- Purpose for excavation (e.g., the excavation of potential ordnance items)

The final depth and construction method shall be collectively determined by the FOL and designated Competent Person. The actual layout of each test pit, temporary staging area, and spoils pile may further be predicated based on site conditions and wind direction at the time the test pit is excavated. Prior to excavation, the area may be surveyed by magnetometer or metal detector or other passive methods specified in SOP HS1.0, Utility Location and Excavation Clearance, to identify the presence of underground utilities or drums. Where possible, the excavator should be positioned upwind and preferably within an enclosed cab.

No personnel shall enter any test pit or excavation except as a last resort, and then only under direct supervision of a Competent Person. If entrance is required, OSHA requirements must be met (e.g., walls must be braced with wooden or steel braces, ladders must be placed for every 25 feet of lateral travel and extended 3 feet above ground surface). A temporary guard rail or vehicle stop must be placed along the surface of the hole before entry in situations where the excavation may be approached by traffic. Spoils will be stockpiled no closer than 2 feet from the sidewall of the excavation. The excavation equipment operator shall be careful not to undercut sidewalls and will, where necessary, bench back to increase stability. The top cover, when considered clean, will be placed separately from the subsurface materials to permit clean cover. It is emphasized that the project data needs should be structured such that required samples can be collected without requiring entrance into the excavation. For example, samples of leachate, groundwater, or sidewall soil can be collected with telescoping poles or similar equipment.

Dewatering and watering may be required to ensure the stability of the side walls, to prevent the bottom of the pit from heaving, and to keep the excavation stable. This is an important consideration for excavations in cohesionless material below the groundwater table and for excavations left open greater than a day. Liquids removed as a result of dewatering operations must be handled as potentially contaminated materials. Procedures for the collection and disposal of such materials should be discussed in the site-specific project plans.

Where possible excavations and test pits shall be opened and closed within the same working day. Where this is not possible, the following engineering controls shall be put in place to control access:

- Trench covers/street plates
- Fences encompassing the entire excavation intended to control access
- Warning signs warning personnel of the hazards
- Amber flashing lights to demarcate boundaries of the excavation at night

Excavations left open will have emergency means to exit should someone accidentally enter.

6.8.3 Sampling in Test Pits and Trenches

6.8.3.1 General

Log test pits and trenches as they are excavated in accordance with the Test Pit Log presented in Attachment C. These records include plan and profile sketches of the test pit/trench showing materials encountered, their depth and distribution in the pit/trench, and sample locations. These records also include safety and sample screening information.

Entry of test pits by personnel is extremely dangerous, shall be avoided unless absolutely necessary, and can occur only after all applicable health and safety and OSHA requirements have been met as stated above. These provisions will be reiterated as appropriate in the project-specific HASP.

The final depth and type of samples obtained from each test pit will be determined at the time the test pit is excavated. Sufficient samples are usually obtained and analyzed to quantify contaminant distribution as a function of depth for each test pit. Additional samples of each waste phase and any fluids encountered in each test pit may also be collected.

In some cases, samples of soil may be extracted from the test pit for reasons other than waste sampling and chemical analysis, for instance, to obtain geotechnical information. Such information includes soil types, stratigraphy, strength, etc., and could therefore entail the collection of disturbed (grab or bulk) or relatively undisturbed (hand-carved or pushed/driven) samples that can be tested for geotechnical properties. The purposes of such explorations are very similar to those of shallow exploratory or test borings, but often test pits offer a faster, more cost-effective method of sampling than installing borings.

6.8.3.2 Sampling Equipment

The following equipment is needed for obtaining samples for chemical or geotechnical analysis from test pits and trenches:

- Backhoe or other excavating machinery.
- Shovels, picks, hand augers, and stainless steel trowels/disposable trowels.
- Sample container - bucket with locking lid for large samples; appropriate bottle ware for chemical or geotechnical analysis samples.
- Polyethylene bags for enclosing sample containers; buckets.
- Remote sampler consisting of 10-foot sections of steel conduit (1-inch-diameter), hose clamps, and right angle adapter for conduit (see Attachment D).

6.8.3.3 Sampling Methods

The methods discussed in this section refer to test pit sampling from grade level. If test pit entry is required, see Section 6.8.3.4.

- Excavate the trench or pit in several 0.5- to 1.0-foot depth increments. Where soil types support the use of a sand bar cutting plate, use of this device is recommended to avoid potentially snagging utilities with the excavator teeth. It is recommended that soil probes or similar devices be employed where buried items or utilities may be encountered. This permits the trench floor to be probed prior to the next cut.

- After each increment:

  - the operator shall wait while the sampler inspects the test pit from grade level

  - the sampler shall probe the next interval where this is considered necessary.. Practical depth increments for lithological evaluations may range from 2 to 4 feet i or where lithological changes are noted.

- The backhoe operator, who will have the best view of the test pit, shall immediately cease digging if:

  - Any fluid phase, including groundwater seepage, is encountered in the test pit

  - Any drums, other potential waste containers, obstructions, or utility lines are encountered

  - Distinct changes of material being excavated are encountered

This action is necessary to permit proper sampling of the test pit and to prevent a breach of safety protocol. Depending on the conditions encountered, it may be required to excavate more slowly and carefully with the backhoe.

For obtaining test pit samples from grade level, the following procedure shall be followed:

- Use the backhoe to remove loose material from the excavation walls and floor to the greatest extent possible.

- Secure the walls of the pit, if necessary. (There is seldom any need to enter a pit or trench that would justify the expense of shoring the walls. All observations and samples should be taken from the ground surface.)

- Samples of the test pit material are to be obtained either directly from the backhoe bucket or from the material after it has been deposited on the ground, as follows:

  a. The sampler or FOL shall direct the backhoe operator to remove material from the selected depth or location within the test pit/trench.

  b. The backhoe operator shall bring the bucket over to a designated location on the sidewall a sufficient distance from the pit (at least 5 feet) to allow the sampler to work around the bucket.

  c. After the bucket has been set on the ground, the backhoe operator shall either disengage the controls or shut the machine down.

  d. When signaled by the operator that it is safe to do, the sampler will approach the bucket.

e. The soil shall be monitored with a photoionization or flame ionization detector (PID or FID) as directed in the project -specific planning documents.

f. The sampler shall collect the sample from the center of the bucket or pile in accordance with surface soil sampling procedures of Section 6.3 or 6.4, as applicable. Collecting samples from the center of a pile or bucket eliminates cross-contamination from the bucket or other depth intervals.

- If a composite sample is desired, several depths or locations within the pit/trench will be selected, and the bucket will be filled from each area. It is preferable to send individual sample bottles filled from each bucket to the laboratory for compositing under the more controlled laboratory conditions. However, if compositing in the field is required, each sample container shall be filled from materials that have been transferred into a mixing bucket and homogenized. Note that homogenization/compositing is not applicable for samples to be subjected to volatile organic analysis.

> ***CAUTION***
> Care must be exercised when using the remote sampler described in the next step because of potential instability of trench walls. In situations where someone must move closer than 2 feet to the excavation edge, a board or platform should be used to displace the sampler's weight to minimize the chance of collapse of the excavation edge. Fall protection should also be employed when working near the edges or trenches greater than 6 feet deep. An immediate means to extract people who have fallen into the trench will be immediately available. These means may include ladders or rope anchor points.

- Using the remote sampler shown in Attachment D, samples can be taken at the desired depth from the sidewall or bottom of the pit as follows:

  a. Scrape the face of the pit/trench using a long-handled shovel or hoe to remove the smeared zone that has contacted the backhoe bucket.

  b. Collect the sample directly into the sample jar, by scraping with the jar edge, eliminating the need for sample handling equipment and minimizing the likelihood of cross-contamination.

  c. Cap the sample jar, remove it from the remote sampler assembly, and package the sample for shipment in accordance with SOP SA-6.3.

- Complete documentation as described in SOP SA-6.3 and Attachment C of this SOP.

6.8.3.4 <u>In-Pit Sampling</u>

Under rare conditions, personnel may be required to enter the test pit/trench. This is necessary only when soil conditions preclude obtaining suitable samples from the backhoe bucket (e.g., excessive mixing of soil or wastes within the test pit/trench) or when samples from relatively small discrete zones within the test pit are required. This approach may also be necessary to sample any seepage occurring at discrete levels or zones in the test pit that are not accessible with remote samplers.

In general, personnel shall sample and log pits and trenches from the ground surface, except as provided for by the following criteria:

- There are no practical alternative means of obtaining such data.
- The SSO and Competent Person determine that such action can be accomplished without breaching site safety protocol. This determination will be based on actual monitoring of the pit/trench after it is dug (including, at a minimum, measurements of oxygen concentration, flammable gases, and toxic compounds, in that order). Action levels will be provided in project-specific planning documents.
- A company-designated Competent Person determines that the pit/trench is stable trough soil classification evaluation/inspections or is made stable (by cutting/grading the sidewalls or using shoring) prior to entrance of any personnel. OSHA requirements shall be strictly observed.

If these conditions are satisfied, only one person may enter the pit/trench. On potentially hazardous waste sites, this individual shall be dressed in selected PPE as required by the conditions in the pit. He/she shall be affixed to a harness and lifeline and continuously monitored while in the pit.

A second and possible third individual shall be fully dressed in protective clothing including a self-contained breathing device and on standby during all pit entry operations to support self rescue or assisted self rescue. The individual entering the pit shall remain therein for as brief a period as practical, commensurate with performance of his/her work. After removing the smeared zone, samples shall be obtained with a decontaminated trowel or spoon. [TMD1]

6.8.3.5 Geotechnical Sampling

In addition to the equipment described in Section 6.8.3.2, the following equipment is needed for geotechnical sampling:

- Soil sampling equipment, similar to that used in shallow drilled boring (i.e., thin-walled tube samplers), that can be pushed or driven into the floor of the test pit.
- Suitable driving (e,g., sledge hammer) or pushing (e.g., backhoe bucket) equipment used to advance the sampler into the soil.
- Knives, spatulas, and other suitable devices for trimming hand-carved samples.
- Suitable containers (bags, jars, tubes, boxes, etc.), labels, wax, etc. for holding and safely transporting collected soil samples.
- Geotechnical equipment (pocket penetrometer, torvane, etc.) for field testing collected soil samples for classification and strength properties.

Disturbed grab or bulk geotechnical soil samples may be collected for most soil in the same manner as comparable soil samples for chemical analysis. These collected samples may be stored in jars or plastic-lined sacks (larger samples), which will preserve their moisture content. Smaller samples of this type are usually tested for their index properties to aid in soil identification and classification: larger bulk samples are usually required to perform compaction tests.

Relatively undisturbed samples are usually extracted in cohesive soil using thin-walled tube samplers, and such samples are then tested in a geotechnical laboratory for their strength, permeability, and/or compressibility. The techniques for extracting and preserving such samples are similar to those used in performing Shelby tube sampling in borings, except that the sampler is advanced by hand or backhoe, rather than by a drill rig. Also, the sampler may be extracted from the test pit by excavation around the tube when it is difficult to pull it out of the ground. If this excavation requires entry of the test pit, the requirements described in Section 6.8.3.4 shall be followed. The thin-walled tube sampler shall be

pushed or driven vertically into the floor or steps excavated in the test pit at the desired sampling elevations. Extracting tube samples horizontally from the walls of the test pit is not appropriate because the sample will not have the correct orientation.

A sledge hammer or backhoe may be used to drive or push the tube into the ground. Place a piece of wood over the top of the sampler or sampling tube to prevent damage during driving/pushing of the sample. Pushing the sampler with a constant thrust is always preferable to driving it with repeated blows, thus minimizing disturbance to the sample. When using a sledge hammer, it is recommended that the sampler be stabilized using a rope/strap wrench or pipe wrench to remove the person's hands holding the sampler from the strike zone. If the sample cannot be extracted by rotating it at least two revolutions (to shear off the sample at the bottom), hook the sampler to the excavator or backhoe and extract. This means an alternative head will be used as a connection point or that multiple choke hitches will be applied to extract the sampler. If this fails and the excavator can dig deeper without potentially impacting subsurface utilities, excavate the sampler. If this fails or if the excavator cannot be used due to subsurface utilities, hand-excavate to remove the soil from around the sides of the sampler. If hand-excavation requires entry into the test pit, the requirements in Section 6.8.3.4 must be followed. Prepare the sample as described in Steps 9 through 13 in Section 6.2.3, and label, pack and transport the sample in the required manner, as described in SOPs SA-6.3 and SA-6.1.

6.8.4 Backfilling of Trenches and Test Pits

All test pits and excavations must be either backfilled, covered, or otherwise protected at the end of each day. No excavations shall remain open during non-working hours unless adequately covered or otherwise protected.

Before backfilling, the onsite crew may photograph, if required by the project-specific work plan, all significant features exposed by the test pit and trench and shall include in the photograph a scale to show dimensions. Photographs of test pits shall be marked to include site number, test pit number, depth, description of feature, and date of photograph. In addition, a geologic description of each photograph shall be entered in the site logbook. All photographs shall be indexed and maintained as part of the project file for future reference.

After inspection, backfill material shall be returned to the pit under the direction of the FOL. Backfill should be returned to the trench or test pit in 6-inch to 1-foot lifts and compacted with the bucket. Remote controlled tampers or rollers may be lowered into the trench and operated from top side. This procedure will continue to the grade surface. It is recommended that the trench be tracked or rolled in. During excavation, clean soil from the top 2 feet may have been separated to be used to cover the last segments. Where these materials are not clean, it is recommended that clean fill be used for the top cover.

If a low-permeability layer is penetrated (resulting in groundwater flow from an upper contaminated flow zone into a lower uncontaminated flow zone), backfill material must represent original conditions or be impermeable. Backfill could consist of a soil-bentonite mix prepared in a proportion specified by the FOL (representing a permeability equal to or less than original conditions). Backfill can be covered by "clean" soil and graded to the original land contour. Revegetation of the disturbed area may also be required.

6.9 Records

The appropriate sample log sheet (see Attachment A of this SOP) must be completed by the site geologist/sampler for all samples collected. All soil sampling locations should be documented by tying in the location of two or more nearby permanent landmarks (building, telephone pole, fence, etc.) or obtaining GPS coordinates; and shall be noted on the appropriate sample log sheet, site map, or field notebook. Surveying may also be necessary, depending on the project requirements.

Test pit logs (see Attachment C of this SOP) shall contain a sketch of pit conditions. If the project-specific work plan requires photographs, at least one photograph with a scale for comparison shall be taken of each pit. Included in the photograph shall be a card showing the test pit number. Boreholes, test pits, and trenches shall be logged by the field geologist in accordance with SOP GH-1.5.

Other data to be recorded in the field logbook include the following:

- Name and location of job
- Date of boring and excavation
- Approximate surface elevation
- Total depth of boring and excavation
- Dimensions of pit
- Method of sample acquisition
- Type and size of samples
- Soil and rock descriptions
- Photographs if required
- Groundwater levels
- PID/FID/LEL/O_2 meter readings
- Other pertinent information, such as waste material encountered

In addition, site-specific documentation to be maintained by the SSO and/or Competent Person will be required including:

- Calibration logs
- Excavation inspection checklists
- Soil type classification

7.0 REFERENCES

American Society for Testing and Materials, 1987. ASTM Standards D1587-83 and D1586-84. ASTM Annual Book of Standards. ASTM. Philadelphia, Pennsylvania. Volume 4.08.

NUS Corporation, 1986. Hazardous Material Handling Training Manual.

NUS Corporation and CH2M Hill, August, 1987. Compendium of Field Operation Methods. Prepared for the U.S. EPA.

OSHA, Excavation, Trenching and Shoring 29 CFR 1926.650-653.

OSHA, Confined Space Entry 29 CFR 1910.146.

USEPA, November 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual.

ATTACHMENT A

SOIL & SEDIMENT SAMPLE LOG SHEET

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: _____
Project No.: _____

[] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other: _____
[] QA Sample Type: _____

Sample ID No.: _____
Sample Location: _____
Sampled By: _____
C.O.C. No.: _____

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings				
(Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

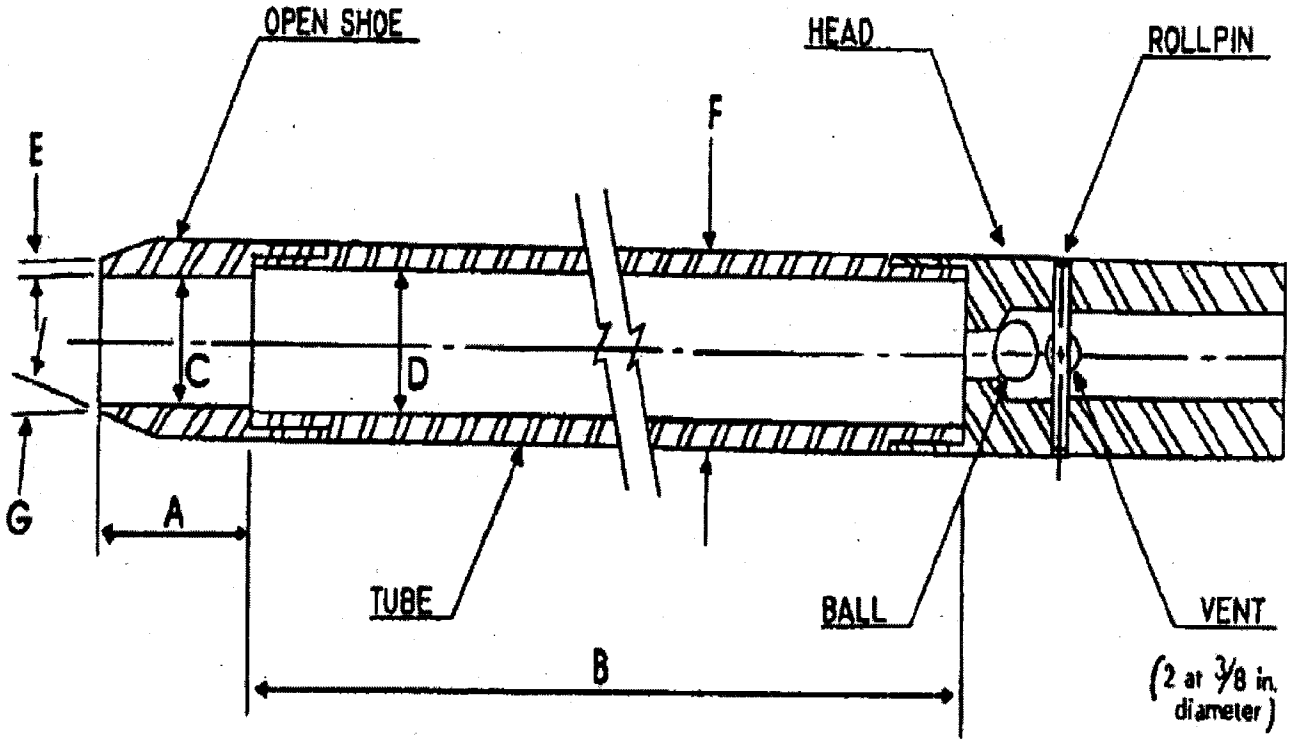
Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

ATTACHMENT B

SPLIT-SPOON SAMPLER



A = 1.0 to 2.0 in. (25 to 50 mm)
B = 18.0 to 30.0 in. (0.457 to 0.762 m)
C = 1.375 ± 0.005 in. (34.93 ± 0.13 mm)
D = 1.50 ± 0.05 – 0.00 in. (38.1 ± 1.3 – 0.0 mm)
E = 0.10 ± 0.02 in. (2.54 ± 0.25 mm)
F = 2.00 ± 0.05 – 0.00 in. (50.8 ± 1.3 – 0.0 mm)
G = 18.0° to 23.0°

The 1½ in. (38 mm) inside diameter split barrel may be used with a 16-gage wall thickness split liner. The penetrating end of the drive shoe may be slightly rounded. Metal or plastic retainers may be used to retain soil samples.

ATTACHMENT C

TEST PIT LOG

TEST PIT LOG

Tetra Tech NUS, Inc.

Page ___ of ___

PROJECT NAME: _____ TEST PIT No.: _____
PROJECT NUMBER: _____ DATE: _____
LOCATION: _____ GEOLOGIST: _____

Depth (Ft.)	Lithology Change (Depth/Ft.)	MATERIAL DESCRIPTION Soil/Waste Characteristics (lithology, density, color, etc.)	USCS	Remarks	PID/FID READING Source (ppm)	PID/FID READING BZ (ppm)

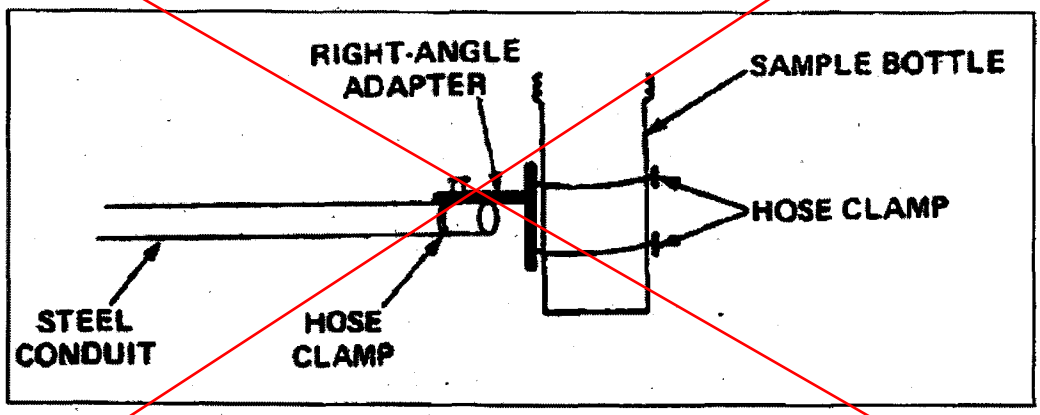
TEST PIT CROSS SECTION AND / OR PLAN VIEW

REMARKS: _____

PHOTO LOG: _____

ATTACHMENT D

REMOTE SAMPLE HOLDER FOR TEST PIT/TRENCH SAMPLING



TECHNICAL GUIDE

COLLECTING GROUNDWATER SAMPLES FOR PERCHLORATE

Prepared by: DoD Environmental Data Quality Workgroup **Date:**_____

Reviewed by: _____ **Date:**_____

Approved by: _____ **Date:** _____

1.0 Scope & Application

1.1 This Technical Guide (TG) has been developed to generate consistency across DoD for the collection and analysis of groundwater samples for perchlorate.

1.2 The use of this TG is restricted to individuals familiar with groundwater sampling methods.

2.0 Summary of Method

2.1 Low-Flow Purging and Sampling (LFPS) procedures are the preferred method for sampling groundwater wells for perchlorate. However, because of the solubility and stability of perchlorate, samples may be collected using any standard groundwater sampling method that meets the project-specific data quality objectives (DQOs) for sample representativeness.

2.2 Materials typically used in the construction of wells or the manufacture of sampling equipment do not affect perchlorate.

2.3 Analyses of perchlorate samples must be performed by laboratories that meet the requirements of the *DoD Perchlorate Handbook* and the *DoD Quality Systems Manual for Environmental Laboratories* (DoD-QSM) (http://www.navylabs.navy.mil/ManualsDocs.htm).

3.0 Health and Safety Warnings

3.1 This guide does not attempt to address all health and safety issues. The user must determine applicable requirements and establish appropriate health and safety protective measures.

3.2 Users of this guide should review the site health and safety plan with specific emphasis placed on hazards related to well sampling tasks. Follow standard safe operating practices.

3.3 When working with potentially hazardous materials, follow U.S. EPA, OSHA and Service-specific health and safety regulations, polices and procedures.

4.0 Interferences

4.1 The use of disposable/dedicated sampling equipment is recommended to eliminate the potential for sample contamination from documented sources of interferences such as detergents.

4.2 If non-disposable/dedicated sampling equipment is used, proper field decontamination techniques must be followed.

4.3 If perchlorate is the only target analyte, an acceptable decontamination procedure is to use a non-phosphate soap wash, followed by a deionized water rinse and air drying.

4.4 If the investigation includes additional target analytes, then samplers should follow standard decontamination practices for those analytes, except that non-phosphate detergent must be used.

4.5 Field samplers must use a rinsate blank to determine that the decontamination has been effective.

4.6 Filtration is used to remove microorganisms and suspended solids.

5.0 Equipment and Supplies

5.1 Sampling equipment is typically constructed from Teflon®, stainless steel, PVC, polyethylene, or polypropylene. These materials are all suitable for perchlorate sampling.

6.0 Sample Collection

6.1 Standard groundwater sampling equipment and procedures may be used to collect groundwater samples for perchlorate analysis. Dissolved perchlorate will not volatilize, so agitation of the sample or entrained air bubbles from the sampling equipment does not interfere with the analytical results. Standard Low-Flow Purging and Sampling (LFPS) procedures are the preferred method to be used to collect representative groundwater samples. Examples of low-flow purging and sampling procedures are:

- EPA Region I Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells, July 30, 1996, Revision 2.
- Puls, R.W. and Barcelona, M.J., "Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedure", U.S. Environmental Protection Agency, Office of Research and Development, Publication # EPA/540/5-95/, pp. 12.
- ASTM D6771-2, "Standard Practice For Low Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations"

6.1.1 Wells that are continuously pumped or under regular use, so that water in the wells does not have an opportunity to become stagnant (e.g., operating recovery wells, municipal supply wells, and domestic supply wells), can be sampled without additional purging. In such cases the well can be sampled using any appropriate technique. Approval by the regulatory agency may be required.

6.1.2 In those situations where the groundwater conditions and well construction make it appropriate, no-purge sampling methods with devices (e.g. Hydrasleeve and Snap sampler) that are demonstrated to collect representative samples for perchlorate may be used. Approval by the regulatory agency may be required.

6.2 If sample collection is required for other analytes, sampling methods and procedures will be dictated by the sampling requirements for the most sensitive parameters.

6.2.1 Samples must be collected in order of decreasing volatility of target analytes. Samples for volatile organic compounds are normally collected first, followed by semivolatile organic compounds and finally inorganic compounds. The sampling order will be specified by the sampling and analysis plan or permit.

6.3 Once sampling is complete, all field documentation records and chain-of-custody forms must be completed.

6.4 Some sites may be contaminated with light non-aqueous-phase liquids (LNAPLs) or dense non-aqueous-phase liquids (DNAPL), or both, in addition to perchlorate. The presence of DNAPLs and LNAPLs should not affect the sampling procedures for perchlorate. When possible, collect the sample above the DNAPLs or below the LNAPLs.

6.5 If there is potential for high-density perchlorate solutions to occur at a site (Perchlorate concentrations > 10,000 ppm) the solution will likely behave like a DNAPL. If monitoring for perchlorate is required in the presence of a high-density perchlorate brine solution, consult the DoD Perchlorate Handbook for additional guidance.

7.0 Sample Handling and Preservation

7.1 Filter the sample through a sterile 0.2µm filter, to remove microorganisms and eliminate

suspended solids. In cases where it is difficult to filter the sample through the 0.2µm filter, pre-filtering through a 0.45µM may be necessary. Collect 80 mL filtered sample in the sterile sample container. After filtering, store the samples with headspace in order to minimize the possibility of anaerobic conditions developing during sample storage.

7.2 Samples should be cooled as specified by the applicable method. If no guidance is provided, store the samples at 4 ± 2 °C.

7.3 Samples that are stored and collected in the manner described in this TG may be held for a maximum of 28 days before analysis.

7.4 Contact your laboratory to clarify all preservation requirements.

8.0 Data and Records Management

8.1 Once sampling is complete, all field documentation records and chain-of-custody forms must be completed.

8.2 Logbooks should be used and, as with any groundwater sampling event, the logbook should contain such things as: maps showing sample locations, a narrative of the sampling event, a list of all personnel involved with sample collection, water depth, volume purged, and sampling method.

9.0 Field Sample Quality Control and Quality Assurance

9.1 The following field quality control samples/checks shall be performed:

9.1.1 Field Duplicate – One field duplicate sample must be taken per sampling event, or one per 10 samples, whichever is more frequent.

9.1.2 Field Equipment or Rinse Blank – One rinsate blank must be taken per sampling event. (Only required when decontamination of sampling equipment is performed in the field.)

9.1.3 Matrix Spike/Matrix Spike Duplicate – One sample per sampling event, or one per 20 samples, whichever is more frequent, must be designated for use as a Matrix Spike/Matrix Spike Duplicate.

10.0 Laboratory Selection, Quality Control, and Quality Assurance

10.1 The laboratory selected to perform the analysis must be approved by a DoD Component and meet the requirements of the National Environmental Laboratory Accreditation Program (NELAP) and the latest version of the DoD QSM. More information about laboratory and method selection is contained in Appendix G of the *DoD Perchlorate Handbook*.

TECHNICAL GUIDE

COLLECTING SURFACE WATER AND WASTEWATER SAMPLES FOR PERCHLORATE

Prepared by: DoD Environmental Data Quality Workgroup **Date:**_____

Reviewed by: _____ **Date:**_____

Approved by: _____ **Date:** _____

1.0 Scope & Application

1.1 This Technical Guide (TG) has been developed to generate consistency across DoD for the collection and analysis of surface water and wastewater samples for perchlorate.

1.2 The use of this TG is restricted to individuals trained and experienced in surface water or wastewater sampling methods. It should be used in conjunction with professional judgment, taking site-specific requirements into consideration.

1.3 If sampling and testing activities have been requested by a regulatory agency, or are subject to regulatory oversight, then installations should obtain regulatory authority review and comment on the QAPP or SAP.

2.0 Summary of Method

2.1 Samples may be collected using the same process specified in the current permit or standard wastewater sampling procedures, as detailed in *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, Section, "1060 - Collection and Preservation of Samples".

2.2 Materials typically used in the sampling of surface water and wastewater do not affect sampling for perchlorate.

2.3 Analyses of perchlorate samples must be performed by laboratories that meet the requirements of the *DoD Perchlorate Handbook* and the *DoD Quality Systems Manual for Environmental Laboratories* (DoD-QSM) (http://www.navylabs.navy.mil/ManualsDocs.htm).

3.0 Health and Safety Warnings

3.1 This guide does not attempt to address all health and safety issues. The user must determine applicable requirements and establish appropriate health and safety protective measures.

3.2 Users of this guide should review the site health and safety plan with specific emphasis placed on hazards related to surface water and wastewater sampling tasks. Follow standard safe operating practices.

3.3 When working with potentially hazardous materials, follow U.S. EPA, OSHA and Service-specific health and safety regulations, policies and procedures.

4.0 Interferences

4.1 The use of disposable or dedicated sampling equipment is recommended to eliminate the potential for sample cross-contamination.

4.2 If non-disposable/dedicated sampling equipment is used, proper field decontamination techniques must be followed.

4.3 If perchlorate is the only target analyte, an acceptable decontamination procedure is to use a non-phosphate soap/detergent wash, followed by a deionized water rinse and air drying.

4.4 If the investigation includes additional target analytes, then samplers should follow standard decontamination practices for those analytes, except that non-phosphate detergent must be used.

4.5 A rinsate blank should be collected to demonstrate that the decontamination has been effective.

5.0 Equipment and Supplies

5.1 Sampling equipment is typically constructed from stainless steel, PVC, polyethylene, or polypropylene. These materials are all suitable for perchlorate sampling.

6.0 Sample Collection

6.1 Standard surface water or wastewater sampling procedures may be used to collect samples for perchlorate analysis (*Standard Methods for the Examination of Water and Wastewater*, 20th Edition, Section, "1060 - Collection and Preservation of Samples"). Dissolved perchlorate will not volatilize so agitation of the sample or entrained air bubbles will not interfere with the analytical results.

6.2 If sample collection is required for other analytes, sampling methods and procedures will be dictated by the sampling requirements for the most sensitive parameters.

6.2.1 Samples must be collected in order of decreasing volatility of target analytes. Samples for volatile organic compounds are normally collected first, followed by semivolatile organic compounds and finally inorganic compounds. The sampling order will be specified by the sampling and analysis plan or permit.

6.3 If waste stream has multiple phases, each phase needs to be collected and analyzed separately.

7.0 Sample Handling and Preservation

7.1 Collect 80 mL of sample and store with headspace in order to minimize the possibility of anaerobic conditions developing during sample storage.

7.2 Samples should be cooled as specified by the applicable method. If no guidance is provided, store the samples at 4 ± 2 °C.

7.3 Samples that are stored and collected in the manner described in this TG may be held for a maximum of 28 days before analysis.

7.4 Contact your laboratory to clarify all preservation requirements.

8.0 Data and Records Management

8.1 Once sampling is complete, all field documentation records and chain-of-custody forms must be completed.

8.2 Logbooks should be used and contain such things as: sample locations, time and date of collection, list of all personnel involved with sample collection and any field measurements take (e.g. pH).

9.0 Field Sample Quality Control and Quality Assurance

9.1 Matrix Spike/Matrix Spike Duplicate – One sample per sampling event, or one per 20 samples per matrix, whichever is more frequent, must be designated for use as a Matrix Spike/Matrix Spike Duplicate.

10.0 Laboratory Selection, Quality Control, and Quality Assurance

10.1 The laboratory selected to perform the analysis must be approved by a DoD Component and meet the requirements of the National Environmental Laboratory Accreditation Program (NELAP) and the latest version of the DoD QSM. More information about laboratory and method selection is contained in Appendix G of the *DoD Perchlorate Handbook*.

TECHNICAL GUIDE

COLLECTING SOLID SAMPLES FOR PERCHLORATE

Prepared by: DoD Environmental Data Quality Workgroup **Date:**_____

Reviewed by: _____ **Date:**_____

Approved by: _____ **Date:** _____

1.0 Scope & Application

1.1 This Technical Guide (TG) has been developed to generate consistency across DoD for the collection and analysis of solid for perchlorate.

1.2 The use of this TG is restricted to individuals trained and experienced in soil and sediment sampling methods. It should be used in conjunction with professional judgment, taking site-specific requirements into consideration.

1.3 If sampling and testing activities have been requested by a regulatory agency, or are subject to regulatory oversight, then installations should obtain regulatory authority review and comment on the QAPP or SAP. In this case, the collection of split samples is strongly recommended (i.e. where a portion of each sample is sent to a second laboratory).

2.0 Summary of Method

2.1 Solid samples for perchlorate can be collected with many types of sampling equipment (e.g. trowels, hand augers, split spoons, direct-push samplers, Ekman dredges, Ponar dredges, Gravity corers).

2.2 Care must be taken to ensure that each sample represents the location, sample medium, and depth being evaluated. Poor sampling techniques will produce misleading results and lead to incorrect decisions.

2.3 Analysis of perchlorate samples must be performed by laboratories that meet the requirements of the *DoD Perchlorate Handbook* and the *DoD Quality Systems Manual for Environmental Laboratories* (DoD QSM) (http://www.navylabs.navy.mil/ManualsDocs.htm).

2.4 Definitive methods (e.g., those employing mass spectrometry (MS)) must be used for the analysis of soil and sediment samples for perchlorate. The use of EPA Method 314.0 or one of its modifications is not appropriate.

3.0 Health and Safety Warnings

3.1 This guide does not attempt to address all health and safety issues. The user must determine applicable requirements and establish appropriate health and safety protective measures.

3.2 Users of this guide should review the site health and safety plan with specific emphasis placed on hazards related to soil and sediment sampling tasks. Follow standard safe operating practices.

3.3 When working in the presence of potentially hazardous materials, energetics or ordnance, follow U.S. EPA, OSHA and Service-specific health and safety regulations, policies and procedures.

4.0 Interferences

4.1 The use of disposable or dedicated sampling equipment is recommended to eliminate the potential for sample cross-contamination.

4.2 If non-disposable/dedicated sampling equipment is used, proper field decontamination techniques must be followed.

4.3 If perchlorate is the only target analyte, an acceptable decontamination procedure is to use a non-phosphate soap/detergent wash, followed by a deionized water rinse and air drying.

4.4 If the investigation includes additional target analytes, then samplers should follow standard

decontamination practices for those analytes, except that non-phosphate detergent must be used.

4.5 A rinsate blank to should be collected to demonstrate that the decontamination has been effective.

5.0 Equipment and Supplies

5.1 Sampling equipment is typically constructed from Teflon®, stainless steel, PVC, polyethylene, or polypropylene. These materials are all suitable for perchlorate sampling.

6.0 Sample Collection

6.1 Because of its high solubility, it is unlikely that perchlorate will reside in sediments. For this reason, in most situations it will be unnecessary to sample sediments for perchlorate. Sediment sampling may be required in rare situations where large quantities of perchlorate have been released and an evaporative environment exists (waste impoundment associated with munitions demilitarization activities). When this situation exists, standard procedures for sampling sediment should be employed.

6.2 Standard soil sampling equipment and procedures may be used to collect samples for perchlorate analysis. Examples include those described in ASTM publication ENVSITE 02, *ASTM Standards Related to Environmental Site Characterization*, 2nd edition and ASTM D4700-91(1998) *Standard Guide for Soil Sampling from the Vadose Zone*.

6.3 Avoid unusual areas, such as eroded areas, rock outcroppings, and fence lines, unless these features have been specifically designated as sample points in the SAP.

6.4 If no contradictory guidance is provided in the QAPP or SAP, remove debris such as sticks, rocks, and vegetation from the soil surface before collecting the samples.

6.5 If perchlorate is expected to be distributed homogeneously (e.g. a former wastewater impoundment area at a manufacturing plant) then discrete samples can be taken. If the distribution is expected to be heterogeneous (e.g. retained in propellant matrices, distributed in soil, and not immediately dissolved) or is unknown, then composite (or incremental) soil sampling techniques are recommended. In this case, a sample representing a particular sampling unit (area or volume of soil) should consist of at least five subsamples collected within the sampling unit. Subsamples should be as close to the same size (in terms of mass) as possible.

6.6 Following the collection of all subsamples representing a particular sample unit, the sample should be mixed until it achieves a consistent physical appearance.

6.7 Well-mixed samples should be placed in clean 4-oz amber glass bottles.

7.0 Sample Handling and Preservation

7.1 Samples should be cooled as specified by the applicable method. If no guidance is provided, the samples should be stored at 4 ± 2 °C.

7.2 Samples that are stored and collected in the manner described in this TG may be held for a maximum of 28 days before analysis.

7.3 Contact your laboratory to clarify all preservation requirements.

8.0 Data and Records Management

8.1 Once sampling is complete, all field documentation records and chain-of-custody forms

must be completed.

8.2 Logbooks should be used and, as with any sampling event, they include: maps showing sample locations, a narrative description of the sampling event, a list of all personnel involved with sample collection, and sampling method.

9.0 Field Sample Quality Control and Quality Assurance

9.1 Field Duplicate (Field Split) – One field duplicate sample must be taken per sampling event, or one per 10 samples, whichever is more frequent.

9.2 Field Equipment or Rinsate Blank – One rinsate blank must be taken per sampling event. (Only required when decontamination of sampling equipment is performed in the field.)

9.3 Matrix Spike/Matrix Spike Duplicate – One sample per matrix per sampling event, or one per 20 samples of the same matrix, whichever is more frequent, must be designated for use as a Matrix Spike/Matrix Spike Duplicate.

10.0 Laboratory Selection, Quality Control, and Quality Assurance

10.1 The laboratory selected to perform the analysis must be approved by a DoD Component and meet the requirements of the National Environmental Laboratory Accreditation Program (NELAP) or the American Association for Laboratory Accreditation (A2LA) and the latest version of the DoD QSM. More information about laboratory and method selection is contained in Appendix G of the *DoD Perchlorate Handbook*.

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1.0 PURPOSE

The purpose of this procedure is to provide general reference information on Direct Push Technology (DPT). DPT is designed to collect soil, groundwater, and soil gas samples without using conventional drilling techniques. The advantage of using DPT over conventional drilling includes the generation of little or no drill cuttings, sampling in locations with difficult accessibility, reduced overhead clearance requirements, no fluid introduction during probing, and typical lower costs per sample than with conventional techniques. Disadvantages include a maximum penetration depth of approximately 15 to 40 feet in dense soils (although it may be as much as 60 to 80 feet in certain types of geological environments), reduced capability of obtaining accurate water-level measurements, and the inability to install permanent groundwater monitoring wells. The methods and equipment described herein are for collection of surface and subsurface soil samples and groundwater samples. Soil gas sampling is discussed in SOP SA-2.4.

2.0 SCOPE

This procedure provides information on proper sampling equipment and techniques for DPT. Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling techniques. The techniques described shall be followed whenever applicable, noting that site-specific conditions or project-specific plans may require adjustments in methodology.

3.0 GLOSSARY

Direct Push Technology (DPT) - DPT refers to sampling tools and sensors that are driven directly into the ground without the use of conventional drilling equipment. DPT typically utilizes hydraulic pressure and/or percussion hammers to advance the sampling tools. A primary advantage of DPT over conventional drilling techniques is that DPT results in the generation of little or no investigation derived waste.

Geoprobe® - Geoprobe® is a manufacturer of a hydraulically-powered, percussion/probing machines utilizing DPT to collect subsurface environmental samples. Geoprobe® relies on a relatively small amount of static weight (vehicle) combined with percussion as the energy for advancement of a tool string. The Geoprobe® equipment can be mounted in a multitude of vehicles for access to all types of environmental sites.

HydroPunch™ - HydroPunch™ is a manufacturer of stainless steel and Teflon® sampling tools that are capable of collecting representative groundwater and/or soil samples without requiring the installation of a groundwater monitoring well or conventional soil boring. HydroPunch™ is an example of DPT sampling equipment.

Flame Ionization Detector (FID) - A portable instrument for the measurement of many combustible organic compounds and a few inorganic compounds in air at parts-per million levels. The basis for the detection is the ionization of gaseous species utilizing a flame as the energizing source.

Photo Ionization Detector (PID) - A portable instrument for the measurement of many combustible organic compounds and a few inorganic compounds in air at parts-per million levels. The basis for the detection is the ionization of gaseous species utilizing ultraviolet radiation as the energizing source.

4.0 RESPONSIBILITIES

Project Manager - The Project Manager is responsible for selecting and/or reviewing the appropriate DPT drilling procedure required to support the project objectives.

Field Operations Leader (FOL)- The FOL is primarily responsible for performing the DPT in accordance with the project-specific plan.

5.0 SOIL SAMPLING PROCEDURES

5.1 General

The common methodology for the investigation of the vadose zone is soil boring drilling and soil sampling. However, drilling soil borings can be very expensive. Generally the advantage of DPT for subsurface soil sampling is the reduced cost of disposal of drilling cuttings and shorter sampling times.

5.2 Sampling Equipment

Equipment needed for conducting DPT drilling for subsurface soil sampling includes, but is not limited to, the following:

- Geoprobe® Sampling Kit
- Cut-resistant gloves
- 4-foot x 1.5-inch diameter macrocore sampler
- Probe sampling adapters
- Roto-hammer with 1.5-inch bit
- Disposable acetate liners for soil macrocore sampler
- Cast aluminum or steel drive points
- Geoprobe® AT-660 Series Large Bore Soil Sampler, or equivalent
- Standard decontamination equipment and solutions

For health and safety equipment and procedures, follow the direction provided in the Safe Work Permit in Attachment 1, or the more detailed directions provided in the project's Health and Safety Plan.

5.3 DPT Sampling Methodology

There are several methods for the collection of soil samples using DPT drilling. The most common method is discussed in the following section. Variations of the following method may be conducted upon approval of the Project Manager in accordance with the project-specific plan.

- Macrocore samplers fitted with detachable aluminum or steel drive points are driven into the ground using hydraulic pressure. If there is concrete or pavement over a sampling location, a Roto-hammer is used to drill a minimum 1.5-inch diameter hole through the surface material. A Roto-hammer may also be used if very dense soils are encountered.

- The sampler is advanced continuously in 4-foot intervals or less if desired. No soil cuttings are generated because the soil which is not collected in the sampler is displaced within the formation.

- The sampler is retracted from the hole, and the 4-foot continuous sample is removed from the outer coring tube. The sample is contained within an inner acetate liner.

- Attach the metal trough from the Geoprobe® Sampling Kit firmly to the tail gate of a vehicle. If a vehicle with a tail gate is not available, secure the trough on another suitable surface.

- Place the acetate liner containing the soils in the trough.

- While wearing cut-resistant gloves (constructed of leather or other suitable material), cut the acetate liner through its entire length using the double-bladed knife that accompanies the Geoprobe® Sampling Kit. Then remove the strip of acetate from the trough to gain access to the collected soils. Do not attempt to cut the acetate liner while holding it in your hand.

- Field screen the sample with an FID or PID, and observe/examine the sample (according to SOP GH-1.3). If appropriate, transfer the sample to sample bottles for laboratory analysis. If additional volume is required, push an additional boring adjacent to the first and composite/mix the same interval. Field compositing is usually not acceptable for sample requiring volatile organics analysis.

- Once sampling has been completed, the hole is backfilled with bentonite chips or bentonite cement grout, depending upon project requirements. Asphalt or concrete patch is used to cap holes through paved or concrete areas. All holes should be finished smooth to existing grade.

- In the event the direct push van/truck cannot be driven to a remote location or a sampling location with difficult accessibility, sampling probes may be advanced and sampled manually or with air/electric operated equipment (e.g., jack hammer).

- Sampling equipment is decontaminated prior to collecting the next sample.

6.0 GROUNDWATER SAMPLING PROCEDURES

6.1 General

The most common methodology for the investigation of groundwater is the installation and sampling of permanent monitoring wells. If only groundwater screening is required, the installation and sampling of temporary well points may be performed. The advantage of temporary well point installation using DPT is reduced cost due to no or minimal disposal of drilling cuttings and well construction materials, and shorter installation/times sampling.

Two disadvantages of DPT drilling for well point installation are:

- In aquifers with low yields, well points may have to be sampled without purging or development.
- If volume requirements are high, this method can be time consuming for low yield aquifers.

6.2 Sampling Equipment

Equipment needed for temporary well installation and sampling using DPT includes, but is not limited, to the following:

- 2-foot x 1-inch diameter mill-slotted (0.005 to 0.02-inch) well point
- Connecting rods
- Roto-hammer with 1.5-inch bit
- Mechanical jack
- 1/4-inch OD polyethylene tubing
- 3/8-inch OD polyethylene tubing
- Peristaltic pump
- Standard decontamination equipment and solutions

6.3 DPT Temporary Well Point Installation and Sampling Methodology

There are several methods for the installation and sampling of temporary well points using DPT. The most common methodology is discussed below. Variations of the following method may be conducted upon approval of the Project Manager in accordance with the project specific plan.

- A 2-foot x 1-inch diameter mill-slotted (0.005 to 0.02-inch) well point attached to connecting rods is driven into the ground to the desired depth using a rotary electric hammer or other direct push drill rig. If there is concrete or pavement over a sampling location, a Roto-hammer or electric coring machine is used to drill a hole through the surface material.

- The well point will be allowed to equilibrate for at least 15 minutes, after which a measurement of the static water level will be taken. The initial measurement of the water level will be used to assess the amount of water which is present in the well point and to determine the amount of silt and sand infiltration that may have occurred.

- The well point will be developed using a peristaltic pump and polyethylene tubing to remove silt and sand which may have entered the well point. The well point is developed by inserting polyethylene tubing to the bottom of the well point and lifting and lowering the tubing slightly while the pump is operating. The pump will be operated at a maximum rate of approximately 2 liters per minute. After removal of sediment from the bottom of the well point, the well point will be vigorously pumped at maximum capacity until discharge water is visibly clear and no further sediments are being generated. Measurements of pH, specific conductance, temperature, and turbidity shall be recorded every 5 to 10 minutes during the purging process. After two consistent readings of pH, specific conductance, temperature and turbidity (±10 percent), the well may be sampled.

- A sample will be collected using the peristaltic pump set at the same or reduced speed as during well development. Samples (with the exception of the samples to be analyzed for volatile organic compounds, VOCs) will be collected directly from the pump discharge. Sample containers for VOCs will be filled by (first shutting off the pump) crimping the discharge end of the sample tubing when filled, removing the inlet end of the sample tubing from the well, suspending the inlet tubing above the vial, and allowing water to fill each vial by gravity flow.

- Once the groundwater sample has been collected, the connecting rods and well point will be removed from the hole with the direct push rig hydraulics. The hole will be backfilled with bentonite chips or bentonite cement grout, depending upon project requirements. Asphalt or concrete patch will be used to cap holes through paved or concrete areas. All holes will be finished smooth to existing grade.

- In the event the direct push van/truck cannot be driven to a remote location or sampling location with difficult accessibility, sampling probes may be advanced and sampled manually or with air/electric-operated equipment (e.g., jack hammer).

- Decontaminate the equipment before moving to the next location.

7.0 RECORDS

A record of all field procedures, tests, and observations must be recorded in the field logbook, boring logs, and sample log sheets, as needed. Entries should include all pertinent data regarding the investigation. The use of sketches and field landmarks will help to supplement the investigation and evaluation.

ATTACHMENT 1
SAFE WORK PERMIT FOR DPT OPERATIONS

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

I. Work limited to the following (description, area, equipment used): **Monitoring well drilling and installation through direct push technology**

II. Required Monitoring Instruments: _____

III. Field Crew: _____

IV. On-site Inspection conducted ☐ Yes ☐ No Initials of Inspector _____ _____
TtNUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

V. Protective equipment required
Level D ☒ Level B ☐
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required
Full face APR ☐ Escape Pack ☐
Half face APR ☐ SCBA ☐
SKA-PAC SAR ☐ Bottle Trailer ☐
Skid Rig ☐ None ☒

Level D Minimum Requirements: Sleeved shirt and long pants, safety footwear, and work gloves. Safety glasses, hard hats, and hearing protection will be worn when working near or sampling in the vicinity of the DPT rig.

Modifications/Exceptions.

VI. Chemicals of Concern | Action Level(s) | Response Measures

VII. Additional Safety Equipment/Procedures

Hard-hat	☒ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☒ Yes	☐ No
Safety Glasses	☒ Yes	☐ No	Safety belt/harness	☐ Yes	☒ No
Chemical/splash goggles	☐ Yes	☒ No	Radio	☐ Yes	☒ No
Splash Shield	☐ Yes	☒ No	Barricades	☒ Yes	☐ No
Splash suits/coveralls	☐ Yes	☐ No	Gloves (Type - _____)	☐ Yes	☐ No
Steel toe Work shoes or boots	☒ Yes	☐ No	Work/warming regimen	☐ Yes	☐ No

Modifications/Exceptions: Reflective vests for high traffic areas.

VIII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☒	Emergency alarms	☐	☐
Daily tail gate meetings	☒	☐	Evacuation routes	☐	☐
Contractor tools/equipment/PPE inspected	☐	☐	Assembly points	☐	☐

IX. Site Preparation

Utility Clearances obtained for areas of subsurface investigation	☐ Yes	☐ No
Physical hazards removed or blockaded	☐ Yes	☐ No
Site control boundaries demarcated/signage	☐ Yes	☐ No

X. Equipment Preparation

	Yes	NA
Equipment drained/depressurized	☐	☒
Equipment purged/cleaned	☐	☒
Isolation checklist completed	☐	☒
Electrical lockout required/field switch tested	☐	☒
Blinds/misalignments/blocks & bleeds in place	☐	☒
Hazardous materials on walls/behind liners considered	☐	☒

XI. Additional Permits required (Hot work, confined space entry) ☐ Yes ☐ No
If yes, complete permit required or contact Health Sciences, Pittsburgh Office

XII. Special instructions, precautions:

Permit Issued by: _____ Permit Accepted by: _____

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1.0 PURPOSE

The objective of this Standard Operating Procedure is to specify the proper approach and methodologies to identify and quantify airborne chemical contamination levels through the use of direct reading instrumentation and air sample collection. The results of these activities provide vital information for site characterization and risk assessment considerations.

2.0 SCOPE

Applies to all Tetra Tech NUS site activities where the potential for personnel exposures to respiratory health hazards exists.

3.0 GLOSSARY

Direct Reading Instruments (DRIs) - Instrumentation operating on various detection principles such as flame ionization or photoionization providing real time readings of ambient contaminants in air.

Personal/Area Air Sampling - Personal/area air sampling is conducted utilizing an air sampling pump and a specific collection media to quantify airborne contaminants.

Meteorological Considerations - Meteorological information must be collected on site to properly determine air sampling results, as well as aid in the characterization of contaminant potential plume migration and intensity. This information will also be used to support the selection of sampling locations and determine which samples should be analyzed. The meteorological information will be used to estimate downwind concentration levels based on short-term field levels encountered at the source.

4.0 RESPONSIBILITIES

Project Manager (PM) - Responsible for all aspects of project implementation and direction. The project manager is responsible for providing the necessary resources in support of all air monitoring and sampling applications.

Field Operations Leader (FOL) - Responsible for implementing the air monitoring program as detailed in approved project plans for the specific site. Air monitoring requirements will be included in both the Field Sampling and Analysis Plan (FSAP) and the site-specific Health and Safety Plan (HASP).

Health and Safety Officer (HSO) - The health and safety officer provides technical assistance to the FOL concerning air monitoring and sampling applications, collection methodologies, data interpretations, and establishes action items based on results. This information is further used to assess atmospheric migration of airborne chemical contaminants.

5.0 PROCEDURES

5.1 Introduction

Air monitoring is used to help establish criteria for worker safety, document potential exposures, and determine protective measures for the site personnel and the surrounding public. To accomplish this, it is necessary for an effective air surveillance program to be tailored to meet the conditions found at each work site.

During site operations, data are collected concerning air contaminants representative for site operations. Monitoring for vapors, gases, and particulates is performed using DRIs, air sampling systems, and

meteorological considerations. DRIs can be used to detect many organics as well as a few inorganics and can provide approximate total concentrations through applications of relative response ratios of contaminants to reference standards. If specific chemicals (organics and inorganics) have been identified, then properly calibrated DRIs can be used for more accurate onsite assessments.

The most accurate method for evaluating any air contaminant is to collect samples and analyze them at a qualified laboratory. Although accurate, this method presents two disadvantages: (1) cost and (2) the time required to obtain results. Analyzing large numbers of laboratory samples can be expensive, especially if results are needed quickly. Onsite laboratories tend to reduce the turnaround time, but unless they can analyze other types of samples, they may also be costly. In emergencies, time is often not available for laboratory analysis of samples either on site or off site.

To obtain air monitoring data rapidly at the site, DRI utilizing flame ionization detectors (FIDs), photoionization detectors (PIDs), and other detection methodology can be used. Some of these may be used as survey instruments or operated as gas chromatographs. As gas chromatographs, these instruments can provide real-time, qualitative/quantitative data when calibrated with standards of known air contaminants. Combined with selective laboratory analysis of samples, they provide a tool for evaluating airborne organic hazards on a real-time basis and at a lower cost than analyzing samples in a laboratory.

5.2 Air Sampling

For more complete information about air contaminants, measurements obtained with DRIs can be supplemented by collecting and analyzing air samples. To assess air contaminants more thoroughly, air sampling devices equipped with appropriate collection media may be placed at various locations throughout the area and on persons with at-risk occupations. These samples provide air quality information for the period of time they are taken, and can indicate contaminant types and concentrations over the sampling period. As a result, careful selection of sampling types, numbers, and locations, by a qualified health and safety professional is essential to obtain representative information. As data is obtained (from the analysis of samples, DRIs, knowledge about materials involved, site operations, and the potential for airborne toxic hazards), adjustments can be in the types of samples, number of samples collected, frequency of sampling, and analysis required. In addition to air samplers, area monitoring stations may also include DRIs equipped with data logging capabilities and operated as continuous air monitors.

Area air sampling locations may be located in various places as required by project and site needs. Area air sampling stations may include, but are not limited to:

- Upwind - Industrial operations, vehicle traffic, spills and other contributing sources may cause or otherwise result in the generation of air pollutants. Upwind samples establish background levels

- Support Zone (SZ) - Samples may be taken near the command post or other support facilities to ensure that they are, in fact, located in an unaffected area, and that the area remains clean throughout operations at the site.

- Contamination Reduction Zone (CRZ) - Air samples may be collected along the decontamination line to ensure that decontamination workers are properly protected and that onsite workers are not removing their respiratory protective gear in a contaminated area.

- Exclusion Zone (EZ) - The Exclusion Zone presents the greatest risk of release/generation of contaminants and requires the highest concern for air sampling. The location of sampling stations shall be based upon factors such as hot-spots detected by DRIs, types of substances present, and potential for airborne contaminants. The data from these stations, in conjunction with intermittent

walk-around surveys with DRIs, are used to verify the selection of proper levels of worker protection and EZ boundaries as well as to provide a continual record of air contaminants.

- Downwind - One or more sampling stations may be located downwind from the site to indicate if any air contaminants are leaving the site. If there are indications of airborne hazards in populated areas, appropriate response action must be taken and additional samplers should be placed downwind. Downwind locations are further determined based on meteorological considerations concerning generation, air plume migration, and intensity.

5.3 Media for Collecting Air Samples

Hazardous material incidents and abandoned waste sites can involve thousands of potentially dangerous substances, such as gases, vapors, and particulates that could become airborne. A variety of media are used to collect these substances. Sampling systems typically include a calibrated air sampling pump, which draws air into selected collection media. It is essential that appropriate, approved air sampling methodologies (such as those published by NIOSH, OSHA, and EPA) be followed for the collection of each specific analyte. Some of the most common types of samples and the collection media used for them are described in the following information:

One of the most common types of collection media is activated carbon which is an excellent adsorbent for most organic vapors. However, other solid adsorbents (such as Tenax, silica gel, and Florisil) are routinely used to sample specific organic compounds or classes of compounds that do not adsorb or desorb well onto activated carbon. To avoid stocking a large number of sorbents for collecting samples for various chemicals, a smaller number is generally chosen for collecting the widest range of materials or for chemicals known to be present. The vapors are collected using an industrial hygiene personal sampling pump with either one sampling port or a manifold capable of simultaneously collecting samples on several sorbent tubes (provided that sampling parameters such as flow rates and sample volumes are satisfied). For example, in a manifold with four sorbent tubes (or on individual pumps with varying flow rates), the tubes might contain:

- Activated carbon to collect vapors of materials with a boiling point above zero degrees Centigrade. Common materials collected on activated carbon include organic vapors such as solvents, BTEX, and ketones.

- A porous polymer, such as Tenax or Chromosorb, to collect substances (such as high-molecular-weight hydrocarbons, organophosphorus compounds, and the vapors of certain pesticides) that adsorb poorly onto activated carbon. Some of these porous polymers also absorb organic materials at low ambient temperatures more efficiently than carbon.

- A polar sorbent, such as silica gel, to collect organic vapors (aromatic amines, for example) that exhibit a relatively high dipole moment.

- Another specialty absorbent selected for the specific site. For example, a Florisil tube could be used if polychlorinated biphenyls are expected.

- Liquid impingers - aldehydes, ketones, phosgene, phenols.

- Glass fiber filters, membrane filters, Teflon filters - Inorganics and other semivolatile compounds.

- Airborne particulates can be either solid or liquid. Examples of common particulate analytes include some metals, fibers such as asbestos, and condensed particulates such as welding fumes. Dusts, fumes, smoke, and fibers are dispersed solids; mists and fogs are dispersed liquids. For air sampling, most particulates are collected using glass fiber, mixed cellulose ester, or polyvinyl chloride filters,

~~depending on the filter's ability to collect the subject material and its suitability for laboratory analysis. A cyclone is used to collect particles of respirable size. Atomic Absorption Spectrophotometry, Emission Spectroscopy, Phase Contrast Microscopy, and other techniques are used to analyze various types of particulates. Direct-reading monitors are also used to quantify particulate concentrations, and are usually based on the light-scattering properties of the particulate matter.~~

5.3.1 Other Methods

Colorimetric detector tubes can also be used with a sampling pump when monitoring for some specific compounds. A detector tube is a vial that contains a chemical preparation that reacts with the measured substance by changing color. Most detector tubes are scale tubes that permit a comparison of the length of the stain to an indicated concentration. Passive organic vapor monitors can be substituted for the active monitoring if they are available for the types of materials suspected to be present at a given site.

5.3.2 NIOSH Methods

The National Institute for Occupational Safety and Health's (NIOSH) Manual of Analytical Methods, 4th ed., contains acceptable methods for collecting and analyzing air samples for a variety of chemical substances. Consult these volumes for specific procedures.

5.4 Collection and Analysis

Collection and analysis of air samples is a multi-faceted task, and is part of the overall air surveillance program. The program is structured to cover the following air pathway analyses:

5.4.1 Selecting Monitoring Constituents

Applications within this program are accomplished using two considerations:

- Air surveillance for specific constituents is based on quantity of the pollutant and the likelihood for vapor release or generation.
- Controlling toxicity - These substances, even when represented in limited quantities, present the greatest threat to the public or worker safety, and influence environmental impact.

5.4.2 Specifying Meteorological Considerations

The following factors will influence sample collection:

- Wind direction and speed
- Sigma theta (atmospheric stability)
- Temperature
- Barometric pressure
- Humidity

These factors will provide information essential to properly arrive at accurate air sampling concentration results. This information is also used to identify how airborne chemical contaminants will react for modeling and for monitoring purposes. The results will provide indicators of plume movement, intensity, and dilution.

5.4.3 Design of Monitoring Network

The air surveillance network is structured to consider:

- Source characteristics (physical state; vapor release and/or generation; emission rates; and disturbance of the source impacting these aspects)
- Receptor sites (receptor sites are monitored and tracked based on priority)
- Meteorological consideration
- Air modeling input
- Data quality objectives

5.4.4 Air Monitoring Documentation/Data Reduction

5.4.4.1 Air Monitoring Documentation

Elements of the air surveillance program are used to provide documentation valuable to safely performing/containing site activities.

Air monitoring results from DRIs must be recorded, such as on instrument results reporting forms, or in the field logbook. This information, where applicable, will be correlated to air sampling information if/when collected.

Air sampling results for personnel and area measurement efforts must be validated, prior to notifying affected individuals. Personal air sampling results notification is accomplished through verbal or written communications.

Results of air monitoring/sampling activities can be identified on site maps. This information is used to structure operational zones and identify levels of protection.

5.4.4.2 Data Reduction

Data reduction combines and correlates the DRI results, air sampling results, and meteorological information to determine area and source airborne contaminant levels and movement.

All air sampling surveillance efforts must incorporate appropriate and approved NIOSH, OSHA, or EPA analytical methods. These procedures identify specific sample collection media, sampling methodologies, and analytical procedures. Sample analysis for health and safety considerations must be further supported by using American Industrial Hygiene Association accredited laboratories.

5.5 Personnel Monitoring

In addition to area atmospheric sampling, personnel monitoring -- both active and passive -- can be used to sample for air contaminants. Representative workers must be identified, and equipped with appropriate personal sampling systems to determine contaminants at specific locations or for specific work being performed. When sampling devices are placed on workers (generally within 1 foot of the mouth and nose) the results are used to indicate worker exposures.

5.6 Calibration

As a rule, the entire air sampling system shall be calibrated. Proper pre-and post-calibration activities are essential for correct operation and for accurate data. In some instances, additional calibration during the sampling period may be required. The overall frequency of calibration will depend upon the particular sampling event, including the general handling and use of a given sampling system. Pump mechanisms shall be calibrated after repair, when newly purchased, and following suspected abuse. All DRIs will be calibrated according to manufacturers instructions. All calibration activities for both air monitoring and sampling equipment must be properly documented, such as through the use of a calibration form. This form will be kept on site throughout the life of the project. The calibration log will be submitted as documentation that instrument calibration was performed on a regular basis.

5.7 Meteorological Considerations

Meteorological information is an integral part of an air surveillance program. Data concerning wind speed and direction, temperature, barometric pressure, and humidity (singularly or in combination) are needed for:

- Selecting air sampling locations
- Calculating accurate air sampling results
- Calculating air dispersion
- Calibrating instruments
- Determining population at risk or environmental exposure from airborne contaminants

Knowledge of wind speed and direction is necessary to effectively place air samplers. In source-oriented ambient air sampling, samplers need to be located downwind (at different distances) of the source and others need to be placed to collect background samples. Shifts in wind direction must be known. Consequently, the samplers must be relocated or corrections made for these shifts. In addition, atmospheric simulation models for predicting contaminant dispersion and concentration need windspeed and direction as inputs for predictive calculations. Information may be needed concerning the frequency and intensity that winds blow from certain directions (windrose data). Consequently, the wind direction must be continually monitored when use of this type of data is contemplated.

Air sampling systems need to be calibrated before use. This must include corrections in the calibration curves for actual temperatures and pressures during the sampling event. After sampling, collected air volumes are also mathematically corrected for temperature and pressure conditions.

Air sampling is sometimes designed to assess population exposure (and frequently potential worker exposure). Air samplers are generally located in population centers, irrespective of wind direction. Even in these instances, however, meteorological data is needed for air dispersion modeling. Models are then used to predict or verify population-oriented sampling results.

Proper data is collected by having meteorological stations on site or by obtaining the information from one or more of several government or private organizations, which routinely collect this data. The choice of how information is obtained depends on the availability of reliable data at the location desired, resources needed to obtain meteorological equipment, accuracy of information needed, and use of information.

The collection, handling, and analysis of air samples is an intricate, involved process. Appropriate methodologies, media, and equipment must be used to collect accurate data. Furthermore, selection of appropriate numbers, types, and locations of samples is essential if the data collected are to be used for personnel exposure criteria. For these reasons, air sampling activities must be coordinated and conducted by properly qualified and experienced industrial hygiene professionals. Air monitoring activities also need to be established and monitored carefully. However, as the proper use of these instruments is

not as complicated as air sampling, it is commonly acceptable to cross-train capable environmental professionals to use DRIs, with adequate technical support provided by health and safety professionals.

6.0 REFERENCES

Standard Operating Safety Guides, EPA, November 1984.
NIOSH Manual of Analytical Methods, 4th Edition.

7.0 ATTACHMENTS

None.

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1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide information on sample preservation, packaging, and shipping procedures to be used in handling environmental samples submitted for chemical constituent, biological, or geotechnical analysis. Sample chain-of-custody procedures and other aspects of field documentation are addressed in SOP SA-6.3. Sample identification is addressed in SOP CT-04.

2.0 SCOPE

This procedure describes the appropriate containers to be used for samples depending on the analyses to be performed, and the steps necessary to preserve the samples when shipped off site for chemical analysis.

3.0 GLOSSARY

Hazardous Material - A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. Under 49 CFR, the term includes hazardous substances, hazardous wastes, marine pollutants, and elevated temperature materials, as well as materials designated as hazardous under the provisions of §172.101 and §172.102 and materials that meet the defining criteria for hazard classes and divisions in Part 173. With slight modifications, IATA has adopted DOT "hazardous materials" as IATA "Dangerous Goods."

Hazardous Waste - Any substance listed in 40 CFR, Subpart D (~~y~~261.30 et seq.), or otherwise characterized as ignitable, corrosive, reactive, or toxic (as defined by Toxicity Characteristic Leaching Procedure, TCLP, analysis) as specified under 40 CFR, Subpart C (~~y~~261.20 et seq.), that would be subject to manifest requirements specified in 40 CFR 262. Such substances are defined and regulated by EPA.

Marking - A descriptive name, identification number, instructions, cautions, weight, specification or UN marks, or combination thereof required on outer packaging of hazardous materials.

n.o.i - Not otherwise indicated (may be used interchangeably with n.o.s.).

n.o.s. - Not otherwise specified.

Packaging - A receptacle and any other components or materials necessary for compliance with the minimum packaging requirements of 49 CFR 174, including containers (other than freight containers or overpacks), portable tanks, cargo tanks, tank cars, and multi-unit tank-car tanks to perform a containment function in conformance with the minimum packaging requirements of 49 CFR 173.24(a) & (b).

Placard - Color-coded, pictorial sign which depicts the hazard class symbol and name and which is placed on the side of a vehicle transporting certain hazardous materials.

Common Preservatives:

- Hydrochloric Acid - HCl
- Sulfuric Acid - H_2SO_4
- Nitric Acid - HNO_3
- Sodium Hydroxide - NaOH

Other Preservatives

- Zinc Acetate
- Sodium Thiosulfate - $Na_2S_2O_3$

Normality (N) - Concentration of a solution expressed as equivalent per liter, an equivalent being the amount of a substance containing 1 gram-atom of replaceable hydrogen or its equivalent.

Reportable Quantity (RQ) - For the purposes of this SOP, means the quantity specified in column 3 of the Appendix to DOT 49 CFR §172.101 for any material identified in column 1 of the appendix. A spill greater than the amount specified must be reported to the National Response Center.

Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the location and time of collection.

4.0 RESPONSIBILITIES

Field Operations Leader - Directly responsible for the bottling, preservation, labeling, packaging, shipping, and custody of samples up to and including release to the shipper.

Field Samplers - Responsible for initiating the Chain-of-Custody Record (per SOP SA-6.3), implementing the packaging and shipping requirements, and maintaining custody of samples until they are relinquished to another custodian or to the shipper.

5.0 PROCEDURES

Sample identification, labeling, documentation, and chain-of-custody are addressed by SOP SA-6.3.

5.1 Sample Containers

Different types of chemicals react differently with sample containers made of various materials. For example, trace metals adsorb more strongly to glass than to plastic, whereas many organic chemicals may dissolve various types of plastic containers. Attachments A and B show proper containers (as well as other information) per 40 CFR 136. In general, the sample container shall allow approximately 5-10 percent air space ("ullage") to allow for expansion/vaporization if the sample warms during transport. However, for collection of volatile organic compounds, head space shall be omitted. The analytical laboratory will generally provide certified-clean containers for samples to be analyzed for chemical constituents. Shelby tubes or other sample containers are generally provided by the driller for samples requiring geotechnical analysis. Sufficient lead time shall be allowed for a delivery of sample container orders. Therefore, it is critical to use the correct container to maintain the integrity of the sample prior to analysis.

Once opened, the container must be used at once for storage of a particular sample. Unused but opened containers are to be considered contaminated and must be discarded. Because of the potential for introduction of contamination, they cannot be reclosed and saved for later use. Likewise, any unused containers which appear contaminated upon receipt, or which are found to have loose caps or a missing Teflon liner (if required for the container), shall be discarded.

5.2 Sample Preservation

Many water and soil samples are unstable and therefore require preservation to prevent changes in either the concentration or the physical condition of the constituent(s) requiring analysis. Although complete and irreversible preservation of samples is not possible, preservation does retard the chemical and biological

changes that inevitably take place after the sample is collected. Preservation techniques are usually limited to pH control, chemical addition(s), and refrigeration/ freezing (certain biological samples only).

5.2.1 Overview

The preservation techniques to be used for various analytes are listed in Attachments A and B. Reagents required for sample preservation will either be added to the sample containers by the laboratory prior to their shipment to the field or be added in the field (in a clean environment). Only high purity reagents shall be used for preservation. In general, aqueous samples of low-concentration organics (or soil samples of low- or medium-concentration organics) are cooled to 4°C. Medium-concentration aqueous samples, high-hazard organic samples, and some gas samples are typically not preserved. Low-concentration aqueous samples for metals are acidified with HNO_3, whereas medium-concentration and high-hazard aqueous metal samples are not preserved. Low- or medium-concentration soil samples for metals are cooled to 4°C, whereas high-hazard samples are not cooled.

The following subsections describe the procedures for preparing and adding chemical preservatives. Attachments A and B indicate the specific analytes which require these preservatives.

The FOL is responsible for ensuring that an accurate Chemical Inventory is created and maintained for all hazardous chemicals brought to the work site (see Section 5 of the TtNUS Health and Safety Guidance Manual). Furthermore, the FOL must ensure that a corresponding Material Safety Data Sheet (MSDS) is collected for every substance entered on the site Chemical Inventory, and that all persons using/handling/ disposing of these substances review the appropriate MSDS for substances they will work with. The Chemical Inventory and the MSDSs must be maintained at each work site in a location and manner where they are readily-accessible to all personnel.

5.2.2 Preparation and Addition of Reagents

Addition of the following acids or bases may be specified for sample preservation; these reagents shall be analytical reagent (AR) grade or purer and shall be diluted to the required concentration with deionized water before field sampling commences. To avoid uncontrolled reactions, be sure to Add Acid to water (not vice versa). A dilutions guide is provided below.

Acid/Base	Dilution	Concentration	Estimated Amount Required for Preservation
Hydrochloric Acid (HCl)	1 part concentrated HCl: 1 part double-distilled, deionized water	6N	5-10 mL
Sulfuric Acid (H_2SO_4)	1 part concentrated H_2SO_4: 1 part double-distilled, deionized water	18N	2 - 5 mL
Nitric Acid (HNO_3)	Undiluted concentrated HNO_3	16N	2 - 5 mL
Sodium Hydroxide (NaOH)	400 grams solid NaOH dissolved in 870 mL double-distilled, deionized water; yields 1 liter of solution	10N	2 mL

The amounts required for preservation shown in the above table assumes proper preparation of the preservative and addition of the preservative to one liter of aqueous sample. This assumes that the sample is initially at pH 7, is poorly buffered, and does not contain particulate matter; as these conditions vary, more preservative may be required. Consequently, the final sample pH must be checked using narrow-range pH paper, as described in the generalized procedure detailed below:

- Pour off 5-10 mL of sample into a dedicated, clean container. Use some of this sample to check the initial sample pH using wide range (0-14) pH paper. Never dip the pH paper into the sample; always apply a drop of sample to the pH paper using a clean stirring rod or pipette.

- Add about one-half of the estimated preservative required to the original sample bottle. Cap and invert gently several times to mix. Check pH (as described above) using medium range pH paper (pH 0-6 or pH 7.5-14, as applicable).

- Cap sample bottle and seal securely.

Additional considerations are discussed below:

- To test if ascorbic acid must be used to remove oxidizing agents present in the sample before it can be properly preserved, place a drop of sample on KI-starch paper. A blue color indicates the need for ascorbic acid addition.

  If required, add a few crystals of ascorbic acid to the sample and retest with the KI-starch paper. Repeat until a drop of sample produces no color on the KI-starch paper. Then add an additional 0.6 grams of ascorbic acid per each liter of sample volume.

  Continue with proper base preservation of the sample as described above.

- Samples for sulfide analysis must be treated by the addition of 4 drops (0.2 mL) of 2N zinc acetate solution per 100 ml of sample.

  The 2N zinc acetate solution is made by dissolving 220 grams of zinc acetate in 870 mL of double-distilled, deionized water to make 1 liter of solution.

  The sample pH is then raised to 9 using the NaOH preservative.

- Sodium thiosulfate must be added to remove residual chlorine from a sample. To test the sample for residual chlorine use a field test kit specially made for this purpose.

  If residual chlorine is present, add 0.08 grams of sodium thiosulfate per liter of sample to remove the residual chlorine.

  Continue with proper acidification of the sample as described above.

For biological samples, 10% buffered formalin or isopropanol may also be required for preservation. Questions regarding preservation requirements should be resolved through communication with the laboratory before sampling begins.

5.3 Field Filtration

At times, field-filtration may be required to provide for the analysis of dissolved chemical constituents. Field-filtration must be performed prior to the preservation of samples as described above. General procedures for field filtration are described below:

- The sample shall be filtered through a non-metallic, 0.45-micron membrane filter, immediately after collection. The filtration system shall consist of dedicated filter canister, dedicated tubing, and a peristaltic pump with pressure or vacuum pumping squeeze action (since the sample is filtered by mechanical peristalsis, the sample travels only through the tubing).

- To perform filtration, thread the tubing through the peristaltic pump head. Attach the filter canister to the discharge end of the silicon tubing (note flow direction arrow); attach the aqueous sample container to the intake end of the silicon tubing. Turn the peristaltic pump on and perform filtration. Run approximately 100 ml of sample through the filter and discard prior to sample collection.

- Continue by preserving the filtrate (contained in the filter canister), as applicable and generally described above.

5.4 Sample Packaging and Shipping

Only employees who have successfully completed the TtNUS "Shipping Hazardous Materials" training course are authorized to package and ship hazardous substances. These trained individuals are responsible for performing shipping duties in accordance with this training.

Samples collected for shipment from a site shall be classified as either environmental or hazardous material samples. Samples from drums containing materials other than Investigative Derived Waste (IDW) and samples obtained from waste piles or bulk storage tanks are generally shipped as hazardous materials. A distinction must be made between the two types of samples in order to:

- Determine appropriate procedures for transportation of samples (if there is any doubt, a sample shall be considered hazardous and shipped accordingly.)

- Protect the health and safety of transport and laboratory personnel receiving the samples (special precautions are used by the shipper and at laboratories when hazardous materials are received.)

Detailed procedures for packaging environmental samples are outlined in the remainder of this section.

5.4.1 Environmental Samples

Environmental samples are packaged as follows:

- Place properly identified sample container, with lid securely fastened, in a plastic bag (e.g. Ziploc baggie), and seal the bag.

- Place sample in a cooler constructed of sturdy material which has been lined with a large, plastic bag (e.g. "garbage" bag). Drain plugs on coolers must be taped shut.

- Pack with enough cushioning materials such as bubble wrap (shoulders of bottles must be iced if required) to minimize the possibility of the container breaking.

- If cooling is required (see Attachments A and B), place ice around sample container shoulders, and on top of packing material (minimum of 8 pounds of ice for a medium-size cooler).

- Seal (i.e., tape or tie top in knot) large liner bag.

- The original (top, signed copy) of the COC form shall be placed inside a large Ziploc-type bag and taped inside the lid of the shipping cooler. If multiple coolers are sent but are included on one COC form, the COC form should be sent with the cooler containing the vials for VOC analysis. The COC form should then state how many coolers are included with that shipment.

- Close and seal outside of cooler as described in SOP SA-6.3. Signed custody seals must be used.

Coolers must be marked as containing "Environmental Samples." The appropriate side of the container must be marked "This End Up" and arrows placed appropriately. No DOT marking or labeling is required; there are no DOT restrictions on mode of transportation.

6.0 REFERENCES

American Public Health Association, 1981. Standard Methods for the Examination of Water and Wastewater, 15th Edition. APHA, Washington, D.C.

International Air Transport Association (latest issue). Dangerous Goods Regulations, Montreal, Quebec, Canada.

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U.S. EPA, 1984. "Guidelines Establishing Test Procedures for the Analysis of Pollutants under Clean Water Act." Federal Register, Volume 49 (209), October 26, 1984, p. 43234.

U.S. EPA, 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020, U.S. EPA-EMSL, Cincinnati, Ohio.

ATTACHMENT A

GENERAL SAMPLE CONTAINER AND PRESERVATION REQUIREMENTS

Sample Type and Concentration		Container[1]	Sample Size	Preservation[2]	Holding Time[2]
WATER					
Organics (GC&GC/MS)	VOC Low	Borosilicate glass	2 x 40 mL	Cool to 4°C HCl to ≤ 2	14 days[9]
	Extractables (Low SVOCs and pesticide/PCBs)	Amber glass	2x2 L or 4x1 L	Cool to 4°C	7 days to extraction; 40 days after extraction
	Extractables (Medium SVOCs and pesticide/PCBs)	Amber glass	2x2 L or 4x1 L	None	7 days to extraction; 40 days after extraction
Inorganics	Metals Low	High-density polyethylene	1 L	HNO_3 to pH ≤2	6 months (Hg-28 days)
	Medium	Wide-mouth glass	16 oz.	None	6 months
	Cyanide Low	High-density polyethylene	1 L	NaOH to pH>12	14 days
	Cyanide Medium	Wide-mouth glass	16 oz.	None	14 days
Organic/ Inorganic	High Hazard	Wide-mouth glass	8 oz.	None	14 days
SOIL					
Organics (GC&GC/MS)	VOC	EnCore Sampler	(3) 5 g Samplers	Cool to 4°C	48 hours to lab preservation
	Extractables (Low SVOCs and pesticides/PCBs)	Wide-mouth glass	8 oz.	Cool to 4°C	14 days to extraction; 40 days after extraction
	Extractables (Medium SVOCs and pesticides/PCBs)	Wide-mouth glass	8 oz.	Cool to 4°C	14 days to extraction; 40 days after extraction
Inorganics	Low/Medium	Wide-mouth glass	8 oz.	Cool to 4°C	6 months (Hg - 28 days) Cyanide (14 days)
Organic/Inorganic	High Hazard	Wide-mouth glass	8 oz.	None	NA
Dioxin/Furan	All	Wide-mouth glass	4 oz.	None	35 days until extraction; 40 days after extraction
TCLP	All	Wide-mouth glass	8 oz.	None	7 days until preparation; analysis as per fraction
AIR					
Volatile Organics	Low/Medium	Charcoal tube – 7 cm long, 6 mm OD, 4 mm ID	100 L air	Cool to 4°C	5 days recommended

1 All glass containers should have Teflon cap liners or septa.
2 See Attachment E. Preservation and maximum holding time allowances per 40 CFR 136.

ATTACHMENT B

ADDITIONAL REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Parameter Number/Name	Container[1]	Preservation[2][3]	Maximum Holding Time[4]
INORGANIC TESTS:			
Acidity	P, G	Cool, 4°C	14 days
Alkalinity	P, G	Cool, 4°C	14 days
Ammonia - Nitrogen	P, G	Cool, 4°C; H_2SO_4 to pH 2	28 days
Biochemical Oxygen Demand (BOD)	P, G	Cool, 4°C	48 hours
Bromide	P, G	None required	28 days
Chemical Oxygen Demand (COD)	P, G	Cool, 4°C; H_2SO_4 to pH 2	28 days
Chloride	P, G	None required	28 days
Chlorine, Total Residual	P, G	None required	Analyze immediately
Color	P, G	Cool, 4°C	48 hours
Cyanide, Total and Amenable to Chlorination	P, G	Cool, 4°C; NaOH to pH 12; 0.6 g ascorbic acid[5]	14 days[6]
Fluoride	P	None required	28 days
Hardness	P, G	HNO_3 to pH 2; H_2SO_4 to pH 2	6 months
Total Kjeldahl and Organic Nitrogen	P, G	Cool, 4°C; H_2SO_4 to pH 2	28 days
Nitrate - Nitrogen	P, G	None required	48 hours
Nitrate-Nitrite - Nitrogen	P, G	Cool, 4°C; H_2SO_4 to pH 2	28 days
Nitrite - Nitrogen	P, G	Cool, 4°C	48 hours
Oil & Grease	G	Cool, 4°C; H_2SO_4 to pH 2	28 days
Total Organic Carbon (TOC)	P, G	Cool, 4°C; HCl or H_2SO_4 to pH 2	28 days
Orthophosphate	P, G	Filter immediately; Cool, 4°C	48 hours
Oxygen, Dissolved-Probe	G Bottle & top	None required	Analyze immediately
Oxygen, Dissolved-Winkler	G Bottle & top	Fix on site and store in dark	8 hours
Phenols	G	Cool, 4°C; H_2SO_4 to pH 2	28 days
Phosphorus, Total	P, G	Cool, 4°C; H_2SO_4 to pH 2	28 days
Residue, Total	P, G	Cool, 4°C	7 days
Residue, Filterable (TDS)	P, G	Cool, 4°C	7 days
Residue, Nonfilterable (TSS)	P, G	Cool, 4°C	7 days
Residue, Settleable	P, G	Cool, 4°C	48 hours
Residue, Volatile (Ash Content)	P, G	Cool, 4°C	7 days
Silica	P	Cool, 4°C	28 days
Specific Conductance	P, G	Cool, 4°C	28 days
Sulfate	P, G	Cool, 4°C	28 days

ATTACHMENT B
ADDITIONAL REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES
PAGE TWO

Parameter Number/Name	Container[1]	Preservation[2][3]	Maximum Holding Time[4]
INORGANIC TESTS (Cont'd):			
Sulfide	P, G	Cool, 4°C; add zinc acetate plus sodium hydroxide to pH 9	7 days
Sulfite	P, G	None required	Analyze immediately
Turbidity	P, G	Cool, 4°C	48 hours
METALS:[7]			
Chromium VI (Hexachrome)	P, G	Cool, 4°C	24 hours
Mercury (Hg)	P, G	HNO_3 to pH 2	28 days
Metals, except Chromium VI and Mercury	P, G	HNO_3 to pH 2	6 months
ORGANIC TESTS:[8]			
Purgeable Halocarbons	G, Teflon-lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$[5]	14 days
Purgeable Aromatic Hydrocarbons	G, Teflon-lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$[5] HCl to pH 2 [9]	14 days
Acrolein and Acrylonitrile	G, Teflon-lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$[5] adjust pH to 4-5 [10]	14 days
Phenols[11]	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[5]	7 days until extraction; 40 days after extraction
Benzidines[11], [12]	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[5]	7 days until extraction[13]
Phthalate esters[11]	G, Teflon-lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction
Nitrosamines[11], [14]	G, Teflon-lined cap	Cool, 4°C; store in dark; 0.008% $Na_2S_2O_3$[5]	7 days until extraction; 40 days after extraction
PCBs[11]	G, Teflon-lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction
Nitroaromatics & Isophorone[11]	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[5]; store in dark	7 days until extraction; 40 days after extraction
Polynuclear Aromatic Hydrocarbons (PAHs)[11],[14]	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[5]; store in dark	7 days until extraction; 40 days after extraction
Haloethers[11]	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[5]	7 days until extraction; 40 days after extraction
Dioxin/Furan (TCDD/TCDF)[11]	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[5]	7 days until extraction; 40 days after extraction

ATTACHMENT B
ADDITIONAL REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES
PAGE THREE

(1) Polyethylene (P): generally 500 ml or Glass (G): generally 1L.
(2) Sample preservation should be performed immediately upon sample collection. For composite chemical 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 chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
(3) 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).
(4) 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 be 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 samples under study are stable for the longer periods, and has received a variance from the Regional Administrator.
(5) Should only be used in the presence of residual chlorine.
(6) Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before pH adjustments are made to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.
(7) Samples should be filtered immediately on site before adding preservative for dissolved metals.
(8) Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.
(9) Sample receiving no pH adjustment must be analyzed within 7 days of sampling.
(10) The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.
(11) When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for 7 days before extraction and for 40 days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re: the requirement for thiosulfate reduction of residual chlorine) and footnotes 12, 13 (re: the analysis of benzidine).
(12) If 1,2-diphenylthydrazine is likely to be present, adjust the pH of the sample to 4.0±0.2 to prevent rearrangement to benzidine.
(13) Extracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.
(14) For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.
(15) The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.

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1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to identify and designate the field data record forms, logs and reports generally initiated and maintained for documenting field activities.

2.0 SCOPE

Documents presented within this procedure (or equivalents) shall be used for all contractor field activities, as applicable. Other or additional documents may be required by specific client contracts or project planning documents.

3.0 GLOSSARY

None

4.0 RESPONSIBILITIES

Project Manager (PM) - The Project Manager is responsible for obtaining hardbound, controlled-distribution logbooks (from the appropriate source), as needed. In addition, the Project Manager is responsible for placing all field documentation used in site activities (i.e., records, field reports, sample data sheets, field notebooks, and the site logbook) in the project's central file upon the completion of field work.

Field Operations Leader (FOL) - The Field Operations Leader is responsible for ensuring that the site logbook, notebooks, and all appropriate and current forms and field reports illustrated in this guideline (and any additional forms required by the contract) are correctly used, accurately filled out, and completed in the required time-frame.

5.0 PROCEDURES

5.1 Site Logbook

5.1.1 General

The site logbook is a hard-bound, paginated, controlled-distribution record book in which all major onsite activities are documented. At a minimum, the following activities/events shall be recorded or referenced (daily) in the site logbook:

- All field personnel present
- Arrival/departure of site visitors
- Time and date of H&S training
- Arrival/departure of equipment
- Time and date of equipment calibration
- Start and/or completion of borehole, trench, monitoring well installation, etc.
- Daily onsite activities performed each day
- Sample pickup information
- Health and Safety issues (level of protection observed, etc.)
- Weather conditions

A site logbook shall be maintained for each project. The site logbook shall be initiated at the start of the first onsite activity (e.g., site visit or initial reconnaissance survey). Entries are to be made for every day

that onsite activities take place which involve contractor or subcontractor personnel. Upon completion of the fieldwork, the site logbook must become part of the project's central file.

The following information must be recorded on the cover of each site logbook:

- Project name
- Contractor project number
- Sequential book number
- Start date
- End date

Information recorded daily in the site logbook need not be duplicated in other field notebooks (see Section 5.2), but must summarize the contents of these other notebooks and refer to specific page locations in these notebooks for detailed information (where applicable). An example of a typical site logbook entry is shown in Attachment A.

If measurements are made at any location, the measurements and equipment used must either be recorded in the site logbook or reference must be made to the field notebook in which the measurements are recorded (see Attachment A).

All logbook, notebook, and log sheet entries shall be made in indelible ink (black pen is preferred). No erasures are permitted. If an incorrect entry is made, the entry shall be crossed out with a single strike mark, and initialed and dated. At the completion of entries by any individual, the logbook pages used must be signed and dated. The site logbook must also be signed by the Field Operations Leader at the end of each day.

5.1.2 Photographs

When movies, slides, or photographs are taken of a site or any monitoring location, they must be numbered sequentially to correspond to logbook/notebook entries. The name of the photographer, date, time, site location, site description, and weather conditions must be entered in the logbook/notebook as the photographs are taken. A series entry may be used for rapid-sequence photographs. The photographer is not required to record the aperture settings and shutter speeds for photographs taken within the normal automatic exposure range. However, special lenses, films, filters, and other image-enhancement techniques must be noted in the logbook/notebook. If possible, such techniques shall be avoided, since they can adversely affect the accuracy of photographs. Chain-of-custody procedures depend upon the subject matter, type of camera (digital or film), and the processing it requires. Film used for aerial photography, confidential information, or criminal investigation require chain-of-custody procedures. Once processed, the slides of photographic prints shall be consecutively numbered and labeled according to the logbook/notebook descriptions. The site photographs and associated negatives and/or digitally saved images to compact disks must be docketed into the project's central file.

5.2 Field Notebooks

Key field team personnel may maintain a separate dedicated field notebook to document the pertinent field activities conducted directly under their supervision. For example, on large projects with multiple investigative sites and varying operating conditions, the Health and Safety Officer may elect to maintain a separate field notebook. Where several drill rigs are in operation simultaneously, each site geologist assigned to oversee a rig must maintain a field notebook.

5.3 Field Forms

Example field forms are listed in Section 6.0 of this SOP. Forms may be altered or revised for project-specific needs contingent upon client approval. Care must be taken to ensure that all essential information can be documented. Guidelines for completing these forms can be found in the related sampling SOP.

5.3.1 Sample Collection, Labeling, Shipment, Request for Analysis, and Field Test Results

5.3.1.1 Sample Log Sheet

Sample Log Sheets are used to record specified types of data while sampling. The data recorded on these sheets are useful in describing the sample as well as pointing out any problems, difficulties, or irregularities encountered during sampling. A log sheet must be completed for each sample obtained, including field quality control (QC) samples.

5.3.1.2 Sample Label

A typical sample label is illustrated in Attachment B. Adhesive labels must be completed and applied to every sample container. Sample labels can usually be obtained from the appropriate Program source electronically generated in-house, or are supplied from the laboratory subcontractor.

5.3.1.3 Chain-of-Custody Record Form

The Chain-of-Custody (COC) Record is a multi-part form that is initiated as samples are acquired and accompanies a sample (or group of samples) as they are transferred from person to person. This form must be used for any samples collected for chemical or geotechnical analysis whether the analyses are performed on site or off site. One carbonless copy of the completed COC form is retained by the field crew, one copy is sent to the Project Manager (or designee), while the original is sent to the laboratory. The original (top, signed copy) of the COC form shall be placed inside a large Ziploc-type bag and taped inside the lid of the shipping cooler. If multiple coolers are sent but are included on one COC form, the COC form should be sent with the cooler containing vials for VOC analysis or the cooler with the air bill attached. The air bill should then state how many coolers are included with that shipment. An example of a Chain-of-Custody Record form is provided as Attachment C. Once the samples are received at the laboratory, the sample cooler and contents are checked and any problems are noted on the enclosed COC form (any discrepancies between the sample labels and COC form and any other problems that are noted are resolved through communication between the laboratory point-of-contact and the contractor Project Manager). The COC form is signed and copied. The laboratory will retain the copy while the original becomes part of the samples' corresponding analytical data package.

5.3.1.4 Chain-of-Custody Seal

Attachment D is an example of a custody seal. The Custody seal is an adhesive-backed label. It is part of a chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field and sealed in coolers for transport to the laboratory. The COC seals are signed and dated by the sampler(s) and affixed across the lid and body of each cooler (front and back) containing environmental samples (see SOP SA-6.1). COC seals may be available from the laboratory; these seals may also be purchased from a supplier.

5.3.1.5 Geochemical Parameters Log Sheets

Field Analytical Log Sheets are used to record geochemical and/or natural attenuation field test results.

5.3.2 Hydrogeological and Geotechnical Forms

5.3.2.1 Groundwater Level Measurement Sheet

A Groundwater Level Measurement Sheet must be filled out for each round of water level measurements made at a site.

5.3.2.2 Data Sheet for Pumping Test

During the performance of a pumping test (or an in-situ hydraulic conductivity test), a large amount of data must be recorded, often within a short time period. The Pumping Test Data Sheet facilitates this task by standardizing the data collection format for the pumping well and observation wells, and allowing the time interval for collection to be laid out in advance.

5.3.2.3 Packer Test Report Form

A Packer Test Report Form must be completed for each well upon which a packer test is conducted.

5.3.2.4 Boring Log

During the progress of each boring, a log of the materials encountered, operation and driving of casing, and location of samples must be kept. The Summary Log of Boring, or Boring Log is used for this purpose and must be completed for each soil boring performed. In addition, if volatile organics are monitored on cores, samples, cuttings from the borehole, or breathing zone, (using a PID or FID), these readings must be entered on the boring log at the appropriate depth. The "Remarks" column can be used to subsequently enter the laboratory sample number, the concentration of key analytical results, or other pertinent information. This feature allows direct comparison of contaminant concentrations with soil characteristics.

5.3.2.5 Monitoring Well Construction Details Form

A Monitoring Well Construction Details Form must be completed for every monitoring well, piezometer, or temporary well point installed. This form contains specific information on length and type of well riser pipe and screen, backfill, filter pack, annular seal and grout characteristics, and surface seal characteristics. This information is important in evaluating the performance of the monitoring well, particularly in areas where water levels show temporal variation, or where there are multiple (immiscible) phases of contaminants. Depending on the type of monitoring well (in overburden or bedrock, stick-up or flush mount), different forms are used.

5.3.2.6 Test Pit Log

When a test pit or trench is constructed for investigative or sampling purposes, a Test Pit Log must be filled out by the responsible field geologist or sampling technician.

5.3.2.7 Miscellaneous Monitoring Well Forms

Monitoring Well Materials Certificate of Conformance should be used as the project directs to document all materials utilized during each monitoring well installation.

The Monitoring Well Development Record should be used as the project directs to document all well development activities.

5.3.2.8 Miscellaneous Field Forms - QA and Checklists

Container Sample and Inspection Sheet may be used as the project directs each time a container (drum, tank, etc.) is sampled and/or inspected.

QA Sample Log Sheet may be used at the project directs each time a QA sample is colleted, such as Rinsate Blank, Source Blank, etc.

Field Task Modification Request (FTMR) will be prepared for all deviations from the project planning documents. The FOL is responsible for initiating the FTMRs. Copies of all FTMRs will be maintained with the onsite planning documents and originals will be placed in the final evidence file.

The Field Project Daily Activities Check List and Field Project Pre-Mobilization Checklist may be used during both the planning and field effort to assure that all necessary tasks are planned for and completed. These two forms are not a requirement but a useful tool for most field work.

5.3.3 Equipment Calibration and Maintenance Form

The calibration or standardization of monitoring, measuring or test equipment is necessary to assure the proper operation and response of the equipment, to document the accuracy, precision or sensitivity of the measurement, and determine if correction should be applied to the readings. Some items of equipment require frequent calibration, others infrequent. Some are calibrated by the manufacturer, others by the user.

Each instrument requiring calibration has its own Equipment Calibration Log which documents that the manufacturer's instructions were followed for calibration of the equipment, including frequency and type of standard or calibration device. An Equipment Calibration Log must be maintained for each electronic measuring device used in the field; entries must be made for each day the equipment is used or in accordance with the manufacturer's recommendations.

5.4 Field Reports

The primary means of recording onsite activities is the site logbook. Other field notebooks may also be maintained. These logbooks and notebooks (and supporting forms) contain detailed information required for data interpretation or documentation, but are not easily useful for tracking and reporting of progress. Furthermore, the field logbook/notebooks remain onsite for extended periods of time and are thus not accessible for timely review by project management.

5.4.1 Daily Activities Report

To provide timely oversight of onsite contractors, Daily Activities Reports are completed and submitted as described below.

5.4.1.1 Description

The Daily Activities Report (DAR) documents the activities and progress for each day's field work. This report must be filled out on a daily basis whenever there are drilling, test pitting, well construction, or other related activities occurring which involve subcontractor personnel. These sheets summarize the work performed and form the basis of payment to subcontractors. An example DAR form can be found in Appendix E.

5.4.1.2 Responsibilities

It is the responsibility of the rig geologist to complete the DAR and obtain the driller's signature acknowledging that the times and quantities of material entered are correct.

5.4.1.3 Submittal and Approval

At the end of the shift, the rig geologist must submit the Daily Activities Report to the Field Operations Leader (FOL) for review and filing. The Daily Activities Report is not a formal report and thus requires no further approval. The DAR reports are retained by the FOL for use in preparing the site logbook and in preparing weekly status reports for submission to the Project Manager.

5.4.2 Weekly Status Reports

To facilitate timely review by project management, photocopies of logbook/notebook entries may be made for internal use.

It should be noted that in addition to summaries described herein, other summary reports may also be contractually required.

\

6.0 SAMPLE FIELD FORMS

Example field forms can be found in Attachment C of the Master SAP.
Groundwater Sample Log Sheet
Surface Water Sample Log Sheet
Soil/Sediment Sample Log Sheet
Groundwater Level Measurement Sheet
Pumping Test Data Sheet
Packer Test Report Form
Boring Log
Monitoring Well Construction Bedrock Flush Mount
Monitoring Well Construction Bedrock Open Hole
Monitoring Well Construction Bedrock Stick Up
Monitoring Well Construction Confining Layer
Monitoring Well Construction Overburden Flush Mount
Monitoring Well Construction Overburden Stick Up
Test Pit Log
Monitoring Well Development Record
Daily Activities Record
Field Task Modification Request
Hydraulic Conductivity Test Data Sheet
Low Flow Purge Data Sheet
Equipment Calibration Log

ATTACHMENT A
TYPICAL SITE LOGBOOK ENTRY

START TIME: _____ DATE: _____

SITE LEADER: _____

PERSONNEL:

CONTRACTOR	DRILLER	SITE VISITORS
_____	_____	_____
_____	_____	_____
_____	_____	_____

WEATHER: Clear, 68°F, 2-5 mph wind from SE

ACTIVITIES:

1. Steam jenney and fire hoses were set up.
2. Drilling activities at well ____ resumes. Rig geologist was _____. See Geologist's Notebook, No. 1, page 29-30, for details of drilling activity. Sample No. 123-21-S4 collected; see sample logbook, page 42. Drilling activities completed at 11:50 and a 4-inch stainless steel well installed. See Geologist's Notebook, No. 1, page 31, and well construction details for well _____.
3. Drilling rig No. 2 steam-cleaned at decontamination pit. Then set up at location of well _____.
4. Well _____ drilled. Rig geologist was _____. See Geologist's Notebook, No. 2, page ____ for details of drilling activities. Sample numbers 123-22-S1, 123-22-S2, and 123-22-S3 collected; see sample logbook, pages 43, 44, and 45.
5. Well _____ was developed. Seven 55-gallon drums were filled in the flushing stage. The well was then pumped using the pitcher pump for 1 hour. At the end of the hour, water pumped from well was "sand free."
6. EPA remedial project manger arrives on site at 14:25 hours.
7. Large dump truck arrives at 14:45 and is steam-cleaned. Backhoe and dump truck set up over test pit _____.
8. Test pit _____ dug with cuttings placed in dump truck. Rig geologist was _____. See Geologist's Notebook, No. 1, page 32, for details of test pit activities. Test pit subsequently filled. No samples taken for chemical analysis. Due to shallow groundwater table, filling in of test pit ___ resulted in a very soft and wet area. A mound was developed and the area roped off.
9. Express carrier picked up samples (see Sample Logbook, pages 42 through 45) at 17:50 hours. Site activities terminated at 18:22 hours. All personnel off site, gate locked.

_____

Field Operations Leader

ATTACHMENT B

Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, 15220 (412)921-7090	**Project:** **Site:** **Location:**	
Sample No:		**Matrix:**
Date:	**Time:**	**Preserve:**
Analysis:		
Sampled by:	**Laboratory:**	

ATTACHMENT C

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER 3413 | PAGE ____ OF ____

PROJECT NO:	FACILITY:	PROJECT MANAGER	PHONE NUMBER	LABORATORY NAME AND CONTACT:
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER	PHONE NUMBER	ADDRESS
		CARRIER/WAYBILL NUMBER		CITY, STATE

STANDARD TAT ☐
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G)
PRESERVATIVE USED
TYPE OF ANALYSIS

DATE YEAR ____	TIME	SAMPLE ID	LOCATION ID	TOP DEPTH (FT)	BOTTOM DEPTH (FT)	MATRIX (GW, SO, SW, SD, QC, ETC.)	COLLECTION METHOD GRAB (G) COMP (C)	No. OF CONTAINERS									COMMENTS

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

4/02R
FORM NO. TINUS-001

ATTACHMENT D

CHAIN-OF-CUSTODY SEAL

CUSTODY SEAL	**CUSTODY SEAL**
Date	**Date**
Signature	**Signature**

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A INVESTIGATION-DERIVED WASTE LABEL 8

1.0 PURPOSE

Decontamination is the process of removing and/or neutralizing site contaminants that have contacted and/or accumulated on equipment. The purpose of this Standard Operating Procedure (SOP) is to protect site personnel, the general public, and the environment while preserving or maintaining sample integrity. It is further intended through this procedure to describe the steps necessary for proper decontamination of drilling equipment, earth-moving equipment , chemical sampling equipment and field operation and analytical equipment.

2.0 SCOPE AND APPLICABILITY

This procedure applies to all equipment used to provide access to/acquire environmental samples that may have become contaminated through direct contact with contaminated media including air, water, and soil. This equipment includes drilling and heavy equipment and chemical sampling and field analytical equipment. Where technologically and economically feasible, single-use sealed disposable equipment will be employed to minimize the potential for cross-contamination. This SOP also provides general reference information on the control of contaminated materials.

Decontamination methods and equipment requirements may differ from one project to another. General equipment items are specified in Section 6.0, but project-specific equipment must be obtained to address the project-specific decontamination procedures presented in Section 7.0 and applicable subsections.

3.0 GLOSSARY

Alconox/Liquinox - A brand of phosphate-free laboratory-grade detergent.

Decontamination Solution - A solution selected/identified in the Health and Safety Plan or Project-Specific Quality Assurance Plan. The solution is selected and employed as directed by the project chemist/health and safety professional.

Deionized Water (DI) - Tap water that has been treated by passing through a standard deionizing resin column. This water may also pass through additional filtering media to attain various levels of analyte-free status. The DI water should meet College of American Pathologists (CAP) and National Committee for Clinical Laboratory Standards (NCCLS) specifications for reagent-grade Type I water.

Potable Water - Tap water from any municipal water treatment system. Use of an untreated potable water supply is not an acceptable substitute for tap water.

Pressure Washing - Process employing a high-pressure pump and nozzle configuration to create a high-pressure spray of potable water. High-pressure spray is employed to remove solids from equipment.

Solvent – A liquid in which solid chemicals or other liquids are dissolved. The solvent of choice is pesticide-grade isopropanol. Use of other solvents (methanol, acetone, or hexane) may be required for particular projects or for a particular purpose (e.g., removal of concentrated waste) and must be justified in the project planning documents. For example, it may be necessary to use hexane when analyzing for trace levels of pesticides, PCBs, or fuels. In addition, because many of these solvents are not miscible in water, the equipment should be air dried prior to use. Solvents should not be used on PVC equipment or well construction materials.

Steam Pressure Washing - A cleaning method employing a high-pressure spray of heated potable water to remove various organic/inorganic chemicals from equipment.

4.0 RESPONSIBILITIES AND PERSONNEL QUALIFICATIONS

Project Manager - Responsible for ensuring that all field activities are conducted in accordance with approved project plan(s) requirements.

Decontamination Personnel - Individuals assigned the task of decontamination. It is the responsibility of these individuals to understand the use and application of the decontamination process and solutions as well as the monitoring of that process to ensure that it is working properly. This is accomplished through visual evaluation, monitoring instrument scanning of decontaminated items, and/or through the collection of rinsate blanks to verify contaminant removal.

Field Operations Leader (FOL) - Responsible for the implementation of project-specific planning documents. This includes on-site verification that all field activities are performed in compliance with approved SOPs or as otherwise dictated by the approved project plan(s). The FOL is also responsible for the completion and accuracy of all field documentation.

Site Safety Officer (SSO) - Exercises shared responsibility with the FOL concerning decontamination effectiveness. All equipment arriving on site (as part of the equipment inspection), leaving the site, and moving between locations is required to go through a decontamination evaluation. This is accomplished through visual examination and/or instrument screening to determine the effectiveness of the decontamination process. Improper or incomplete decontamination is sufficient to restrict equipment from entering the site, exiting the site, or moving to a new location on the site until the objectives are successfully completed.

General personnel qualifications for decontamination activities include the following:

- Occupational Safety and Health Administration (OSHA) 40-hour and applicable refresher training.
- Capability of performing field work under the expected physical and environmental (i.e., weather) conditions.
- Familiarity with appropriate decontamination procedures.

5.0 HEALTH AND SAFETY

In addition to the health and safety issues and reminders specified in subsections of this SOP, the following considerations and requirements must be observed as SOPs for field equipment decontamination activities:

- If any solvents or hazardous chemicals (e.g., isopropyl alcohol) are to be used in equipment decontamination activities, the FOL must first obtain the manufacturer's/supplier's Material Safety Data Sheet (MSDS) and assure that it is reviewed by all users (prior to its use), added to the site Hazardous Chemical Inventory, and maintained on site as part of the project Hazard Communication Program.

- Review and observe specific health and safety requirements (e.g., personal protective equipment [PPE]) specified in the project-specific health and safety plan for this activity.

6.0 EQUIPMENT LIST

- Wood for decontamination pad construction, when applicable (see Section 7.1).

- Tools for constructing decontamination pad frame, when applicable (see Section 7.1).

- Visqueen sheeting or comparable material to cover decontamination pad frame, when applicable (see Section 7.1).
- Wash/drying racks for auger flights and drill/drive rods, when applicable (see Section 7.2).
- PPE as specified in the project health and safety plan.
- Soap and water for washing and rinsing.
- Deionized water for final rinsing.
- Solvents (e.g., pesticide-grade isopropanol) for rinsing (see applicable portions of Section 7.2).
- Tubs, buckets, etc. for containerizing rinse water (see applicable portions of Section 7.2).
- Sample bottles for collecting rinsate blanks (see Section 7.2).
- Calibrated photoionization detector (PID) or flame ionization detector (FID) to monitor decontaminated equipment for organic vapors generated through the existence of residual contamination or the presence of decontamination solvent remaining after the piece was rinsed.
- Aluminum foil or clear clean plastic bag for covering cleaned equipment (see applicable portions of Section 7.2).
- Paper towels or cloths for wiping.
- Brushes, scrapers, or other hand tools useful for removing solid materials from equipment.
- Clear plastic wrap for covering or wrapping large decontaminated equipment items (see Section 7.2.2).
- Drum-moving equipment for moving filled waste drums (optional) (see Section 7.3).
- Drum labels for waste drums (see Attachment A).

7.0 PROCEDURES

The process of decontamination is accomplished through the removal of contaminants, neutralization of contaminants, or isolation of contaminants. To accomplish this activity, preparation is required including site preparation, equipment selection, and evaluation of the decontamination requirements and processes. Site contaminant types, concentrations, and media types are primary drivers in the selection of the types of decontamination and where it will be conducted. For purposes of this SOP, discussion is limited to decontamination procedures for general environmental investigations.

Decontamination processes will be performed at the location(s) specified in project-specific planning documents. Typical decontamination locations include the following:

- Temporary decontamination pads/facilities
- Sample locations
- Centralized decontamination pad/facilities
- Combination of some or all of the above

The following discussion includes general considerations for the decontamination process. Specific construction and implementation procedures will be as specified in the project-specific planning documents and/or may be as dictated by site-specific conditions as long as the intent of the requirements in the planning documents is met. This intent is to contain any residual fluids and solids generated through the decontamination process.

7.1 Decontamination Pad Design/Construction Considerations

7.1.1 Temporary Decontamination Pads

Temporary decontamination pads may be constructed at satellite locations within the site area in support of temporary work areas. These structures are generally constructed to support the decontamination of heavy equipment such as drill rigs and earth-moving equipment but can be employed for smaller articles.

The purpose of the decontamination pad is to contain wash waters and potentially contaminated soil generated during decontamination procedures. Therefore, construction of these pads should take into account the following considerations:

- Site location – The decontamination site selected should be far enough from the work site to maximize decontamination effectiveness while minimizing travel distance. The location of the decontamination site shall be selected to provide, in the judgment of the FOL or FOL designee, compliance with as many of the following characteristics as practicable:

  - Well removed from pedestrian/vehicle thoroughfares.

  - Avoidance of areas where control/custody cannot be maintained.

  - Avoidance of areas where potential releases of contaminated media or decontamination fluids may be compounded through access to storm water transport systems, streams, or other potentially sensitive areas.

  - Avoidance of potentially contaminated areas.

  - Avoidance of areas too close to the ongoing operation, where cross-contamination may occur.

  The selected decontamination site should include the following, where possible:

  - Areas where potable water and electricity are provided.

> ***Safety Reminder***
>
> When utilizing electrical power sources, either hard-wired or portable-generated sources, ensure that:
>
> - All power is routed through a Ground Fault Circuit Interrupter (GFCI).
>
> - All power cords are in good condition (no physical damage), rated for the intended energy load, and designated for outdoor use.
>
> In situations where accomplishing these elements is not possible, it will be necessary to implement a site electrical grounding program.

- Areas where support activities such as removing decontamination waters soil and sediment are possible without entering an active exclusion zone.

- Areas that offer sufficient size to carry out the specific decontamination sequence.

- Decontamination pad (decon pad) – The decon pad shall be constructed to meet the following characteristics:

  - Size – The size of the pad should be sufficient to accept the equipment to be decontaminated as well as permitting free movement around the equipment by the personnel conducting the decontamination. The size should permit these movements utilizing pressure/steam washer wands and hoses and minimizing splash due to work in close quarters.

  - Slope – An adequate slope will be constructed to permit the collection of water and potentially contaminated soil within a trough or sump constructed at one end. The collection point for wash waters should be of adequate distance that the decontamination workers do not have to walk through the wash waters while completing their tasks. Because the pad will be sloped, place a light coating of sand over the plastic to minimize potential slips and falls. See the text about liners below.

  - Sidewalls – The sidewalls shall be at least 6 inches in height (or as high as possible if 6 inches is not achievable) to provide adequate containment for wash waters and soil. If splash represents a potential problem, splash guards should be constructed to control overspray. Sidewalls may be constructed of wood, inflatables, sand bags, etc. to permit containment. Splash guards are typically wood frames with Visqueen coverings to control overspray.

  - Liner – Depending on the types of equipment and decontamination method to be used, the liner should be of sufficient thickness to provide a puncture-resistant barrier between the decontamination operation and the unprotected environment. Care should be taken to examine the surface area prior to placing the liner to remove sharp articles (sticks, stones, debris) that could puncture the liner. Liners are intended to form an impermeable barrier. The thickness may vary from a minimum recommended thickness of 10 mil to 30 mil. The desired thickness may be achieved through layering materials of lighter construction. It should be noted that various materials (rubber, polyethylene sheeting) become slippery when wet. To minimize this potential hazard associated with a sloped liner, a light coating of sand shall be applied to provide traction as necessary.

  - Wash/drying racks – Auger flights, drill/drive rods, and similar equipment require racks positioned off of the ground to permit these articles to be washed, drained, and dried while secured from falling during this process.

For decontamination of direct-push technology (DPT) equipment, the pad may be as simple as a mortar tub containing buckets of soapy water for washing and an empty bucket to capture rinse waters. Decontamination may be conducted at the rear of the rig to permit rapid tool exchange.

- Maintenance – Maintain the decontamination area by:

  - Periodically clearing the work area of standing water, soil, and debris, and coiling hoses to aid in eliminating slip, trip, and fall hazards. In addition, these articles will reduce potential backsplash and cross-contamination.

  - Regularly changing the decontamination fluids to ensure proper cleaning and prevent cross-contamination.

- PPE – Periodically evaluate the condition of, and maintain the decontamination equipment, including regular cleaning of face shields and safety glasses. This is critical to ensuring the safety of decontamination personnel and the integrity of the decontamination process, and it will ensure that equipment is functioning properly.

7.1.2 Decontamination Activities at Drill Rigs/DPT Units

During subsurface sampling activities including drilling and DPT activities, decontamination of drive rods, Macro Core Samplers, split spoons, etc. is typically conducted at an area adjacent to the operation. Decontamination is generally accomplished using a soap/water wash and rinse utilizing buckets and brushes. This area requires sufficient preparation to accomplish the decontamination objectives.

Buckets shall be placed within mortar tubs or similar secondary containment tubs to prevent splash and spills from reaching unprotected environmental media. Drying racks shall be employed as directed for temporary pads to permit parts to dry and be evaluated prior to use/reuse. Methodology regarding this activity is provided in Section 7.2.

7.1.3 Decontamination Activities at Remote Sample Locations

When sampling at remote locations, sampling equipment such as trowels and pumps/tubing should be evacuated of potentially contaminated media to the extent possible. This equipment should be wrapped in plastic for transport to the temporary/centralized decontamination location for final cleaning and disposition. Flushing and cleaning of single-use equipment such as disposable trowels, tubing, and surgeon's gloves may allow disposal of this equipment after visible soil and water remnants have been removed.

7.2 Equipment Decontamination Procedures

The following represents procedures to be employed for the decontamination of equipment that may have contacted and/or accumulated contamination through site investigation activities.

7.2.1 Monitoring Well Sampling Equipment

7.2.1.1 Groundwater sampling equipment – This includes pumps inserted into monitoring wells such as bladder pumps, Whale pumps, and Redi-Flo pumps and reusable bailers, etc.

1. Evacuate to the extent possible, any purge water within the pump/bailer.
2. Scrub using soap and water and/or steam clean the outside of the pump/bailer and, if applicable, the pump tubing.
3. Insert the pump and tubing/bailer into a clean container of soapy water. Pump/run a sufficient amount of soapy water through the pump/bailer to flush out any residual well water. After the pump is flushed, circulate soapy water through the pump to ensure that the internal components are thoroughly flushed.
4. Remove the pump and tubing/bailer from the container
5. Rinse external pump components using tap water.
6. Insert the pump and tubing/bailer into a clean container of tap water. Pump/run a sufficient amount of tap water through the pump/bailer to evacuate all of the soapy water (until clear).

CAUTION

Do not rinse PE, PVC, and associated tubing with solvents – Use the procedures defined in the project-specific planning documents. If they are not defined, contact the FOL for guidance. The solvent rinse described in Step 7 may be omitted if groundwater does not contain oil, grease, PAHs, PCBs, or other hard to remove organic materials.

7. If groundwater contains or is suspected to contain oil, grease, PAHs, PCBs, or other hard to remove organic materials, rinse the equipment to be cleaned with pesticide-grade isopropanol.

8. Pass deionized water through the hose to flush out the tap water and solvent residue as applicable.

9. Drain residual deionized water to the extent possible.

10. Allow components of the equipment to air dry.

11. For bladder pumps, disassemble the pump and wash the internal components with soap and water, then rinse with tap water, isopropanol, and deionized water and allow to dry. After the parts are dry, conduct a visual inspection and a monitoring instrument scan to ensure that potential contaminants and all decontamination solvent have been removed. Collect a rinsate blank in accordance with the project-specific planning documents to ensure that the decontamination process is functioning as intended. The typical frequency of collection for rinsate blanks is 1 per 20 field samples. In addition, wipe samples or field tests such as UV light may be used.

12. Wrap pump/bailer in aluminum foil or a clear clean plastic bag for storage.

SAFETY REMINDER

Remember when handling powered equipment to disconnect the power source and render the equipment to a zero energy state (both potential and kinetic) before opening valves, disconnecting lines, etc.

7.2.1.2 Electronic Water Level Indicators/Sounders/Tapes

During water level measurements, rinsing the extracted tape and probe with deionized water and wiping the surface of the extracted tape between locations is acceptable. However, periodic full decontamination should be conducted as follows:

1. Wash with soap and water
2. Rinse with tap water
3. Rinse with deionized water

NOTE

In situations where oil, grease, free product, other hard to remove materials are encountered, probes and exposed tapes should be washed in hot soapy water. If probes or tapes cannot be satisfactorily decontaminated (they are still stained, discolored, etc.), they should be removed from service.

7.2.1.3 Miscellaneous Equipment

Miscellaneous equipment including analytical equipment (water quality testing equipment) shall be cleaned per manufacturers' instructions. This generally includes wiping the sensor housing and rinsing with tap and deionized water.

Coolers/shipping containers employed to ship samples are received from the laboratory in a variety of conditions including marginal to extremely poor. Coolers shall be evaluated prior to use for the following:

- Structural integrity – Coolers missing handles or having breaks in the outer housing should be removed and not used. Notify the laboratory that the risk of shipping samples in the cooler(s) provided is too great and request a replacement unit.

- Cleanliness – As per protocol, only volatile organic samples are accompanied by a trip blank. If a cooler's cleanliness is in question (visibly dirty/stained) or if there are noticeable odors, the cooler should be decontaminated prior to use as follows:

  1. Wash with soap and water
  2. Rinse with tap water
  3. Dry

If these measures fail to clean the cooler to an acceptable level, remove the unit from use as a shipping container and ask the cooler provider (e.g., the analytical laboratory) to provide a replacement unit.

7.2.2 Downhole Drilling Equipment

This includes any portion of the drill rig that is over the borehole, including auger flights, drill stems, rods, and associated tooling that would extend over the borehole. The following procedure is to be employed prior to initiating the drilling/sampling activity, then between locations:

> ***CAUTION***
> Exercise care when using scrapers to remove soil and debris from downhole drilling equipment. Inadvertent slips of scrapers have resulted in cuts, scrapes, and injured knuckles, so use scrapers carefully when removing soil from these items.

1. Remove loose soil using shovels, scrapers, etc.

2. Through a combination of scrubbing using soap and water and/or steam cleaning or pressure washing, remove visible dirt/soil from the equipment being decontaminated.

> ***CAUTION***
> In Step 3, do not rinse PE, PVC, and associated tubing with solvents. The appropriate procedures should be defined within the project-specific planning documents. If they are not defined, contact the FOL for guidance. The solvent rinse described in Step 4 may be omitted if groundwater does not contain oil, grease, PAHs, PCBs, or other hard to remove organic materials.

3. Rinse the equipment with tap water, where applicable (steam cleaning and pressure washing incorporate rinsing as part of the process).

4. If the equipment has directly or indirectly contacted contaminated sample media and is known or suspected of being contaminated with oil, grease, PAHs, PCBs, or other hard to remove organic materials, rinse equipment with pesticide-grade isopropanol

5. To the extent possible, allow components to air dry.

6. If the decontaminated equipment is to be used immediately after decontamination, screen it with a calibrated photoionization detector (PID)/flame ionization detector (FID) to ensure that all contaminants and possible decontamination solvents (if they were used) have been adequately removed.

7. Wrap or cover equipment in clear plastic until it is time to be used.

SAFETY REMINDER

Even when equipment is disconnected from power sources, dangers such as the following may persist:

Falls - An auger flight standing on its end may fall and injure someone. Secure all loose articles to prevent heavy articles from falling onto people or equipment.

Burns - Steam cleaner water is heated to more than 212 °F and exhibits thermal energy that can cause burns. Prevent contact of skin with hot water or surfaces.

High water pressure - Pressure washer discharge can have 2,000 to 4,000 psi of water pressure. Water under this amount of pressure can rupture skin and other human tissues. Water at 4,000 psi exiting a 0° tip can be dangerous because of its relatively high cutting power. The exit velocity and cutting power of the water are reduced when exiting a 40° fan tip, but damage to soft tissues is still possible.

In general, follow the rules below to avoid injury, equipment damage, or incomplete decontamination:

1. Read the operating manual and follow the manufacturers' recommended safety practices before operating pressure washers and steam cleaners.

2. Never point the pressure washer or steam cleaner at another person or use to clean your boots or other parts of your body. Water lacerations and burns may appear to be minor at first but can be life threatening. Do not attempt to hold small parts in your hand while washing them with high-temperature or high-pressure water.

3. Always wear PPE as specified in the HASP such as:

   - Hard hat, safety glasses, splash shield, impermeable apron or splash suit, and hearing protection. Remember that excessive noise is a hazard when operating gas-powered engines and electrically driven pressure washers. PPE will be identified in your project specific planning documents.

4. Inspect each device before use. An inspection checklist will be provided in the project-specific planning documents. If it is a rented device, safety measures are typically provided by the vendor. In all cases, if you are not familiar with the operation of a pressure washer/steam cleaner, do not operate it until you obtain and thoroughly review operating instructions and recommended safety practices.

5. Do not modify equipment unless the manufacturer has approved the modifications.

7.2.3 Soil/Sediment Sampling Equipment

This section applies to soil sampling equipment including but not limited to hand augers, stainless steel trowels/spoons, bowls, dredges, scoops, split spoons, Macro Core samplers, etc.

1. Remove all loose soil from the equipment through manual means.
2. Through a combination of scrubbing using soap and water and/or steam cleaning or pressure washing, remove visible dirt/soil from the equipment.
3. Rinse the equipment with tap water.

> ***CAUTION***
> Do not rinse PE, PVC, and associated tubing with solvents. The appropriate procedures should be defined within the project-specific planning documents. If they are not defined, contact the FOL for guidance. The solvent rinse described in Step 4 may be omitted if groundwater does not contain oil, grease, PAHs, PCBs, or other hard to remove organic materials.

4. If the equipment is contaminated or suspected to be contaminated with oil, grease, PAHs, PCBs, or other hard to remove organic materials, rinse the equipment with pesticide-grade isopropanol.
5. Rinse the equipment with deionized water.
6. To the extent possible, allow components to air dry.
7. If the equipment is to be used immediately after decontamination, screen it with a calibrated PID/FID to ensure that all solvents (if they were used) and trace contaminants have been adequately removed.
8. After the equipment has dried, wrap it in aluminum foil for storage until use.

Dredges employed in sediment sampling are typically decontaminated as follows:

- Remove the sediment sample from the sampling device
- If sufficient associated surface water is available at the sampling site, place the dredge in the water and flush to remove visible sediment.
- Extract the dredge and wash it in soap and water per the project-specific planning documents.

> ***CAUTION***
> When handling dredges, the primary safety concern is trapping fingers or extremities in the larger dredge samplers within the jaws or pinch points of the mechanical jaws. Keep hands, fingers, and extremities away from these pinch and compression points. Either handle the device by the rope or preferably lock the jaws in place to control the potential for closing during maintenance and/or cleaning.

7.3 Contact Waste/Materials

During the course of field investigations, disposable/single-use equipment becomes contaminated. These items include tubing, trowels, PPE (gloves, overboots, splash suits, etc.), and broken sample containers.

With the exception of the broken glass, single-use articles should be cleaned (washed and rinsed) of visible materials and disposed as normal refuse. The exception to this rule is that extremely soiled materials that cannot be cleaned shall be containerized for disposal in accordance with applicable federal, state, and local regulations.

7.3.1 Investigation-Derived Wastes - Decontamination Wash Waters and Sediments

> ***NOTE***
> Requirements for waste storage may differ from one facility to the next. Facility-specific directions for waste storage areas will be provided in project-specific documents, or separate direction will be provided by the Project Manager.

1. Assume that all investigation-derived waste (IDW) generated from decontamination activities contains the hazardous chemicals associated with the site unless there are analytical or other data to the contrary. Waste solution volumes could vary from a few gallons to several hundred gallons in cases where large equipment required cleaning.

2. Where possible, use filtering systems to extend the use of water within a closed system wash unit to recycle water and to reduce possible waste amounts.

> ***NOTE***
> Containerized waste rinse solutions are best stored in 55-gallon drums (or equivalent containers) that can be sealed until ultimate disposal at an approved facility.

3. Label waste storage containers appropriately labeled (see Attachment A).

4. Ensure that the IDW storage area is configured to meet the following specifications to permit access to the containers and to conduct spill/leak monitoring, sampling, and extraction when the disposal route is determined:

   - Enclose areas accessible by the general public using construction fencing and signs.
   - Stored materials in 55-gallon drums on pallets with four (or fewer) drums per pallet.
   - Maintain the retaining bolt and label on the outside of storage containers where readily visible.
   - Provide at least 4 feet of room between each row of pallets to allow access to containers for sampling, drum removal, and spill response.
   - As directed in project-specific planning documents, maintain an IDW Inventory List and provide the list to the site Point of Contact at the termination of each shift.
   - Maintain spill response equipment at the IDW storage area in case it is required for immediate access.
   - Where possible, use equipment for moving containers. Where not possible, obtain help to manipulate containers.

CAUTION

Each container of water can weigh up to 490 pounds. Each 55-gallon drum of wet soil can weigh more than 750 pounds. Fill drums and temporary containers to 80 percent capacity to minimize spill and handling difficulties. Use drum carts to move filled drums.

See safe lifting techniques provided in Section 4.4 of the Tetra Tech NUS, Inc. Health and Safety Guidance Manual.

When placing drums, keep your fingers out of pinch and smash points such as between the drums. In some cases such as well development and/or purge water, you can place the drums to be filled on the pallet and transport materials in smaller easier to handle containers.

7.4 Decontamination Evaluation

Upon decontamination of equipment, determine the effectiveness of the decontamination process in the following manner:

- Visual evaluation – A visual evaluation will be conducted to ensure the removal of particulate matter. This shall be done to ensure that the washing/rinsing process is working as intended.

- Instrument Screening – A properly calibrated PID/FID should be used to evaluate the presence of site contaminants and solvents used in the cleaning process. The air intake of the instrument shall be passed over the article to be evaluated. Avoid placing the instrument probe into residual waters. A PID/FID reading greater than the daily established background level requires a repeat of the decontamination process, followed by rescreening with the PID/FID. This sequence must be repeated until no instrument readings greater than the daily established background level are observed. It should be noted that the instrument scan is only viable if the contaminants are detectable within the instrument's capabilities.

NOTE

When required by project-specific planning documents, collection of rinsate blanks (see next step) shall be completed without exception unless approval to not collect these samples is obtained from the Project Manager.

- Collection of Rinsate Blanks – It is recommended that rinsate samples be collected to:

  - Evaluate the decontamination procedure representing different equipment applications (pumps versus drilling equipment) and different decontamination applications.

  - Single-use disposable equipment – The number of samples should represent different types of equipment as well as different lot numbers of single-use articles.

  - The collection and the frequency of collection of rinsate samples are as follows unless specified differently in the project-specific planning documents:

    - Per decontamination method
    - Per disposable article/batch number of disposable articles

NOTE

It is recommended that an initial rinsate sample be collected early in the project to ensure that the decontamination process is functioning properly and to avoid using a contaminated batch of single-use articles. It is recommended that a follow-up sample be collected later during the execution of the project to ensure that those conditions do not change.

Rinsate samples collection may be driven by types of and/or levels of contaminant. Difficult to remove contaminants, oils/greases, some PAHs/PCBs, etc. may also support the collection of additional rinsates due to the obvious challenges to the decontamination process. This is a field consideration to be determined by the FOL.

Attachment A IDW Label

INVESTIGATION DERIVED WASTE

GENERATOR INFORMATION:

SITE _____ JOB NO. _____

LOCATION _____

DATE _____

DRUM# _____

CONTENTS _____

VOLUME _____

CONTACT _____

EMERGENCY PHONE NUMBER _____

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1.0 PURPOSE

Utilities such as electric service lines, natural or propane gas lines, water and sewage lines, telecommunications, and steam lines are very often in the immediate vicinity of work locations. Contact with underground or overhead utilities can have serious consequences including employee injury/fatality, property and equipment damage, substantial financial impacts, and loss of utility service to users.

The purpose of this procedure is to provide minimum requirements and technical guidelines regarding the appropriate procedures to be followed when performing subsurface and overhead utility locating services. It is the policy of Tetra Tech NUS, Inc. (TtNUS) to provide a safe and healthful work environment for the protection of our employees. The purpose of this Standard Operating Procedure (SOP) is to aid in achieving the objectives of this policy, to present the acceptable procedures pertaining to utility locating and excavation clearance activities, and to present requirements and restrictions relevant to these types of activities. This SOP must be reviewed by any employee potentially involved with underground or overhead utility locating and avoidance activities.

2.0 SCOPE

This procedure applies to all TtNUS field activities where there may be potential contact with underground or overhead utilities. This procedure provides a description of the principles of operation, instrumentation, applicability, and implementability of typical methods used to determine the presence and avoidance of contact with utility services. This procedure is intended to assist with work planning and scheduling, resource planning, field implementation, and subcontractor procurement. Utility locating and excavation clearance requires site-specific information prior to the initiation of any such activities on a specific project. This SOP is not intended to provide a detailed description of methodology and instrument operation. Specialized expertise during both planning and execution of several of the methods presented may also be required.

3.0 GLOSSARY

Electromagnetic Induction (EMI) Survey - A geophysical exploration method whereby electromagnetic fields are induced in the ground and the resultant secondary electromagnetic fields are detected as a measure of ground conductivity.

Magnetometer – A device used for precise and sensitive measurements of magnetic fields.

Magnetic Survey – A geophysical survey method that depends on detection of magnetic anomalies caused by the presence of buried ferromagnetic objects.

Metal Detection – A geophysical survey method that is based on electromagnetic coupling caused by underground conductive objects.

Vertical Gradiometer – A magnetometer equipped with two sensors that are vertically separated by a fixed distance. It is best suited to map near surface features and is less susceptible to deep geologic features.

Ground Penetrating Radar – Ground Penetrating Radar (GPR) involves specialized radar equipment whereby a signal is sent into the ground via a transmitter. Some portion of the signal will be reflected from the subsurface material, which is then recorded with a receiver and electronically converted into a graphic picture.

4.0 RESPONSIBILITIES

Project Manager (PM)/Task Order Manager (TOM) - Responsible for ensuring that all field activities are conducted in accordance with this procedure.

Site Manager (SM)/Field Operations Leader (FOL) - Responsible for the onsite verification that all field activities are performed in compliance with approved SOPs or as otherwise directed by the approved project plan(s).

Site Health & Safety Officer (SHSO) – Responsible to provide technical assistance and verify full compliance with this SOP. The SHSO is also responsible for reporting any deficiencies to the Corporate Health and Safety Manager (HSM) and to the PM/TOM.

Health & Safety Manager (HSM) – Responsible for preparing, implementing, and modifying corporate health and safety policy and this SOP.

Site Personnel – Responsible for performing their work activities in accordance with this SOP and the TtNUS Health and Safety Policy.

5.0 PROCEDURES

This procedure addresses the requirements and technical procedures that must be performed to minimize the potential for contact with underground and overhead utility services. These procedures are addressed individually from a buried and overhead standpoint.

5.1 Buried Utilities

Buried utilities present a heightened concern because their location is not typically obvious by visual observation, and it is common that their presence and/or location is unknown or incorrectly known on client properties. This procedure must be followed prior to beginning any subsurface probing or excavation that might potentially be in the vicinity of underground utility services. In addition, the Utility Clearance Form (Attachment 3) must be completed for every location or cluster of locations where intrusive activities will occur.

Where the positive identification and de-energizing of underground utilities cannot be obtained and confirmed using the following steps, the PM/TOM is responsible for arranging for the procurement of a qualified, experienced, utility locating subcontractor who will accomplish the utility location and demarcation duties specified herein.

1. A comprehensive review must be made of any available property maps, blue lines, or as-builts prior to site activities. Interviews with local personnel familiar with the area should be performed to provide additional information concerning the location of potential underground utilities. Information regarding utility locations shall be added to project maps upon completion of this exercise.

2., A visual site inspection must be performed to compare the site plan information to actual field conditions. Any findings must be documented and the site plan/maps revised. The area(s) of proposed excavation or other subsurface activities must be marked at the site in white paint or pin flags to identify those locations of the proposed intrusive activities. The site inspection should focus on locating surface indications of potential underground utilities. Items of interest include the presence of nearby area lights, telephone service, drainage grates, fire hydrants, electrical service vaults/panels, asphalt/concrete scares and patches, and topographical depressions. Note the location of any emergency shut off switches. Any additional information regarding utility

locations shall be added to project maps upon completion of this exercise and returned to the PM/TOM.

3. If the planned work is to be conducted on private property (e.g., military installations, manufacturing facilities, etc.) the FOL must identify and contact appropriate facility personnel (e.g., public works or facility engineering) before any intrusive work begins to inquire about (and comply with) property owner requirements. It is important to note that private property owners may require several days to several weeks advance notice prior to locating utilities.

4. If the work location is on public property, the state agency that performs utility clearances must be notified (see Attachment 1). State "one-call" services must be notified prior to commencing fieldwork per their requirements. Most one-call services require, by law, 48- to 72-hour advance notice prior to beginning any excavation. Such services typically assign a "ticket" number to the particular site. This ticket number must be recorded for future reference and is valid for a specific period of time, but may be extended by contacting the service again. The utility service will notify utility representatives who then mark their respective lines within the specified time frame. It should be noted that most military installations own their own utilities but may lease service and maintenance from area providers. Given this situation, "one call" systems may still be required to provide location services on military installations.

5. Utilities must be identified and their locations plainly marked using pin flags, spray paint, or other accepted means. The location of all utilities must be noted on a field sketch for future inclusion on project maps. Utility locations are to be identified using the following industry-standard color code scheme, unless the property owner or utility locator service uses a different color code:

white	excavation/subsurface investigation location
red	electrical
yellow	gas, oil, steam
orange	telephone, communications
blue	water, irrigation, slurry
green	sewer, drain

6. Where utility locations are not confirmed with a high degree of confidence through drawings, schematics, location services, etc., the work area must be thoroughly investigated prior to beginning the excavation. In these situations, utilities must be identified using safe and effective methods such as passive and intrusive surveys, or the use of non-conductive hand tools. Also, in situations where such hand tools are used, they should always be used in conjunction with suitable detection equipment, such as the items described in Section 6.0 of this SOP. Each method has advantages and disadvantages including complexity, applicability, and price. It also should be noted that in some states, initial excavation is required by hand to a specified depth.

7. At each location where trenching or excavating will occur using a backhoe or other heavy equipment, and where utility identifications and locations cannot be confirmed prior to groundbreaking, the soil must be probed using a device such as a tile probe which is made of non-conductive material such as fiberglass. If these efforts are not successful in clearing the excavation area of suspect utilities, hand shoveling must be performed for the perimeter of the intended excavation.

8. All utilities uncovered or undermined during excavation must be structurally supported to prevent potential damage. Unless necessary as an emergency corrective measure, TtNUS shall not make any repairs or modifications to existing utility lines without prior permission of the utility owner, property owner, and Corporate HSM. All repairs require that the line be locked-out/tagged-out prior to work.

5.2 Overhead Power Lines

If it is necessary to work within the minimum clearance distance of an overhead power line, the overhead line must be de-energized and grounded, or re-routed by the utility company or a registered electrician. If protective measures such as guarding, isolating, or insulating are provided, these precautions must be adequate to prevent employees from contacting such lines directly with any part of their body or indirectly though conductive materials, tools, or equipment.

The following table provides the required minimum clearances for working in proximity to overhead power lines.

Nominal Voltage	Minimum Clearance
0 -50 kV	10 feet, or one mast length; whichever is greater
50+ kV	10 feet plus 4 inches for every 10 kV over 50 kV or 1.5 mast lengths; whichever is greater

6.0 UNDERGROUND LOCATING TECHNIQUES

A variety of supplemental utility locating approaches are available and can be applied when additional assurance is needed. The selection of the appropriate method(s) to employ is site-specific and should be tailored to the anticipated conditions, site and project constraints, and personnel capabilities.

6.1 Geophysical Methods

Geophysical methods include electromagnetic induction, magnetics, and ground penetrating radar. Additional details concerning the design and implementation of electromagnetic induction, magnetics, and ground penetrating radar surveys can be found in one or more of the TtNUS SOPs included in the References (Section 8.0).

Electromagnetic Induction

Electromagnetic Induction (EMI) line locators operate either by locating a background signal or by locating a signal introduced into the utility line using a transmitter. A utility line acts like a radio antenna, producing electrons, which can be picked up with a radiofrequency receiver. Electrical current carrying conductors have a 60HZ signal associated with them. This signal occurs in all power lines regardless of voltage. Utilities in close proximity to power lines or used as grounds may also have a 60HZ signal, which can be picked up with an EM receiver. A typical example of this type of geophysical equipment is an EM-61.

EMI locators specifically designed for utility locating use a special signal that is either indirectly induced onto a utility line by placing the transmitter above the line or directly induced using an induction clamp. The clamp induces a signal on the specific utility and is the preferred method of tracing since there is little chance of the resulting signals being interfered with. A good example of this type of equipment is the Schonstedt® MAC-51B locator. The MAC-51B performs inductively traced surveys, simple magnetic locating, and traced nonmetallic surveys.

When access can be gained inside a conduit to be traced, a flexible insulated trace wire can be used. This is very useful for non-metallic conduits but is limited by the availability of gaining access inside the pipe.

Magnetics

Magnetic locators operate by detecting the relative amounts of buried ferrous metal. They are incapable of locating or identifying nonferrous utility lines but can be very useful for locating underground storage tanks (UST's), steel utility lines, and buried electrical lines. A typical example of this type of equipment is the Schonstedt® GA-52Cx locator. The GA-52Cx is capable of locating 4-inch steel pipe up to 8 feet deep.

Non-ferrous lines are often located by using a typical plumbing tool (snake) fed through the line. A signal is then introduced to the snake that is then traced.

Ground Penetrating Radar

Ground Penetrating Radar (GPR) involves specialized radar equipment whereby a signal is sent into the ground via a transmitter. Some portion of the signal will be reflected from the subsurface material, which is then recorded with a receiver and electronically converted into a graphic picture. In general, an object which is harder than the surrounding soil will reflect a stronger signal. Utilities, tunnels, UST's, and footings will reflect a stronger signal than the surrounding soil. Although this surface detection method may determine the location of a utility, this method does not specifically identify utilities (i.e., water vs. gas, electrical vs. telephone); hence, verification may be necessary using other methods. This method is somewhat limited when used in areas with clay soil types or with a high water table.

6.2 Passive Detection Surveys

Acoustic Surveys

Acoustic location methods are generally most applicable to waterlines or gas lines. A highly sensitive Acoustic Receiver listens for background sounds of water flowing (at joints, leaks, etc.) or to sounds introduced into the water main using a transducer. Acoustics may also be applicable to determine the location of plastic gas lines.

Thermal Imaging

Thermal (i.e., infrared) imaging is a passive method for detecting the heat emitted by an object. Electronics in the infrared camera convert subtle heat differentials into a visual image on the viewfinder or a monitor. The operator does not look for an exact temperature; rather they look for heat anomalies (either elevated or suppressed temperatures) characteristic of a potential utility line.

The thermal fingerprint of underground utilities results from differences in temperature between the atmosphere and the fluid present in a pipe or the heat generated by electrical resistance. In addition, infrared scanners may be capable of detecting differences in the compaction, temperature and moisture content of underground utility trenches. High-performance thermal imagery can detect temperature differences to hundredths of a degree.

6.3 Intrusive Detection Surveys

Vacuum Excavation

Vacuum excavation is used to physically expose utility services. The process involves removing the surface material over approximately a 1' x 1' area at the site location. The air-vacuum process proceeds with the simultaneous action of compressed air-jets to loosen soil and vacuum extraction of the resulting

debris. This process ensures the integrity of the utility line during the excavation process, as no hammers, blades, or heavy mechanical equipment comes into contact with the utility line, eliminating the risk of damage to utilities. The process continues until the utility is uncovered. Vacuum excavation can be used at the proposed site location to excavate below the "utility window" which is usually 8 feet.

Hand Excavation

When the identification and location of underground utilities cannot be positively confirmed through document reviews and/or other methods, borings and excavations may be cleared via the use of non-conductive hand tools. This should always be done in conjunction with the use of detection equipment. This would be required for all locations where there is a potential to impact buried utilities. The minimum hand-excavation depth that must be reached is to be determined considering the geographical location of the work site. This approach recognizes that the placement of buried utilities is influenced by frost line depths that vary by geographical region. Attachment 2 presents frost line depths for the regions of the contiguous United States. At a minimum, hand excavation depths must be at least to the frost line depth (see Attachment 2) plus two (2) feet, but never less than 4 feet below ground surface (bgs). For hand excavation, the hole created must be reamed large enough to be at least the diameter of the drill rig auger or bit prior to drilling. For soil gas surveys, the survey probe shall be placed as close as possible to the cleared hand excavation. It is important to note that a post-hole digger must not be used in this type of hand excavation activity.

Tile Probe Surveys

For some soil types, site conditions, and excavation requirements, non-conductive tile probes may be used. A tile probe is a "T"-handled rod of varying lengths that can be pushed into the soil to determine if any obstructions exist at that location. Tile probes constructed of fiberglass or other nonconductive material are readily-available from numerous vendors. Tile probes must be performed to the same depth requirements as previously specified. As with other types of hand excavating activities, the use of a non-conductive tile probe, should always be in conjunction with suitable utility locating detection equipment.

7.0 INTRUSIVE ACTIVITIES SUMMARY

The following list summarizes the activities that must be performed prior to beginning subsurface activities:

1. Map and mark all subsurface locations and excavation boundaries using white paint or markers specified by the client or property owner.

2. Notify the property owner and/or client that the locations are marked. At this point, drawings of locations or excavation boundaries shall be provided to the property owner and/or client so they may initiate (if applicable) utility clearance.

   Note: Drawings with confirmed locations should be provided to the property owner and/or client as soon as possible to reduce potential time delays.

3. Notify "One Call" service. If possible, arrange for an appointment to show the One Call representative the surface locations or excavation boundaries in person. This will provide a better location designation to the utilities they represent. You should have additional drawings should you need to provide plot plans to the One Call service.

4. Implement supplemental utility detection techniques as necessary and appropriate to conform utility locations or the absence thereof.

5. Complete Attachment 3, Utility Clearance Form. This form should be completed for each excavation location. In situations where multiple subsurface locations exist within the close proximity of one another, one form may be used for multiple locations provided those locations are noted on the Utility Clearance Form. Upon completion, the Utility Clearance Form and revised/annotated utility location map becomes part of the project file.

8.0 REFERENCES

OSHA Letter of Interpretation, Mr. Joseph Caldwell, Attachment 4
OSHA 29 CFR 1926(b)(2)
OSHA 29 CFR 1926(b)(3)
TtNUS Utility Locating and Clearance Policy
TtNUS SOP GH-3.1; Resistivity and Electromagnetic Induction
TtNUS SOP GH-3.2; Magnetic and Metal Detection Surveys
TtNUS SOP GH-3.4; Ground-penetrating Radar Surveys

ATTACHMENT 1
LISTING OF UNDERGROUND UTILITY CLEARANCE RESOURCES

American Public Works Association
2345 Grand Boulevard, Suite 500, Kansas City, MO 64108-2625
Phone (816) 472-6100 • Fax (816) 472-1610
Web www.apwa.net • E-mail apwa@apwa.net

ONE-CALL SYSTEMS INTERNATIONAL CONDENSED DIRECTORY

Alabama
Alabama One-Call
1-800-292-8525

Alaska
Locate Call Center of Alaska, Inc.
1-800-478-3121

Arizona
Arizona Blue Stake
1-800-782-5348

Arkansas
Arkansas One Call System, Inc.
1-800-482-8998

California
Underground Service Alert North
1-800-227-2600
Underground Service Alert of Southern California
1-800-227-2600

Colorado
Utility Notification Center of Colorado
1-800-922-1987

Connecticut
Call Before You Dig
1-800-922-4455

Delaware
Miss Utility of Delmarva
1-800-282-8555

Florida
Sunshine State One-Call of Florida, Inc.
1-800-432-4770

Georgia
Underground Protection Center, Inc.
1-800-282-7411

Hawaii
Underground Service Alert North
1-800-227-2600

Idaho
Dig Line Inc.
1-800-342-1585
Kootenai County One-Call
1-800-428-4950
Shoshone - Benewah One-Call
1-800-398-3285

Illinois
JULIE, Inc.
1-800-892-0123
Digger (Chicago Utility Alert Network)
312-744-7000

Indiana
Indiana Underground Plant Protection Service
1-800-382-5544

Iowa
Iowa One-Call
1-800-292-8989

Kansas
Kansas One-Call System, Inc.
1-800-344-7233

Kentucky
Kentucky Underground Protection Inc.
1-800-752-6007

Louisiana
Louisiana One Call System, Inc.
1-800-272-3020

Maine
Dig Safe System, Inc.
1-888-344-7233

Maryland
Miss Utility
1-800-257-7777
Miss Utility of Delmarva
1-800-282-8555

Massachusetts
Dig Safe System, Inc.
1-888-344-7233

Michigan
Miss Dig System, Inc.
1-800-482-7171

Minnesota
Gopher State One Call
1-800-252-1166

Mississippi
Mississippi One-Call System, Inc
1-800-227-6477

Missouri
Missouri One-Call System, Inc.
1-800-344-7483

Montana
Utilities Underground Protection Center
1-800-424-5555
Montana One Call Center
1-800-551-8344

Nebraska
Diggers Hotline of Nebraska
1-800-331-5666

Nevada
Underground Service Alert North
1-800-227-2600

New Hampshire
Dig Safe System, Inc.
1-888-344-7233

New Jersey
New Jersey One Call
1-800-272-1000

New Mexico
New Mexico One Call System, Inc.
1-800-321-2537
Las Cruces- Dona Ana Blue Stakes
1-888-526-0400

New York
Dig Safely New York
1-800-962-7962
New York City- Long Island One Call Center
1-800-272-4480

North Carolina
The North Carolina One-Call Center, Inc.
1-800-632-4949

North Dakota
North Dakota One-Call
1-800-795-0555

Ohio
Ohio Utilities Protection Service
1-800-362-2764
Oil & Gas Producers Underground Protect'n Svc
1-800-925-0988

Oklahoma
Call Okie
1-800-522-6543

Oregon
Oregon Utility Notification Center/One Call Concepts
1-800-332-2344

Pennsylvania
Pennsylvania One Call System, Inc.
1-800-242-1776

Rhode Island
Dig Safe System, Inc.
1-888-344-7233

South Carolina
Palmetto Utility Protection Service Inc.
1-888-721-7877

South Dakota
South Dakota One Call
1-800-781-7474

Tennessee
Tennessee One-Call System, Inc.
1-800-351-1111

ATTACHMENT 1 (Continued)

Texas
Texas One Call System
1-800-245-4545
Texas Excavation Safety System, Inc.
1-800-344-8377
Lone Star Notification Center
1-800-669-8344

Utah
Blue Stakes of Utah
1-800-662-4111

Vermont
Dig Safe System, Inc.
1-888-344-7233

Virginia
Miss Utility of Virginia
1-800-552-7001
Miss Utility (Northern Virginia)
1-800-257-7777

Washington
Utilities Underground Location Center
1-800-424-5555
Northwest Utility Notification Center
1-800-553-4344
Inland Empire Utility Coordinating Council
509-456-8000

West Virginia
Miss Utility of West Virginia, Inc.
1-800-245-4848

Wisconsin
Diggers Hotline, Inc.
1-800-242-8511

Wyoming
Wyoming One-Call System, Inc.
1-800-348-1030
Call Before You Dig of Wyoming
1-800-849-2476

District of Columbia
Miss Utility
1-800-257-7777

Alberta
Alberta One-Call Corporation
1-800-242-3447

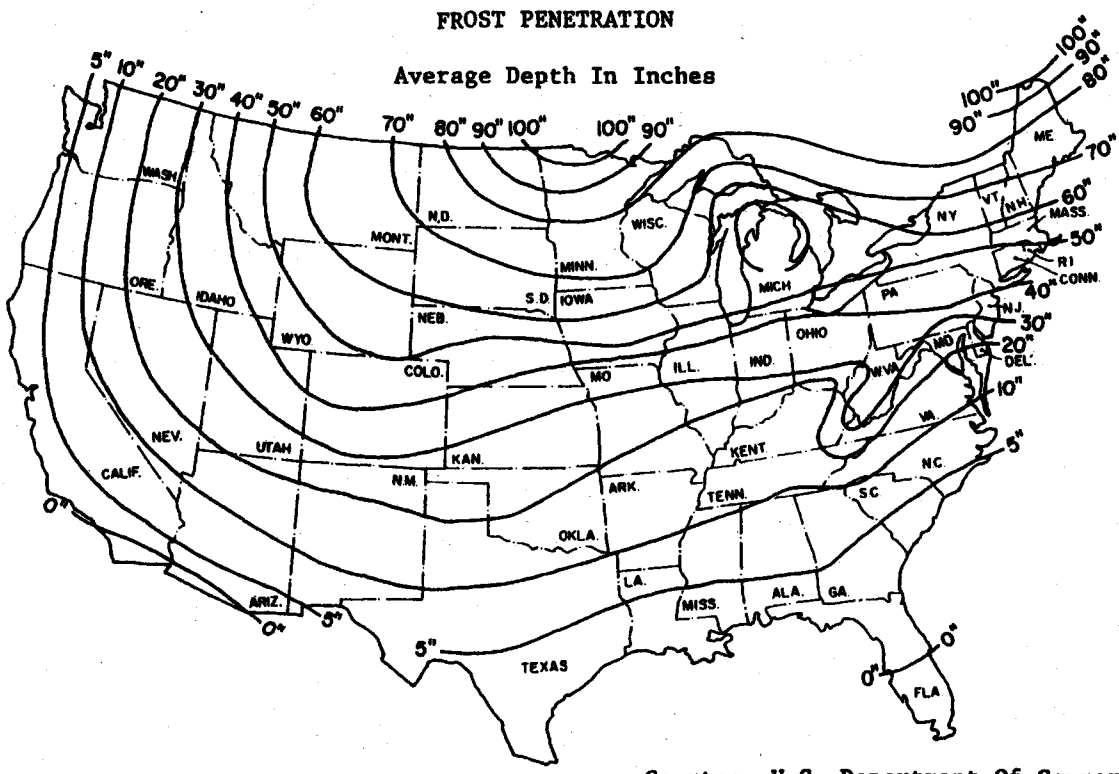
British Columbia
BC One Call
1-800-474-6886

Ontario
Ontario One-Call System
1-800-400-2255

Quebec
Info-Excavation
1-800-663-9228

ATTACHMENT 2

FROST LINE PENETRATION DEPTHS BY GEOGRAPHIC LOCATION



Courtesy U.S. Department Of Commerce

ATTACHMENT 3
UTILITY CLEARANCE FORM

Client: _____ Project Name: _____

Project No.: _____ Completed By: _____

Location Name: _____ Work Date: _____

Excavation Method/Overhead Equipment: _____

1. Underground Utilities — Circle One

a)	Review of existing maps?	yes no N/A
b)	Interview local personnel?	yes no N/A
c)	Site visit and inspection?	yes no N/A
d)	Excavation areas marked in the field?	yes no N/A
e)	Utilities located in the field?	yes no N/A
f)	Located utilities marked/added to site maps?	yes no N/A
g)	Client contact notified Name _____ Telephone: _____ Date: _____	yes no N/A
g)	State One-Call agency called? Caller: _____ Ticket Number: _____ Date: _____	yes no N/A
h)	Geophysical survey performed? Survey performed by: _____ Method: _____ Date: _____	yes no N/A
i)	Hand excavation performed (with concurrent use of utility detection device)? Completed by: _____ Total depth: _____ feet Date: _____	yes no N/A
j)	Trench/excavation probed? Probing completed by: _____ Depth/frequency: _____ Date: _____	yes no N/A

2. Overhead Utilities — Present Absent

a)	Determination of nominal voltage	yes no N/A
b)	Marked on site maps	yes no N/A
c)	Necessary to lockout/insulate/re-route	yes no N/A
d)	Document procedures used to lockout/insulate/re-route	yes no N/A
e)	Minimum acceptable clearance (SOP Section 5.2): _____	

3. Notes:

_____

_____

_____

Approval:

_____ _____

Site Manager/Field Operations Leader Date

c: PM/Project File
Program File

ATTACHMENT 4
OSHA LETTER OF INTERPRETATION

Mr. Joseph Caldwell
Consultant
Governmental Liaison
Pipeline Safety Regulations
211 Wilson Boulevard
Suite 700
Arlington, Virginia 22201

Re: Use of hydro-vacuum or non-conductive hand tools to locate underground utilities.

Dear Mr. Caldwell:

In a letter dated July 7, 2003, we responded to your inquiry of September 18, 2002, regarding the use of hydro-vacuum equipment to locate underground utilities by excavation. After our letter to you was posted on the OSHA website, we received numerous inquiries that make it apparent that aspects of our July 7 letter are being misunderstood. In addition, a number of industry stakeholders, including the National Utility Contractors Association (NUCA), have provided new information regarding equipment that is available for this work.

To clarify these issues, we are withdrawing our July 7 letter and issuing this replacement response to your inquiry.

Question: *Section 1926.651 contains several requirements that relate to the safety of employees engaged in excavation work. Specifically, paragraphs (b)(2) and (b)(3) relate in part to the safety of the means used to locate underground utility installations that, if damaged during an uncovering operation, could pose serious hazards to employees.*

Under these provisions, what constitutes an acceptable method of uncovering underground utility lines, and further, would the use of hydro-vacuum excavation be acceptable under the standard?

Answer

Background

Two sections of 29 CFR 1926 Subpart P (Excavations), 1926.651(Specific excavation requirements), govern methods for uncovering underground utility installations. Specifically, paragraph (b)(2) states:

> When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours * * * or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used. (emphasis added).

Paragraph (b)(3) provides:

ATTACHMENT 4 (Continued)

> When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means. (emphasis added).

Therefore, "acceptable means" must be used where the location of the underground utilities have not been identified by the utility companies and detection equipment is not used.

Subpart P does not contain a definition of either "other acceptable means" or "safe and acceptable means." The preambles to both the proposed rule and the final rule discussed the rationale behind the wording at issue. For example, the preamble to the proposed rule, 52 Fed. Reg. 12301 (April 15, 1987), noted that a 1972 version of this standard contained language that specified "careful probing or hand digging" as the means to uncover utilities. The preamble then noted that an amendment to the 1972 standard later deleted that language "to allow other, *equally effective means* of locating such installations." The preamble continued that in the 1987 proposed rule, OSHA again proposed using language in section (b)(3) that would provide another example of an acceptable method of uncovering utilities that could be used *where the utilities have not been marked and detection equipment is not being used* – "probing with hand-held tools." This method was rejected in the final version of 29 CFR 1926. As OSHA explained in the preamble to the final rule, 54 Fed. Reg. 45916 (October 31, 1989):

> OSHA received two comments * * * and input from ACCSH [OSHA's Advisory Committee on Construction Safety and Health] * * * on this provision. All commenters recommended dropping 'such as probing with hand-held tools' from the proposed provision, because this could create a hazard to employees by damaging the installation or its insulation.

In other words, the commenters objected to the use of hand tools being used unless detection equipment was used in conjunction with them. OSHA then concluded its discussion relative to this provision by agreeing with the commentators and ultimately not including any examples of "acceptable means" in the final provision.

Non-conductive hand tools are permitted

This raises the question of whether the standard permits the use of hand tools alone -- without also using detection equipment. NUCA and other industry stakeholders have recently informed us that non-conductive hand tools that are appropriate to be used to locate underground utilities are now commonly available.

Such tools, such as a "shooter" (which has a non-conductive handle and a snub nose) and non-conductive or insulated probes were not discussed in the rulemaking. Since they were not considered at that time, they were not part of the class of equipment that was thought to be unsafe for this purpose. Therefore, we conclude that the use of these types of hand tools, when used with appropriate caution, is an "acceptable means" for locating underground utilities.

ATTACHMENT 4 (Continued)

Hydro-vacuum excavation

It is our understanding that some hydro-vacuum excavation equipment can be adjusted to use a minimum amount of water and suction pressure. When appropriately adjusted so that the equipment will not damage underground utilities (especially utilities that are particularly vulnerable to damage, such as electrical lines), use of such equipment would be considered a "acceptable means" of locating underground utilities. However, if the equipment cannot be sufficiently adjusted, then this method would not be acceptable under the standard.

Other technologies

We are not suggesting that these are the only devices that would be "acceptable means" under the standard. Industry stakeholders have informed us that there are other types of special excavation equipment designed for safely locating utilities as well.

We apologize for any confusion our July 7 letter may have caused. If you have further concerns or questions, please feel free to contact us again by fax at: U.S. Department of Labor, OSHA, Directorate of Construction, Office of Construction Standards and Compliance Assistance, fax # 202-693-1689. You can also contact us by mail at the above office, Room N3468, 200 Constitution Avenue, N.W., Washington, D.C. 20210, although there will be a delay in our receiving correspondence by mail.

Sincerely,

Russell B. Swanson, Director
Directorate of Construction

NOTE: OSHA requirements are set by statute, standards and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA=s interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at http://www.osha.gov.

FIELD TASK MODIFICATION REQUEST FORM

Project/Installation Name	CTO & Project Number	Task Mod. Number
Modification To (e.g. Work Plan)	Site/Sample Location	Date

Activity Description: _____

Reason for Change: _____

Recommended Disposition: _____

Field Operations Leader (Signature) _____ Date _____

Approved Disposition:

Project/Task Order Manager (Signature) _____ Date _____

Distribution:

Program/Project File –
Project/Task Order Manager –
Field Operations Leader –

Other: _____

Appendix C

Laboratory DoD ELAP Certifications

CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board/ACLASS

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

TestAmerica-South Burlington
30 Community Drive, Suite 11
South Burlington, VT 05403

has been assessed by ACLASS
and meets the requirements of

DoD-ELAP

while demonstrating technical competence in the field(s) of

TESTING

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of tests to which this accreditation applies.

ADE-1492

Certificate Number

ACLASS Approval

Certificate Valid: 10/22/2010 – 10/22/2012

Version No. 002

SCOPE OF DoD-ELAP ACCREDITATION

TestAmerica – South Burlington

30 Community Drive, Suite 11, South Burlington, VT 05403
Kirsten McCracken Phone: 802-660-1990

TESTING

Valid to: October 22, 2012 Certificate Number: ADE – 1492

I. Environmental

MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water	Acid Digestion for Metals	3005A	
Water	Acid Digestion for Metals	3010A	
Solids	Acid digestion	3050B	
Water	Separatory Funnel Extraction	3510C	
Solids	Soxhlet extraction	3540C	
Solids	Ultrasonic Extraction	3550C	
Water/Solids	Florisil Cleanup	3620C	
Water/Solids	Silica Gel Cleanup	3630C	
Water/Solids	Sulfuric Acid/ Permanganate Cleanup	3665A	
Water/Solids	GPC Cleanup	3640A	
Water	Purge and Trap	5030B	
Solids	Purge and Trap	5035	

MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Solids	Perchlorate	6850	HPLC/MS
Water	Perchlorate	331.0	HPLC
Water / Solids	Nitroaromatics/ Nitramines	8330B	HPLC
Solids	pH	9045C / 9045D	pH Meter
Water	pH	9040B / 9040C	pH Meter
Water	TOC	9060A	Catalytic Combustion and Infrared Detector
Solids	TOC	Lloyd Kahn	Elemental Analyzer (Differential TCD)
Water	Cyanide	9012A/9012B	Automated Colorimetric
Solids	Extraction Procedure for Cyanide Analysis	9013	
Solids	Cyanide	9012A/9012B	Automated Colorimetric
Water	Mercury	7470A	CVAA
Solids	Mercury	7471A / 7471B	CVAA
Water / Solids	Metals	6010B / 6010C	ICP-OES
Water / Solids	Metals	6020 / 6020A	ICP-MS
Water / Solids	PCBs	8082 / 8082A	GC/ECD
Water / Solids	Pesticides	8081A / 8081B	GC/ECD
Water / Solids	Herbicides	8151A	GC/ECD
Water / Solids	Semivolatile Organic Compounds	8270C / 8270D	GC/MS
Water / Solids	Semivolatile Organic Compounds	8270C SIM	GC/MS

500 Montgomery St. Suite 625 | Alexandria, VA 22314 | 703-836-0025 | www.aclasscorp.com

MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Solids	Volatile Organic Compounds	8260B	GC/MS
Air	Volatile Organic Compounds	TO15	GC/MS
Solids	Diesel Range Organics	8015B	GC/FID

Notes:

1. ** = As Applicable*
2. ***=Refer to Accredited Analyte Listing for analytes in which the laboratory is accredited*
3. *This scope is part of and must be included with the Certificate of Accreditation No. ADE-1492*

Vice President

500 Montgomery St. Suite 625 | Alexandria, VA 22314 | 703-836-0025 | www.aclasscorp.com

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
	Trace Metals						
1000	Aluminum	6010B/C	6020/A	6010B/C	6020/A		
1005	Antimony	6010B/C	6020/A	6010B/C	6020/A		
1010	Arsenic	6010B/C	6020/A	6010B/C	6020/A		
1015	Barium	6010B/C	6020/A	6010B/C	6020/A		
1020	Beryllium	6010B/C	6020/A	6010B/C	6020/A		
1025	Boron	6010B/C	6020/A	6010B/C	6020/A		
1030	Cadmium	6010B/C	6020/A	6010B/C	6020/A		
1035	Calcium	6010B/C	6020/A	6010B/C	6020/A		
1040	Chromium, total	6010B/C	6020/A	6010B/C	6020/A		
	Cobalt	6010B/C	6020/A	6010B/C	6020/A		
1055	Copper	6010B/C	6020/A	6010B/C	6020/A		
1070	Iron	6010B/C	6020/A	6010B/C	6020/A		
1075	Lead	6010B/C	6020/A	6010B/C	6020/A		
1085	Magnesium	6010B/C	6020/A	6010B/C	6020/A		
1090	Manganese	6010B/C	6020/A	6010B/C	6020/A		
1095	Mercury	7470A		7471A/B			
1100	Molybdenum	6010B/C	6020/A	6010B/C	6020/A		
1105	Nickel	6010B/C	6020/A	6010B/C	6020/A		
1125	Potassium	6010B/C	6020/A	6010B/C	6020/A		
1140	Selenium	6010B/C	6020/A	6010B/C	6020/A		
1150	Silver	6010B/C	6020/A	6010B/C	6020/A		
	Sodium	6010B/C	6020/A	6010B/C	6020/A		
1165	Strontium	6010B/C		6010B/C			
1165	Thallium	6010B/C	6020/A	6010B/C	6020/A		
1180	Tin	6010B/C		6010B/C			
1185	Titanium	6010B/C		6010B/C			
1185	Vanadium	6010B/C	6020/A	6010B/C	6020/A		
1190	Zinc	6010B/C	6020/A	6010B/C	6020/A		
	Misc Analytes						
1895	Perchlorate	331.0	6850	6850			
1900	pH	9040B/C		9045C/D			
1645	Total Cyanide	9012A/B		9012A/B			
2040	TOC	9060A		Lloyd Kahn			
	Petroloeum Hydrocarbons						
	Diesel Range Organics (DRO)			8015B			
	VOCs						
5105	1,1,1,2-Tetrachloroethane	8260B		8260B			
5160	1,1,1-Trichloroethane	8260B		8260B			
5160	1,1,1-Trichloroethane					TO-15	
5110	1,1,2,2-Tetrachloroethane	8260B		8260B		TO-15	
	1,1,2-Trichloro-1,2,2-trifluroethane (Freon TF)	8260B		8260B		TO-15	
5165	1,1,2-Trichloroethane	8260B		8260B			
5165	1,1,2-Trichloroethane					TO-15	
4630	1,1-Dichloroethane	8260B		8260B		TO-15	
4640	1,1-Dichloroethene	8260B		8260B		TO-15	
4670	1,1-Dichloropropene	8260B		8260B			
4695	1,2 Dichlorotetrafluoroethane (Freon 114)					TO-15	
5150	1,2,3-Trichlorobenzene	8260B		8260B			
5180	1,2,3-Trichloropropane	8260B		8260B			
5155	1,2,4-Trichlorobenzene	8260B		8260B		TO-15	
5210	1,2,4-Trimethylbenzene	8260B		8260B		TO-15	
4570	1,2-Dibromo-3-chloropropane (DBCP)	8260B		8260B			
4585	1,2-Dibromoethane (EDB)	8260B		8260B		TO-15	

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
4610	1,2-Dichlorobenzene	8260B		8260B		TO-15	
4635	1,2-Dichloroethane	8260B		8260B		TO-15	
4655	1,2-Dichloropropane	8260B		8260B		TO-15	
5215	1,3,5-Trimethylbenzene	8260B		8260B		TO-15	
4615	1,3-Dichlorobenzene	8260B		8260B		TO-15	
4660	1,3-Dichloropropane	8260B		8260B			
	1,4 Dioxane	8260B		8260B		TO-15	
4620	1,4-Dichlorobenzene	8260B		8260B		TO-15	
	2,2 Dichloropropane	8260B		8260B			
4665	2,2-Dichloropropane			8260B			
4410	2-Butanone (MEK)	8260B		8260B		TO-15	
4500	2-Chloroethylvinylether	8260B		8260B			
	2-Chlorotoluene	8260B		8260B		TO15	
4860	2-Hexanone	8260B		8260B		TO15	
	2-Methyl-2-Propanol (tert-Butyl Alcohol)					TO15	
	3-Choro-1-propene					TO15	
	4-Chlorotoluene	8260B		8260B			
4910	4-Isopropyltoluene	8260B		8260B		TO15	
4995	4-Methyl-2-pentanone (MIBK)	8260B		8260B		TO15	
4315	Acetone	8260B		8260B			
4375	Benzene	8260B		8260B		TO-15	
	Benzyl chloride					TO-15	
4385	Bromobenzene	8260B		8260B			
4390	Bromochloromethane	8260B		8260B			
4395	Bromodichloromethane	8260B		8260B		TO-15	
4400	Bromoform	8260B		8260B		TO-15	
4950	Bromomethane	8260B		8260B		TO-15	
4450	Carbon disulfide	8260B		8260B		TO-15	
4455	Carbon Tetrachloride	8260B		8260B		TO-15	
4475	Chlorobenzene	8260B		8260B		TO-15	
4575	Chlorodibromomethane	8260B		8260B		TO-15	
	Chlorodifluoromethane (Freon 22)					TO-15	
4485	Chloroethane	8260B		8260B		TO-15	
4505	Chloroform	8260B		8260B		TO-15	
4960	Chloromethane	8260B		8260B		TO-15	
4645	*cis* -1,2-Dichloroethene	8260B		8260B		TO-15	
4680	cis-1,3-Dichloropropene	8260B		8260B		TO-15	
4555	Cyclohexane	8260B		8260B		TO-15	
4595	Dibromomethane	8260B		8260B		TO-15	
4625	Dichlorodifluoromethane	8260B		8260B		TO-15	
4975	Dichloromethane (Methylene Chloride)	8260B		8260B		TO-15	
4765	Ethylbenzene	8260B		8260B		TO-15	
4835	Hexachlorobutadiene	8260B		8260B		TO-15	
	Iodomethane	8260B		8260B			
	Isobutyl Alcohol	8260B		8260B			
	Isooctane (2,2,4-Trimethylpentane)					TO-15	
	Isopropyl Alcohol					TO-15	
4900	Isopropylbenzene	8260B		8260B			
	Isopropylbenzene (Cumene)					TO-15	
	Methycyclohexane	8260B		8260B			
	Methyl Acetate	8260B		8260B			
	Methyl methacrylate					TO-15	
5000	Methyl-tert-butylether (MTBE)	8260B		8260B		TO-15	
	m-Xylene & p-Xylene	8260B		8260B		TO-15	
5005	Naphthalene	8260B		8260B		TO-15	
	n-Butylbenzene	8260B		8260B		TO-15	
4825	n-Heptane					TO-15	
4855	n-Hexane					TO-15	
5090	n-Propylbenzene	8260B		8260B		TO-15	

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
	o-Xylene	8260B		8260B		TO-15	
4768	p-Ethyltoluene					TO-15	
	sec-Butylbenzene	8260B		8260B		TO-15	
5100	Styrene	8260B		8260B		TO-15	
4445	tert-Butylbenzene	8260B		8260B		TO-15	
5115	Tetrachloroethene	8260B		8260B		TO-15	
	Tetrahydrofuran	8260B		8260B		TO-15	
5140	Toluene	8260B		8260B		TO-15	
4700	trans-1,2-Dichloroethene	8260B		8260B		TO-15	
4685	*trans* -1,3-Dichloropropene	8260B		8260B		TO-15	
5170	Trichloroethene	8260B		8260B			
5170	Trichloroethene					TO-15	
5175	Trichlorofluoromethane (Freon 11)					TO-15	
5195	Trichlorotrifluoromethane (Freon 113)					TO-15	
5225	Vinyl acetate	8260B		8260B			
5230	Vinyl bromide					TO-15	
5235	Vinyl chloride	8260B		8260B		TO-15	
5260	Xylenes, total	8260B		8260B		TO-15	
	SVOCs - Base/Neutrals/Acids						
	1,1 Biphenyl	8270C/D	8270C SIM	8270C/D	8270C SIM		
6715	1,2,4,5-Tetrachlorobenzene	8270C/D		8270C/D			
5155	1,2,4-Trichlorobenzene	8270C/D		8270C/D			
4610	1,2-Dichlorobenzene	8270C/D		8270C/D			
4615	1,3-Dichlorobenzene	8270C/D		8270C/D			
4620	1,4-Dichlorobenzene	8270C/D		8270C/D			
6380	1-Methylnaphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	1-Methylphenanthrene		8270C SIM		8270C SIM		
	2,2-oxybis (1-chloropropane)	8270C/D		8270C/D			
6735	2,3,4,6-Tetrachlorophenol	8270C/D		8270C/D			
	2,3,5-Trimethylnapthalene		8270C SIM		8270C SIM		
6835	2,4,5-Trichlorophenol	8270C/D		8270C/D			
6840	2,4,6-Trichlorophenol	8270C/D		8270C/D			
6000	2,4-Dichlorophenol	8270C/D		8270C/D			
6130	2,4-Dimethylphenol	8270C/D		8270C/D			
6175	2,4-Dinitrophenol	8270C/D		8270C/D			
6185	2,4-Dinitrotoluene	8270C/D		8270C/D			
6005	2,6-Dichlorophenol	8270C/D		8270C/D			
	2,6-Dimethylnaphthalene		8270C SIM		8270C SIM		
6190	2,6-Dinitrotoluene	8270C/D		8270C/D			
5795	2-Chloronaphthalene	8270C/D		8270C/D			
5800	2-Chlorophenol	8270C/D		8270C/D			
	2-Fluorophenol	8270C/D		8270C/D			
	2-Flurorobiphenyl	8270C/D		8270C/D			
6360	2-Methyl-4,6-Dinitrophenol	8270C/D		8270C/D			
6385	2-Methylnaphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6400	2-Methylphenol	8270C/D		8270C/D			
6460	2-Nitroaniline	8270C/D		8270C/D			
6490	2-Nitrophenol	8270C/D		8270C/D			
5945	3,3'-Dichlorobenzidine	8270C/D		8270C/D			
	3-Methylcholanthrene	8270C/D		8270C/D			
6465	3-Nitroaniline	8270C/D		8270C/D			
5660	4-Bromophenyl-phenylether	8270C/D		8270C/D			
5700	4-Chloro-3-methylphenol	8270C/D		8270C/D			
5745	4-Chloroaniline	8270C/D		8270C/D			
5825	4-Chlorophenyl-phenylether	8270C/D		8270C/D			
6410	4-Methylphenol (and/or 3-Methylphenol)	8270C/D		8270C/D			

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
6470	4-Nitroaniline	8270C/D		8270C/D			
6500	4-Nitrophenol	8270C/D		8270C/D			
5500	Acenaphthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5505	Acenaphthylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Acetophenone	8270C/D		8270C/D			
5545	Aniline	8270C/D		8270C/D			
5555	Anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Atrazine	8270C/D		8270C/D			
	Azobenzene	8270C/D		8270C/D			
5595	Benzidine	8270C/D		8270C/D			
	Benzo (e) pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5575	Benzo(a)anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5580	Benzo(a)pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5585	Benzo(b)fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5590	Benzo(g,h,i)perylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5600	Benzo(k)fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5610	Benzoic acid	8270C/D		8270C/D			
5630	Benzyl alcohol	8270C/D		8270C/D			
5760	bis(2-Chloroethoxy)methane	8270C/D		8270C/D			
5765	bis(2-Chloroethyl)ether	8270C/D		8270C/D			
5780	bis(2-Chloroiospropyl) ether	8270C/D		8270C/D			
6255	bis(2-ethylhexyl) phthalate	8270C/D		8270C/D			
5670	Butyl benzyl phthalate	8270C/D		8270C/D			
5680	Carbazole	8270C/D		8270C/D			
5855	Chrysene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5895	Dibenzo(a,h)anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5905	Dibenzofuran	8270C/D		8270C/D			
	Dibenzothiphene		8270C SIM		8270C SIM		
6070	Diethyl phthalate	8270C/D		8270C/D			
6135	Dimethylphthalate	8270C/D		8270C/D			
5925	Di-n-butylphthalate	8270C/D		8270C/D			
6200	Di-n-octylphthalate	8270C/D		8270C/D			
6265	Fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6270	Fluorene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6275	Hexachlorobenzene	8270C/D		8270C/D			
4835	Hexachlorobutadiene	8270C/D		8270C/D			
6285	Hexachlorocyclopentadiene	8270C/D		8270C/D			
4840	Hexachloroethane	8270C/D		8270C/D			
6315	Indeno(1,2,3, cd)pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Isodrin	8270C/D		8270C/D			
6320	Isophorone	8270C/D		8270C/D			
5005	Naphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5015	Nitrobenzene	8270C/D					
6530	N-Nitrosodimethylamine	8270C/D		8270C/D			
6545	N-Nitroso-di-n-propylamine	8270C/D		8270C/D			
6535	N-Nitrosodiphenylamine	8270C/D		8270C/D			
6605	Pentachlorophenol	8270C/D		8270C/D			
	Perylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6615	Phenanthrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6625	Phenol	8270C/D		8270C/D			
6665	Pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5095	Pyridine	8270C/D		8270C/D			
	Thionazin	8270C/D		8270C/D			
	PCBs						
8880	Aroclor 1016	8082/A		8082/A			
8885	Aroclor 1221	8082/A		8082/A			
8890	Aroclor 1232	8082/A		8082/A			

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
8895	Aroclor 1242	8082/A		8082/A			
8900	Aroclor 1248	8082/A		8082/A			
8905	Aroclor 1254	8082/A		8082/A			
8910	Aroclor 1260	8082/A		8082/A			
	Aroclor 1262	8082/A		8082/A			
	Aroclor 1268	8082/A		8082/A			
	Herbicides						
8655	2,4,5-T	8151A		8151A			
8650	2,4,5-TP (Silvex)	8151A		8151A			
8545	2,4-D	8151A		8151A			
8560	2,4-DB	8151A		8151A			
8600	3,5-Dichlorobenzoic acid	8151A		8151A			
	4-Nitrophenol	8151A		8151A			
8555	Dalapon	8151A		8151A			
8595	Dicamba	8151A		8151A			
8605	Dichloroprop	8151A		8151A			
8620	Dinoseb	8151A		8151A			
6605	Pentachlorophenol	8151A		8151A			
	Nitroaromatic and Nitroamines						
6885	1,3,5-Trinitrobenzene	8330B		8330B			
6160	1,3-Dinitrobenzene	8330B		8330B			
	2,4,6 Trinitrophenol (Picric Acid)	8330B		8330B			
9651	2,4,6-Trinitrotoluene	8330B		8330B			
	2,4-diamino-6-nitrotoluene	8330B		8330B			
6185	2,4-Dinitrotoluene	8330B		8330B			
	2,6-diamino-4-nitrotoluene	8330B		8330B			
6190	2,6-Dinitrotoluene	8330B		8330B			
9303	2-Amino-4,6-dinitrotoluene	8330B		8330B			
9507	2-Nitrotoluene	8330B		8330B			
9510	3-Nitrotoluene	8330B		8330B			
9306	4-Amino-2,6-dinitrotoluene	8330B		8330B			
9513	4-Nitrotoluene	8330B		8330B			
9522	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	8330B		8330B			
5015	Nitrobenzene	8330B		8330B			
	Nitroglycerin	8330B		8330B			
	PETN	8330B		8330B			
9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	8330B		8330B			
6415	Tetryl (methyl-2,4,6-trinitrophenylnitramine)	8330B		8330B			
	Pesticides						
7025	Aldrin	8081A/B		8081A/B			
7110	alpha-BHC	8081A/B		8081A/B			
7240	alpha-Chlordane	8081A/B		8081A/B			
7115	beta-BHC	8081A/B		8081A/B			
7250	Chlordane (technical)	8081A/B		8081A/B			
7105	delta-BHC	8081A/B		8081A/B			
7470	Dieldrin	8081A/B		8081A/B			
7510	Endosulfan I	8081A/B		8081A/B			
7515	Endosulfan II	8081A/B		8081A/B			
7520	Endosulfan sulfate	8081A/B		8081A/B			
7540	Endrin	8081A/B		8081A/B			
7530	Endrin aldehyde	8081A/B		8081A/B			
7535	Endrin ketone	8081A/B		8081A/B			
7120	gamma-BHC (Lindane)	8081A/B		8081A/B			

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
7245	gamma-Chlordane	8081A/B		8081A/B			
7685	Heptachlor	8081A/B		8081A/B			
7690	Heptachlor Epoxide (beta)	8081A/B		8081A/B			
7810	Methoxychlor	8081A/B		8081A/B			
8250	Toxaphene (total)	8081A/B		8081A/B			
7355	4,4'-DDD	8081A/B		8081A/B			
7360	4,4'-DDE	8081A/B		8081A/B			
7365	4,4'-DDT	8081A/B		8081A/B			

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited DoD ELAP Laboratory

A2LA has accredited

TEST AMERICA SAVANNAH

Savannah, GA

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality System Manual for Environmental Laboratories (QSM); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION
CORPORATE SEAL 1978
DISTRICT OF COLUMBIA
A2LA

Presented this 5th day of April 2011.

President & CEO
For the Accreditation Council
Certificate Number 0399.01
Valid to February 28, 2013
Revised June 1, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TEST AMERICA SAVANNAH
5102 LaRoche Avenue
Savannah, GA 31404
Andrea Teal Phone: 912 354 7858

ENVIRONMENTAL

Valid To: February 28, 2013 Certificate Number: 0399.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality Systems Manual for Environmental Laboratories) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below and for the test methods applicable to Kentucky Statute KRS 224.60-130(2)(a):

Testing Technologies

Atomic Absorption/ICP-AES Spectrometry, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, Ion Chromatography, ICP/MS, Methylene Blue Active Substances, Misc.- Electronic Probes (pH, F^-, O_2), Oxygen Demand, Hazardous Waste Characteristics Tests, Spectrophotometry (Visible), Spectrophotometry (Automated), Titrimetry, Total Organic Carbon, Total Organic Halide, Turbidity

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	
			Aqueous	**Solid**
Metals				
Aluminum	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)

5301 Buckeystown Pike, Suite 350 | Frederick, Maryland 21704-8373 | Phone: 301 644 3248 | Fax: 301 662 2974 | www.A2LA.org

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Antimony	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Arsenic	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Barium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Beryllium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Boron	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A
Cadmium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Calcium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)
Chromium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Chromium 3+	SM 3500 Cr B_01 SM3500 Cr D	EPA 7196A SM 3500 Cr B_01 SM 3500 Cr D	EPA 7196A SM 3500 Cr B_01 SM 3500 Cr D	EPA 3060A/7196A
Chromium 6+	SM 3500 Cr B_01 SM3500 Cr D	EPA 7196A SM 3500 Cr B_01 SM 3500 Cr D	EPA 7196A SM 3500 Cr B_01 SM 3500 Cr D	EPA 3060A/7196A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Cobalt	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Copper	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Iron	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Iron, Ferric	SM 3500 Fe B_97 SM3500 Fe D	SM 3500 Fe B_97 SM3500 Fe D	SM 3500 Fe B_97 SM3500 Fe D	- - - - - - - - - -
Iron, Ferrous	SM 3500 Fe B_97 SM3500 Fe D	SM 3500 Fe B_97 SM3500 Fe D	SM 3500 Fe B_97 SM3500 Fe D	- - - - - - - - - -
Lead	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Magnesium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Manganese	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Mercury	EPA 200.8 EPA 245.1	EPA 200.8 EPA 245.1 SM 3112B	EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A EPA 7470A ISM01.2 (Hg) SM 3112B	EPA 3050B/6020 EPA 3050B/6020A EPA 7471A EPA 7471B ISM01.2 (Hg)
Molybdenum	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Nickel	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Potassium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)
Selenium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Silica	EPA 200.7	EPA 200.7	EPA 6010B EPA 6010C	- - - - - - - - - -
Silicon	EPA 200.7	EPA 200.7	EPA 6010B EPA 6010C	- - - - - - - - - -
Silver	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Sodium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP)
Sodium Adsorption Ratio	- - - - - - - - - -	USDA 20B	USDA 20B	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Strontium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A
Thallium	EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Tin	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Titanium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A
Vanadium	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)
Zinc	EPA 200.7 EPA 200.8	EPA 200.7 EPA 200.8	EPA 3005A/6010B EPA 3010A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B EPA 3005A/6010C EPA 3010A/6010C SM 3030C/EPA 6010C EPA 3005A/6020 EPA 3010A/6020 SM 3030C/EPA 6020 EPA 3005A/6020A EPA 3010A/6020A SM 3030C/EPA 6020A ISM01.2 (ICP) ISM01.2 (ICPMS)	EPA 3050B/6010B EPA 3050B/6010C EPA 3050B/6020 EPA 3050B/6020A ISM01.2 (ICP) ISM01.2 (ICPMS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Nutrients				
Ammonia (as N)	EPA 350.1 SM4500NH3_G	EPA 350.1 SM4500NH3_G	EPA 350.1 SM4500NH3_G	- - - - - - - - - -
Kjeldahl nitrogen	EPA 351.2	EPA 351.2	EPA 351.2	- - - - - - - - - -
Nitrate (as N)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrate-nitrite (as N)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrite (as N)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrate (as NO3)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrate-nitrite (as NO3-NO2)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Nitrite (as NO2)	EPA 300.0 EPA 353.2	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 353.2 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Organic Nitrogen (as N)	- - - - - - - - - -	TKN minus Ammonia	TKN minus Ammonia	- - - - - - - - - -
Orthophosphate (as P)	EPA 365.1 SM4500P F	EPA 365.1 SM4500P F	EPA 365.1 SM4500P F	- - - - - - - - - -
Total Nitrogen (as N)	- - - - - - - - - -	TKN plus Nitrate-Nitrite (as N)	TKN plus Nitrate-Nitrite (as N)	- - - - - - - - - -
Total phosphorus	EPA 365.4	EPA 365.4	EPA 365.4	- - - - - - - - - -
Demands				
Adsorbable organic halides (AOX)	- - - - - - - - - -	EPA 1650	EPA 1650	- - - - - - - - - -
Biochemical oxygen demand	EPA 405.1 SM 5210 B	EPA 405.1 SM 5210 B	EPA 405.1 SM 5210 B	- - - - - - - - - -
Carbonacious BOD	SM 5210 B	SM 5210 B	SM 5210 B	- - - - - - - - - -
Chemical oxygen demand	EPA 410.4 SM 5220 D	EPA 410.4 SM 5220 D	EPA 410.4 SM 5220 D	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Dissolved carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Dissolved inorganic carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Dissolved organic carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Extractable organic halides	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	EPA 9023
Total carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Total inorganic carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	- - - - - - - - - -
Total organic carbon	EPA 415.1 SM 5310B	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 415.1 SM 5310B EPA 9060 EPA 9060A	EPA 9060 EPA 9060A Lloyd Kahn
Total organic halides	EPA 9020B	EPA 450.1 EPA 9020B	- - - - - - - - - -	- - - - - - - - - -
Wet Chemistry				
Acidity	EPA 305.1 SM 2310B	EPA 305.1 SM 2310B	EPA 305.1 SM 2310B	- - - - - - - - - -
Alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
Anion/Cation Balance	- - - - - - - - - -	SM 1030 F	SM 1030 F	- - - - - - - - - -
Bicarbonate alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
Bromide	EPA 300.1B	EPA 300.0 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Bromate	EPA 300.1B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Carbon dioxide, free	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
Carbonate alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B SM 4500 CO2 D	EPA 310.1 SM 2320B SM 4500 CO2 D	- - - - - - - - - -
Chlorate	EPA 300.1B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chloride	EPA 300.0 EPA 325.2 SM 4500 Cl- E	EPA 300.0 EPA 325.2 SM4500 Cl- E EPA 9056 EPA 9056A EPA 9251	EPA 9056 EPA 9056A EPA 9251 EPA 300.0 EPA 325.2 SM4500 Cl-E	EPA 300.0 EPA 9056 EPA 9056A EPA 9251
Chloride, residual	EPA 330.3 SM 4500 Cl-B	EPA 330.3 SM4500 Cl-B	EPA 330.3 SM4500 Cl-B	- - - - - - - - - -
Chlorite	EPA 300.1B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Color	EPA 110.2 SM 2120B	EPA 110.2 SM 2120B	EPA 110.2 SM 2120B	- - - - - - - - - -
Corrosivity-calc.carb. stability	SM 2330B	SM 2330B	SM 2330B	- - - - - - - - - -
Cyanide	EPA 335.4 SM 4500-CN-E	EPA 335.4 SM 4500 CN-E ISM01.2 (CN) EPA 9012A EPA 9012B	EPA 9012A EPA 9012B ISM01.2 (CN) EPA 335.4 SM 4500 CN-E	EPA 9012A EPA 9012B ISM01.2 (CN)
Cyanide amenable to chlorination	EPA 335.1	EPA 335.1 EPA 9013/9012A EPA 9013/9012B	EPA 9013/9012A EPA 9013/9012B EPA 335.1	EPA 9013/9012A EPA 9013/9012B
Cyanide, weak acid dissociable	- - - - - - - - - -	SM 4500-CN-I	SM 4500-CN-I	- - - - - - - - - -
Fluoride	EPA 300.0	EPA 300.0 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A	EPA 300.0 EPA 9056 EPA 9056A
Hardness (as calcium carbonate)	EPA 130.2 SM 2340B SM 2340C	EPA 130.2 SM 2340B SM 2340C	EPA 130.2 SM 2340B SM 2340C	- - - - - - - - - -
Hardness, Calcium (as calcium carbonate)	SM 2340B	SM 2340B	SM 2340B	- - - - - - - - - -
Hardness, Magnesium (as calcium carbonate)	SM 2340B	SM 2340B	SM 2340B	- - - - - - - - - -
Hydroxide alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
Odor	EPA 140.1 SM 2150 B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Oxygen, dissolved	EPA 360.2 SM 4500 O C	EPA 360.2 SM 4500 O C	EPA 360.2 SM 4500 O C	- - - - - - - - - -
Perchlorate	EPA 314.0	EPA 314.0	EPA 314.0	EPA 314.0
pH	EPA 150.1 SM 4500 H+ B	EPA 150.1 SM 4500 H+ B EPA 9040B EPA 9040C	EPA 9040B EPA 9040C EPA 150.1 SM 4500 H+ B	EPA 9045C EPA 9045D
Phenolphthalein alkalinity	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	EPA 310.1 SM 2320B	- - - - - - - - - -
MBAS (Surfactants)	EPA 425.1 SM 5540C	EPA 425.1 SM 5540C	EPA 425.1 SM 5540C	
Oil and Grease (HEM)	- - - - - - - - - -	EPA 1664A	EPA 1664A	EPA 9071B
Phenols	EPA 420.1	EPA 420.1 EPA 9065 EPA 9065A	EPA 9065 EPA 9065A EPA 420.1	EPA 9065 EPA 9065A
Filterable residue	EPA 160.1 SM 2540C	EPA 160.1 SM 2540C	EPA 160.1 SM 2540C	- - - - - - - - - -
Nonfilterable residue	EPA 160.2 SM 2540D	EPA 160.2 SM 2540D	EPA 160.2 SM 2540D	- - - - - - - - - -
Settleable Residue	EPA 160.5 SM 2540F	EPA 160.5 SM 2540F	EPA 160.5 SM 2540F	- - - - - - - - - -
Total residue	EPA 160.3 SM 2540B	EPA 160.3 SM 2540B	EPA 160.3 SM 2540B	SM2540G
Volatile dissolved residue	- - - - - - - - - -	SM 2540E	SM 2540E	- - - - - - - - - -
Total volatile suspended residue	- - - - - - - - - -	SM 2540E	SM 2540E	- - - - - - - - - -
Volatile residue	EPA 160.4 SM 2540E	EPA 160.4 SM 2540E	EPA 160.4 SM 2540E	SM2540G
Ash Content	- - - - - - - - - -	SM 2540E	SM 2540E	SM2540G
Fixed residue	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	SM2540G
Percent Moisture	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	SM2540G
Resistivity	EPA 120.1 SM 2510B	EPA 120.1 SM 2510B	EPA 120.1 SM 2510B	- - - - - - - - - -
Salinity	SM 2520B	SM 2520B	SM 2520B	- - - - - - - - - -
Specific conductance	EPA 120.1 SM 2510B	EPA 120.1 SM 2510B	EPA 9050A EPA 120.1 SM 2510B	EPA 9050A
Sulfide	EPA 376.1 SM4500-S2-F	EPA 376.1 EPA 9030B/9034 SM4500 S2 F	EPA 9030B/9034 EPA 376.1 SM4500 S2 F	EPA 9030B/9034

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Sulfate	EPA 300.0 EPA 375.4	EPA 300.0 EPA 375.4 EPA 9038 EPA 9056 EPA 9056A	EPA 300.0 EPA 375.4 EPA 9056 EPA 9056A EPA 9038	EPA 300.0 EPA 9056 EPA 9056A EPA 9038
Sulfite	EPA 377.1 SM4500 SO3 B	EPA 377.1 SM4500 SO3 B	EPA 377.1 SM4500-SO3-B	- - - - - - - - - -
Total Petroleum Hydrocarbons (TPH or SGT-HEM)	- - - - - - - - - -	EPA 1664A	EPA 1664A	EPA 9071B
Turbidity	EPA 180.1 SM 2130B	EPA 180.1 SM 2130B	EPA 180.1 SM 2130B	- - - - - - - - - -
Unionized ammonia	- - - - - - - - - -	FL-DEP SOP	FL-DEP SOP	- - - - - - - - - -
UV-254	SM5910B	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Purgeable Organics (Volatiles)				
Acetone	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Acetonitrile	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Acrolein	- - - - - - - - - -	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Acrylonitrile	- - - - - - - - - -	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Amyl acetate, mixed isomers	- - - - - - - - - -	EPA 1666	EPA 1666	- - - - - - - - - -
Benzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
BTEX, Total		EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromobenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromochloromethane	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromodichloromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromoform	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Bromomethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
n-Butanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
sec-Butanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2-Butanone	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2-Butoxyethanol (Butyl cellosolve)	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Butyl acetate	- - - - - - - - - -	EPA 1666	EPA 1666 EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
sec-Butyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
tert-Butyl alcohol (2-methyl-2-propanol)	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Butylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Sec-Butylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tert-Butylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Carbon disulfide	- - - - - - - - - -	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Carbon tetrachloride	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Cellosolve acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Chlorobenzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Chloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2-Chloroethyl vinyl ether	- - - - - - - - - -	EPA 624	EPA 5030B/8260B	- - - - - - - - - -
Chloroform	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1-Chlorohexane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
4-Isopropyltoluene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Chloromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
3-Chloro-1-propene	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Chloroprene	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Cyclohexane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2-Chlorotoluene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
4-Chlorotoluene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Dibromoacetic Acid (DBAA)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Dibromochloromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1 EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B EPA 8011	EPA 5030/8260B EPA 5035A/8260B
Dibromomethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dibromoethane (EDB)	EPA 504.1 EPA 524.2	EPA 624	EPA 5030B/8260B EPA 8011	EPA 5030/8260B EPA 5035A/8260B
Dichloroacetic Acid (DCAA)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,2-Dichlorobenzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3-Dichlorobenzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,4-Dichlorobenzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trans-1,4-dichloro-2-butene	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Dichlorodifluoromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1-Dichloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dichloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1-Dichloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
cis-1,2-Dichloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
trans-1,2-Dichloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dichloroethene, Total	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Dichloropropane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3-Dichloropropane	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2,2-Dichloropropane	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1-Dichloropropene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
cis-1,3-Dichloropropene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
trans-1,3-Dichloropropene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3-Dichloropropene, Total	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Diethyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Disopropyl ether	EPA 524.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,4-Dioxane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Ethanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI EPA 5030B/8260B	EPA 8015B-DAI EPA 8015C-DAI EPA 5030/8260B EPA 5035A/8260B
Ethyl acetate	- - - - - - - - - -	EPA 1666	EPA 1666 EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Ethyl benzene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Ethyl methacrylate	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Ethylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Tetraethylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Triethylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Furan	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Haloacetic Acids, Total (HAA5)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
n-Heptane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
n-Heptanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
2-Hexanone	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Hexachlorobutadiene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Hexane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Isoamyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Isobutanol	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B EPA 8015B-DAI EPA 8015C-DAI	EPA 5030/8260B EPA 5035A/8260B EPA 8015B-DAI EPA 8015C-DAI
Isobutyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Isopropyl acetate	- - - - - - - - - -	EPA 1666	EPA 1666 EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Isopropanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Isopropyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Isopropylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Iodomethane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methacrylonitrile	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Methyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B EPA 8015B-DAI EPA 8015C-DAI	EPA 5030/8260B EPA 5035A/8260B EPA 8015B-DAI EPA 8015C-DAI
Methylene chloride	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methyl isobutyl ketone	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methyl methacrylate	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Methyl cyclohexane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Monobromoacetic Acid (MBAA)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Monochloroacetic Acid (MCAA)	EPA 552.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Methyl tert-butyl ether (MTBE)	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Naphthalene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2,2'-Oxybisethanol (Diethylene glycol)	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Pentachloroethane	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Phenol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
n-Propanol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Propionitrile	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
2-Propoxy ethanol (Propyl cellosolve)	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Propyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
n-Propylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Propylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Di-propylene glycol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Di-propylene glycol methyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI	EPA 8015B-DAI
Styrene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tert-amyl alcohol	- - - - - - - - - -	- - - - - - - - - -	EPA 8015B-DAI EPA 8015C-DAI	EPA 8015B-DAI EPA 8015C-DAI
Tert-amyl methyl ether (TAME)	EPA 524.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Tert-butyl alcohol (TBA)	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tert-butyl ethyl ether (ETBE)	EPA 524.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,1,1,2-Tetrachloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1,2,2-Tetrachloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tetrachloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Tetrahydrofuran	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Toluene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trichloroacetic acid	EPA 552.2	- - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,1,1-Trichloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,1,2-Trichloroethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trichloroethene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trichlorofluoromethane	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2,3-Trichlorobenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
1,2,4-Trichlorobenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2,3-Trichloropropane	EPA 524.2 EPA 504.1	- - - - - - - - - -	EPA 5030B/8260B EPA 8011	EPA 5030/8260B EPA 5035A/8260B
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2,4-Trimethylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3,5-Trimethylbenzene	EPA 524.2	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Trihalomethanes, Total	EPA 524.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Vinyl acetate	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Vinyl chloride	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Xylenes, total	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,2-Xylene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
1,3 & 1,4-Xylene	EPA 524.2	EPA 624	EPA 5030B/8260B	EPA 5030/8260B EPA 5035A/8260B
Gasoline Range Organics	- - - - - - - - - -	- - - - - - - - - -	EPA 5030B/8015B EPA 5030B/8015C AK101	EPA 5030/8015B EPA 5035A/8015B EPA 5030/8015C EPA 5035A/8015C AK101
Extractable Organics (Semivolatiles)				
Acenaphthene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Acenaphthylene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Acetochlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Acetophenone	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Acetylaminofluorene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Alachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
4-Aminobiphenyl	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Aniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Anthracene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Aramite, Total	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Atrazine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzaldehyde	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzidine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzoic acid	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (a) anthracene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Benzo (b) fluoranthene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (k) fluoranthene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (ghi) perylene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzo (a) pyrene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Benzyl alcohol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,1-Biphenyl	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bis (2-chloroethoxy) methane	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bis (2-chloroethyl) ether	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bis (2-chloroisopropyl) ether	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bis (2-ethylhexyl) phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Bromacil	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
4-Bromophenylphenyl ether	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Butachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Butylate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Butyl benzyl phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-sec-Butyl-4,6-dinitrophenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Caprolactam	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Carbazole	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Chloroaniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Chloro-3-methylphenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Chloronaphthalene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Chlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2-Chlorophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Chlorophenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Chlorophenyl phenyl ether	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Chrysene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Cresols (total methyl phenols)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Diallate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Dibenzofuran	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Dibenz(a,h) anthracene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,2-Dichlorobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,3-Dichlorobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,4-Dichlorobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,3-Dichlorobenzidine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4-Dichlorophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,6-Dichlorophenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Diethyl phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Di(2-ethylhexyl)adipate	EPA 525.2	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Dimethoate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
p-Dimethylaminoazobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
7,12-Dimethylbenz (a) anthracene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,3'-Dimethylbenzidine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Alpha-, alpha-Dimethylphenethlylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,3-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4-Dimethylphenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,5-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4 & 2,5-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2,6-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,4-Dimethylphenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Dimethyl phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Di-n-butyl phthalate	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Di-n-octyl phthalate	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Diphenyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,3-Dinitrobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4-Dinitrophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4-Dinitrotoluene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,6-Dinitrotoluene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,4-Dioxane	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
1,2-Diphenylhydrazine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Diphenamide	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
EPTC	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Ethoprop (Mocap)	EPA 525.2	- - - - - - - - - -		- - - - - - - - - -
Ethyl methane sulfonate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Etridiazole	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Fenarimol	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Fluoranthene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Fluorene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Fluridone	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,2',3,3',4,4',6-Heptachlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Hexachlorobenzene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexachlrobutadiene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexachlorocyclopentadiene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexachloroethane	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexachlorophene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Hexachloropropene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Hexazinone	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Indeno (1,2,3-cd) pyrene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Isophorone	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Isosafrole	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Methapyrilene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Methylbenzoate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3-Methylcholanthrene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Methyl-4,6-Dinitrophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Methyl methane sulfonate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1-Methylnaphthalene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Methylnaphthalene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Methyl paraoxon	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2-Methylphenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3 & 4-Methylphenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Metolachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Metribuzin	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Mevinphos	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
MGK 264, total (isomer a+b)	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Molinate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Napropamide	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Naphthalene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,4-Naphthoquinone	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1-Naphthylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Naphthylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Nitroaniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3-Nitroaniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Nitroaniline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Nitrobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Nitrophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Nitrophenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitroso-di-n-butylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosodiethylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosodimethylamine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosomethylethylamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosomorpholine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosodi-n-propylamine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosodiphenylamine	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
N-Nitrosopiperidine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
N-Nitrosopyrrolidine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
4-Nitroquinoline-1-oxide	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
trans-Nonachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Norflurazon	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Pebulate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Pentachlorobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,2',3,4,6-Pentachlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Pentachlronitrobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Pentachlorophenol	- - - - - - - - - -	EPA 625 EPA 1653	EPA 3520C/8270C EPA 3520C/8270D EPA 1653	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Permethrin, total	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Phenacetin	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Phenanthrene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Phenol	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Phenyl ether	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
p-Phenylene diamine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Phorate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Picoline	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
alpha-Pinene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Pronamide	EPA 525.2	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Propazine	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Pyrene	EPA 525.2	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Pyridine	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Safrole, Total	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Terbacil	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,2,4,5-Tetrachlorobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,2',4,4'-Tetrachlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Tetrachlorocatechol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
Tetrachloroguaicol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
2,3,4,6-Tetrachlorophenol	- - - - - - - - - -	EPA 1653	EPA 1653 EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2-Toluidine (o-Toluidine)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Triademefon	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,4,5-Trichlorobiphenyl	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,2,3-Trichlorobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,2,4-Trichlorobenzene	- - - - - - - - - -	EPA 625	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
1,3,5-Trichlorobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,4,5-Trichlorocatechol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
3,4,6-Trichlorocatechol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
3,4,5-Trichloroguaicol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
3,4,6-Trichloroguaicol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
4,5,6-Trichloroguaicol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
2,4,5-Trichlorophenol	- - - - - - - - - -	EPA 1653	EPA 3520C/8270C EPA 3520C/8270D EPA 1653	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,3,6-Trichlorophenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4,6-Trichlorophenol	- - - - - - - - - -	EPA 625 EPA 1653	EPA 3520C/8270C EPA 3520C/8270D EPA 1653	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,4,5-Trichlorophenol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
Trichlorosyringol	- - - - - - - - - -	EPA 1653	EPA 1653	- - - - - - - - - -
Tricyclazole	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
o,o',o"-Triethylphosphorothioate	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Trifluralin	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
1,3,5-Trinitrobenzene	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Vernolate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
2,3-Xylenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
3,4-Xylenol	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8270C EPA 3520C/8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
#2 Diesel Fuel (Product Identification)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Diesel Range Organics	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C AK102	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C AK102
Residual Range Organics	- - - - - - - - - -	- - - - - - - - - -	AK103	AK103
Kerosene (Product Identification)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Mineral Spirits (Product Identification)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Motor Oil (Product Identification)	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Oil Range Organics	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8015B EPA 3520C/8015C	EPA 3550B/8015B EPA 3546/8015B EPA 3550C/8015C EPA 3546/8015C
Petroleum Range Organics	- - - - - - - - - -	- - - - - - - - - -	FL-PRO	FL-PRO
Pesticides-Herbicides-PCBs				
Acifluorfen	EPA 515.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Aldicarb (MS)	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Aldicarb sulfone	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Aldicarb sulfoxide	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Aldrin	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Atrazine	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
alpha-BHC	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Bentazon	EPA 515.1	- - - - - - - - - -	- - - - - - - - - -	----------
beta-BHC	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
delta-BHC	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
gamma-BHC	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Carbaryl	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Carbofuran (MS)	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chloramben	EPA 515.1			
Chlordane (technical)	EPA 508	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Chlordane (alpha)	EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Chlordane (gamma)	EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Chlorobenzilate	EPA 525.2		EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Decachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Dichlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Heptachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Hexachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Monochlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Nonachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Octachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Pentachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Tetrachlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Trichlorobiphenyl	- - - - - - - - - -	EPA 680	EPA 680	EPA 680
Chloroneb	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chlorpropham	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chlorpyrifos	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chlorthalonil	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Cycloate	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,4-D	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
2,6-Dichlorophenol	- - - - - - - - - -	EPA 615	EPA 8151A	EPA 8151A
DCPA (Dacthal)	EPA 515.1 EPA 525.2	- - - - - - - - - -	EPA 8151A	EPA 8151A
Dalapon	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
2,4-DB	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
2,4'-DDD	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
2,4' DDE	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
2,4'-DDT	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
4,4'-DDD	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
4,4' DDE	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
4,4'-DDT	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Dicamba	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Dichlorvos	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
3,5-Dichlorobenzoic acid	EPA 515.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,3-Dichlorobiphenyl (PCB 5)	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Dichloroprop	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Dieldrin	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Dinoseb	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Diquat	EPA 549.2	- - - - - - - - - -	- - - - - - - - -	- - - - - - - - - -
Disulfoton	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Endosulfan I (alpha)	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endosulfan II (beta)	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endosulfan sulfate	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endothall	EPA 548.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Endrin	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Endrin aldehyde	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Endrin ketone	- - - - - - - - - -	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Famphur	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Glyphosate	EPA 547	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Heptachlor	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Heptachlor epoxide	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B.	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
2,2',4,4',5,6'-Hexachlorobiphenyl (PCB 154)	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
3-Hydroxycarbofuran	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Isodrin	- - - - - - - - - -		EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
MCPA	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
MCPP	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Methiocarb	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Methomyl	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Methoxychlor	EPA 508 EPA 525.2	EPA 608	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
Mirex	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8081A EPA 3520C/8081B	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B
4-Nitrophenol	EPA 515.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (PCB 201)	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Oxamyl (MS)	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Paraquat	EPA 549.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Parathion ethyl	- - - - - - - - - -	EPA 614	EPA 3520C/8141A EPA 3520C/8141B EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8141A EPA 3546/8141A EPA 3550C/8141B EPA 3546/8141B EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
Parathion methyl	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
PCB-1016	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1221	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1232	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1242	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1248	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1254	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1260	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCB-1262	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
PCB-1268	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
PCBs, Total	EPA 508	EPA 608	EPA 3520C/8082 EPA 3520C/8082A	EPA 3550B/8082 EPA 3546/8082 EPA 3550C/8082A EPA 3546/8082A
Pentachlorophenol	EPA 515.1	- - - - - - - - - -	EPA 8151A	EPA 8151A
Picloram	EPA 515.1	- - - - - - - - - -	EPA 8151A	EPA 8151A
Propachlor	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Propoxur (Baygon)	EPA 531.1	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Simazine	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Stirophos	EPA 525.2	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Sulfotepp	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4,5-T	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Thionazin	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C /8270C EPA 3520C /8270D	EPA 3550B/8270C EPA 3546/8270C EPA 3550C/8270D EPA 3546/8270D
2,4,6-Trichlorophenol	- - - - - - - - - -	EPA 615	EPA 8151A	EPA 8151A
2,4,5-TP (Silvex)	EPA 515.1	EPA 615	EPA 8151A	EPA 8151A
Toxaphene	EPA 508	EPA 608	EPA 3520C/8081A EPA 3520C/8081B EPA 3520C/8276	EPA 3550B/8081A EPA 3546/8081A EPA 3550C/8081B EPA 3546/8081B EPA 3546/8276
Hp-Sed	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Hx-Sed	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 26	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 40	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 41	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 44	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 50	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Parlar 62	- - - - - - - - - -	- - - - - - - - - -	EPA 3520C/8276	EPA 3546/8276
Hazardous Waste Characteristics				
BTU	- - - - - - - - - -	ASTM D240	ASTM D240	ASTM D240

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Free Liquid	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	EPA 9095A EPA 9095B
Ignitability	- - - - - - - - - -	EPA 1010 EPA 1010A	EPA 1010 EPA 1010A	EPA 1030
Specific Gravity	- - - - - - - - - -	SM2710 F	SM2710 F	SM2710 F
SPLC	- - - - - - - - - -	- - - - - - - - - -	EPA 1312	EPA 1312
TCLP	- - - - - - - - - -	- - - - - - - - - -	EPA 1311	EPA 1311
Air Testing				
Purgeable Organics				
Methane (FID)	- - - - - - - - - -	RSK-175	RSK-175	- - - - - - - - - -
Methane (TCD)	- - - - - - - - - -	RSK-175	RSK-175	- - - - - - - - - -
Ethane (FID)	- - - - - - - - - -	RSK-175	RSK-175	- - - - - - - - - -
Ethene (FID)	- - - - - - - - - -	RSK-175	RSK-175	- - - - - - - - - -
Kentucky UST Program				
TCLP Metals				
Arsenic	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Barium	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Cadmium	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Chromium	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Lead	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Mercury	- - - - - - - - - -	- - - - - - - - - -	EPA 7470A	EPA 7470A

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	
			Aqueous	Solid
Selenium	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B
Silver	- - - - - - - - - -	- - - - - - - - - -	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B	EPA 3005A/6010B EPA 3010A/6010B SM 3030C/EPA 6010B

CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board/ACLASS

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

TestAmerica-South Burlington
30 Community Drive, Suite 11
South Burlington, VT 05403

has been assessed by ACLASS
and meets the requirements of

DoD-ELAP

while demonstrating technical competence in the field(s) of

TESTING

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of tests to which this accreditation applies.

ADE-1492

Certificate Number

ACLASS Approval

Certificate Valid: 10/22/2010 – 10/22/2012

Version No. 002

SCOPE OF DoD-ELAP ACCREDITATION

TestAmerica – South Burlington

30 Community Drive, Suite 11, South Burlington, VT 05403
Kirsten McCracken Phone: 802-660-1990

TESTING

Valid to: October 22, 2012 Certificate Number: ADE – 1492

I. Environmental

MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water	Acid Digestion for Metals	3005A	
Water	Acid Digestion for Metals	3010A	
Solids	Acid digestion	3050B	
Water	Separatory Funnel Extraction	3510C	
Solids	Soxhlet extraction	3540C	
Solids	Ultrasonic Extraction	3550C	
Water/Solids	Florisil Cleanup	3620C	
Water/Solids	Silica Gel Cleanup	3630C	
Water/Solids	Sulfuric Acid/ Permanganate Cleanup	3665A	
Water/Solids	GPC Cleanup	3640A	
Water	Purge and Trap	5030B	
Solids	Purge and Trap	5035	

MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Solids	Perchlorate	6850	HPLC/MS
Water	Perchlorate	331.0	HPLC
Water / Solids	Nitroaromatics/ Nitramines	8330B	HPLC
Solids	pH	9045C / 9045D	pH Meter
Water	pH	9040B / 9040C	pH Meter
Water	TOC	9060A	Catalytic Combustion and Infrared Detector
Solids	TOC	Lloyd Kahn	Elemental Analyzer (Differential TCD)
Water	Cyanide	9012A/9012B	Automated Colorimetric
Solids	Extraction Procedure for Cyanide Analysis	9013	
Solids	Cyanide	9012A/9012B	Automated Colorimetric
Water	Mercury	7470A	CVAA
Solids	Mercury	7471A / 7471B	CVAA
Water / Solids	Metals	6010B / 6010C	ICP-OES
Water / Solids	Metals	6020 / 6020A	ICP-MS
Water / Solids	PCBs	8082 / 8082A	GC/ECD
Water / Solids	Pesticides	8081A / 8081B	GC/ECD
Water / Solids	Herbicides	8151A	GC/ECD
Water / Solids	Semivolatile Organic Compounds	8270C / 8270D	GC/MS
Water / Solids	Semivolatile Organic Compounds	8270C SIM	GC/MS

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MATRIX	SPECIFIC TEST or ANALYTE GROUP **	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Solids	Volatile Organic Compounds	8260B	GC/MS
Air	Volatile Organic Compounds	TO15	GC/MS
Solids	Diesel Range Organics	8015B	GC/FID

Notes:

1. ** = As Applicable*
2. ***=Refer to Accredited Analyte Listing for analytes in which the laboratory is accredited*
3. *This scope is part of and must be included with the Certificate of Accreditation No. ADE-1492*

Vice President

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Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
	Trace Metals						
1000	Aluminum	6010B/C	6020/A	6010B/C	6020/A		
1005	Antimony	6010B/C	6020/A	6010B/C	6020/A		
1010	Arsenic	6010B/C	6020/A	6010B/C	6020/A		
1015	Barium	6010B/C	6020/A	6010B/C	6020/A		
1020	Beryllium	6010B/C	6020/A	6010B/C	6020/A		
1025	Boron	6010B/C	6020/A	6010B/C	6020/A		
1030	Cadmium	6010B/C	6020/A	6010B/C	6020/A		
1035	Calcium	6010B/C	6020/A	6010B/C	6020/A		
1040	Chromium, total	6010B/C	6020/A	6010B/C	6020/A		
	Cobalt	6010B/C	6020/A	6010B/C	6020/A		
1055	Copper	6010B/C	6020/A	6010B/C	6020/A		
1070	Iron	6010B/C	6020/A	6010B/C	6020/A		
1075	Lead	6010B/C	6020/A	6010B/C	6020/A		
1085	Magnesium	6010B/C	6020/A	6010B/C	6020/A		
1090	Manganese	6010B/C	6020/A	6010B/C	6020/A		
1095	Mercury	7470A		7471A/B			
1100	Molybdenum	6010B/C	6020/A	6010B/C	6020/A		
1105	Nickel	6010B/C	6020/A	6010B/C	6020/A		
1125	Potassium	6010B/C	6020/A	6010B/C	6020/A		
1140	Selenium	6010B/C	6020/A	6010B/C	6020/A		
1150	Silver	6010B/C	6020/A	6010B/C	6020/A		
	Sodium	6010B/C	6020/A	6010B/C	6020/A		
1165	Strontium	6010B/C		6010B/C			
1165	Thallium	6010B/C	6020/A	6010B/C	6020/A		
1180	Tin	6010B/C		6010B/C			
1185	Titanium	6010B/C		6010B/C			
1185	Vanadium	6010B/C	6020/A	6010B/C	6020/A		
1190	Zinc	6010B/C	6020/A	6010B/C	6020/A		
	Misc Analytes						
1895	Perchlorate	331.0	6850	6850			
1900	pH	9040B/C		9045C/D			
1645	Total Cyanide	9012A/B		9012A/B			
2040	TOC	9060A		Lloyd Kahn			
	Petroloeum Hydrocarbons						
	Diesel Range Organics (DRO)			8015B			
	VOCs						
5105	1,1,1,2-Tetrachloroethane	8260B		8260B			
5160	1,1,1-Trichloroethane	8260B		8260B			
5160	1,1,1-Trichloroethane					TO-15	
5110	1,1,2,2-Tetrachloroethane	8260B		8260B		TO-15	
	1,1,2-Trichloro-1,2,2-trifluroethane (Freon TF)	8260B		8260B		TO-15	
5165	1,1,2-Trichloroethane	8260B		8260B			
5165	1,1,2-Trichloroethane					TO-15	
4630	1,1-Dichloroethane	8260B		8260B		TO-15	
4640	1,1-Dichloroethene	8260B		8260B		TO-15	
4670	1,1-Dichloropropene	8260B		8260B			
4695	1,2 Dichlorotetrafluoroethane (Freon 114)					TO-15	
5150	1,2,3-Trichlorobenzene	8260B		8260B			
5180	1,2,3-Trichloropropane	8260B		8260B			
5155	1,2,4-Trichlorobenzene	8260B		8260B		TO-15	
5210	1,2,4-Trimethylbenzene	8260B		8260B		TO-15	
4570	1,2-Dibromo-3-chloropropane (DBCP)	8260B		8260B			
4585	1,2-Dibromoethane (EDB)	8260B		8260B		TO-15	

Accredited Analytes/Methods (by matrix)

TestAmerica - South Burlington

South Burlington, VT

NELAC Code	Analyte	Matrix					
		Aqueous		Solid		Air	
4610	1,2-Dichlorobenzene	8260B		8260B		TO-15	
4635	1,2-Dichloroethane	8260B		8260B		TO-15	
4655	1,2-Dichloropropane	8260B		8260B		TO-15	
5215	1,3,5-Trimethylbenzene	8260B		8260B		TO-15	
4615	1,3-Dichlorobenzene	8260B		8260B		TO-15	
4660	1,3-Dichloropropane	8260B		8260B			
	1,4 Dioxane	8260B		8260B		TO-15	
4620	1,4-Dichlorobenzene	8260B		8260B		TO-15	
	2,2 Dichloropropane	8260B		8260B			
4665	2,2-Dichloropropane			8260B			
4410	2-Butanone (MEK)	8260B		8260B		TO-15	
4500	2-Chloroethylvinylether	8260B		8260B			
	2-Chlorotoluene	8260B		8260B		TO15	
4860	2-Hexanone	8260B		8260B		TO15	
	2-Methyl-2-Propanol (tert-Butyl Alcohol)					TO15	
	3-Choro-1-propene					TO15	
	4-Chlorotoluene	8260B		8260B			
4910	4-Isopropyltoluene	8260B		8260B		TO15	
4995	4-Methyl-2-pentanone (MIBK)	8260B		8260B		TO15	
4315	Acetone	8260B		8260B			
4375	Benzene	8260B		8260B		TO-15	
	Benzyl chloride					TO-15	
4385	Bromobenzene	8260B		8260B			
4390	Bromochloromethane	8260B		8260B			
4395	Bromodichloromethane	8260B		8260B		TO-15	
4400	Bromoform	8260B		8260B		TO-15	
4950	Bromomethane	8260B		8260B		TO-15	
4450	Carbon disulfide	8260B		8260B		TO-15	
4455	Carbon Tetrachloride	8260B		8260B		TO-15	
4475	Chlorobenzene	8260B		8260B		TO-15	
4575	Chlorodibromomethane	8260B		8260B		TO-15	
	Chlorodifluoromethane (Freon 22)					TO-15	
4485	Chloroethane	8260B		8260B		TO-15	
4505	Chloroform	8260B		8260B		TO-15	
4960	Chloromethane	8260B		8260B		TO-15	
4645	*cis* -1,2-Dichloroethene	8260B		8260B		TO-15	
4680	cis-1,3-Dichloropropene	8260B		8260B		TO-15	
4555	Cyclohexane	8260B		8260B		TO-15	
4595	Dibromomethane	8260B		8260B		TO-15	
4625	Dichlorodifluoromethane	8260B		8260B		TO-15	
4975	Dichloromethane (Methylene Chloride)	8260B		8260B		TO-15	
4765	Ethylbenzene	8260B		8260B		TO-15	
4835	Hexachlorobutadiene	8260B		8260B		TO-15	
	Iodomethane	8260B		8260B			
	Isobutyl Alcohol	8260B		8260B			
	Isooctane (2,2,4-Trimethylpentane)					TO-15	
	Isopropyl Alcohol					TO-15	
4900	Isopropylbenzene	8260B		8260B			
	Isopropylbenzene (Cumene)					TO-15	
	Methycyclohexane	8260B		8260B			
	Methyl Acetate	8260B		8260B			
	Methyl methacrylate					TO-15	
5000	Methyl-tert-butylether (MTBE)	8260B		8260B		TO-15	
	m-Xylene & p-Xylene	8260B		8260B		TO-15	
5005	Naphthalene	8260B		8260B		TO-15	
	n-Butylbenzene	8260B		8260B		TO-15	
4825	n-Heptane					TO-15	
4855	n-Hexane					TO-15	
5090	n-Propylbenzene	8260B		8260B		TO-15	

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		Aqueous		Solid		Air	
	o-Xylene	8260B		8260B		TO-15	
4768	p-Ethyltoluene					TO-15	
	sec-Butylbenzene	8260B		8260B		TO-15	
5100	Styrene	8260B		8260B		TO-15	
4445	tert-Butylbenzene	8260B		8260B		TO-15	
5115	Tetrachloroethene	8260B		8260B		TO-15	
	Tetrahydrofuran	8260B		8260B		TO-15	
5140	Toluene	8260B		8260B		TO-15	
4700	trans-1,2-Dichloroethene	8260B		8260B		TO-15	
4685	*trans* -1,3-Dichloropropene	8260B		8260B		TO-15	
5170	Trichloroethene	8260B		8260B			
5170	Trichloroethene					TO-15	
5175	Trichlorofluoromethane (Freon 11)					TO-15	
5195	Trichlorotrifluoromethane (Freon 113)					TO-15	
5225	Vinyl acetate	8260B		8260B			
5230	Vinyl bromide					TO-15	
5235	Vinyl chloride	8260B		8260B		TO-15	
5260	Xylenes, total	8260B		8260B		TO-15	
	SVOCs - Base/Neutrals/Acids						
	1,1 Biphenyl	8270C/D	8270C SIM	8270C/D	8270C SIM		
6715	1,2,4,5-Tetrachlorobenzene	8270C/D		8270C/D			
5155	1,2,4-Trichlorobenzene	8270C/D		8270C/D			
4610	1,2-Dichlorobenzene	8270C/D		8270C/D			
4615	1,3-Dichlorobenzene	8270C/D		8270C/D			
4620	1,4-Dichlorobenzene	8270C/D		8270C/D			
6380	1-Methylnaphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	1-Methylphenanthrene		8270C SIM		8270C SIM		
	2,2-oxybis (1-chloropropane)	8270C/D		8270C/D			
6735	2,3,4,6-Tetrachlorophenol	8270C/D		8270C/D			
	2,3,5-Trimethylnapthalene		8270C SIM		8270C SIM		
6835	2,4,5-Trichlorophenol	8270C/D		8270C/D			
6840	2,4,6-Trichlorophenol	8270C/D		8270C/D			
6000	2,4-Dichlorophenol	8270C/D		8270C/D			
6130	2,4-Dimethylphenol	8270C/D		8270C/D			
6175	2,4-Dinitrophenol	8270C/D		8270C/D			
6185	2,4-Dinitrotoluene	8270C/D		8270C/D			
6005	2,6-Dichlorophenol	8270C/D		8270C/D			
	2,6-Dimethylnaphthalene		8270C SIM		8270C SIM		
6190	2,6-Dinitrotoluene	8270C/D		8270C/D			
5795	2-Chloronaphthalene	8270C/D		8270C/D			
5800	2-Chlorophenol	8270C/D		8270C/D			
	2-Fluorophenol	8270C/D		8270C/D			
	2-Flurorobiphenyl	8270C/D		8270C/D			
6360	2-Methyl-4,6-Dinitrophenol	8270C/D		8270C/D			
6385	2-Methylnaphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6400	2-Methylphenol	8270C/D		8270C/D			
6460	2-Nitroaniline	8270C/D		8270C/D			
6490	2-Nitrophenol	8270C/D		8270C/D			
5945	3,3'-Dichlorobenzidine	8270C/D		8270C/D			
	3-Methylcholanthrene	8270C/D		8270C/D			
6465	3-Nitroaniline	8270C/D		8270C/D			
5660	4-Bromophenyl-phenylether	8270C/D		8270C/D			
5700	4-Chloro-3-methylphenol	8270C/D		8270C/D			
5745	4-Chloroaniline	8270C/D		8270C/D			
5825	4-Chlorophenyl-phenylether	8270C/D		8270C/D			
6410	4-Methylphenol (and/or 3-Methylphenol)	8270C/D		8270C/D			

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		Aqueous		Solid		Air	
6470	4-Nitroaniline	8270C/D		8270C/D			
6500	4-Nitrophenol	8270C/D		8270C/D			
5500	Acenaphthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5505	Acenaphthylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Acetophenone	8270C/D		8270C/D			
5545	Aniline	8270C/D		8270C/D			
5555	Anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Atrazine	8270C/D		8270C/D			
	Azobenzene	8270C/D		8270C/D			
5595	Benzidine	8270C/D		8270C/D			
	Benzo (e) pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5575	Benzo(a)anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5580	Benzo(a)pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5585	Benzo(b)fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5590	Benzo(g,h,i)perylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5600	Benzo(k)fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5610	Benzoic acid	8270C/D		8270C/D			
5630	Benzyl alcohol	8270C/D		8270C/D			
5760	bis(2-Chloroethoxy)methane	8270C/D		8270C/D			
5765	bis(2-Chloroethyl)ether	8270C/D		8270C/D			
5780	bis(2-Chloroiospropyl) ether	8270C/D		8270C/D			
6255	bis(2-ethylhexyl) phthalate	8270C/D		8270C/D			
5670	Butyl benzyl phthalate	8270C/D		8270C/D			
5680	Carbazole	8270C/D		8270C/D			
5855	Chrysene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5895	Dibenzo(a,h)anthracene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5905	Dibenzofuran	8270C/D		8270C/D			
	Dibenzothiphene		8270C SIM		8270C SIM		
6070	Diethyl phthalate	8270C/D		8270C/D			
6135	Dimethylphthalate	8270C/D		8270C/D			
5925	Di-n-butylphthalate	8270C/D		8270C/D			
6200	Di-n-octylphthalate	8270C/D		8270C/D			
6265	Fluoranthene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6270	Fluorene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6275	Hexachlorobenzene	8270C/D		8270C/D			
4835	Hexachlorobutadiene	8270C/D		8270C/D			
6285	Hexachlorocyclopentadiene	8270C/D		8270C/D			
4840	Hexachloroethane	8270C/D		8270C/D			
6315	Indeno(1,2,3, cd)pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
	Isodrin	8270C/D		8270C/D			
6320	Isophorone	8270C/D		8270C/D			
5005	Naphthalene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5015	Nitrobenzene	8270C/D					
6530	N-Nitrosodimethylamine	8270C/D		8270C/D			
6545	N-Nitroso-di-n-propylamine	8270C/D		8270C/D			
6535	N-Nitrosodiphenylamine	8270C/D		8270C/D			
6605	Pentachlorophenol	8270C/D		8270C/D			
	Perylene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6615	Phenanthrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
6625	Phenol	8270C/D		8270C/D			
6665	Pyrene	8270C/D	8270C SIM	8270C/D	8270C SIM		
5095	Pyridine	8270C/D		8270C/D			
	Thionazin	8270C/D		8270C/D			
	PCBs						
8880	Aroclor 1016	8082/A		8082/A			
8885	Aroclor 1221	8082/A		8082/A			
8890	Aroclor 1232	8082/A		8082/A			

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		Aqueous		Solid		Air	
8895	Aroclor 1242	8082/A		8082/A			
8900	Aroclor 1248	8082/A		8082/A			
8905	Aroclor 1254	8082/A		8082/A			
8910	Aroclor 1260	8082/A		8082/A			
	Aroclor 1262	8082/A		8082/A			
	Aroclor 1268	8082/A		8082/A			
	Herbicides						
8655	2,4,5-T	8151A		8151A			
8650	2,4,5-TP (Silvex)	8151A		8151A			
8545	2,4-D	8151A		8151A			
8560	2,4-DB	8151A		8151A			
8600	3,5-Dichlorobenzoic acid	8151A		8151A			
	4-Nitrophenol	8151A		8151A			
8555	Dalapon	8151A		8151A			
8595	Dicamba	8151A		8151A			
8605	Dichloroprop	8151A		8151A			
8620	Dinoseb	8151A		8151A			
6605	Pentachlorophenol	8151A		8151A			
	Nitroaromatic and Nitroamines						
6885	1,3,5-Trinitrobenzene	8330B		8330B			
6160	1,3-Dinitrobenzene	8330B		8330B			
	2,4,6 Trinitrophenol (Picric Acid)	8330B		8330B			
9651	2,4,6-Trinitrotoluene	8330B		8330B			
	2,4-diamino-6-nitrotoluene	8330B		8330B			
6185	2,4-Dinitrotoluene	8330B		8330B			
	2,6-diamino-4-nitrotoluene	8330B		8330B			
6190	2,6-Dinitrotoluene	8330B		8330B			
9303	2-Amino-4,6-dinitrotoluene	8330B		8330B			
9507	2-Nitrotoluene	8330B		8330B			
9510	3-Nitrotoluene	8330B		8330B			
9306	4-Amino-2,6-dinitrotoluene	8330B		8330B			
9513	4-Nitrotoluene	8330B		8330B			
9522	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	8330B		8330B			
5015	Nitrobenzene	8330B		8330B			
	Nitroglycerin	8330B		8330B			
	PETN	8330B		8330B			
9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	8330B		8330B			
6415	Tetryl (methyl-2,4,6-trinitrophenylnitramine)	8330B		8330B			
	Pesticides						
7025	Aldrin	8081A/B		8081A/B			
7110	alpha-BHC	8081A/B		8081A/B			
7240	alpha-Chlordane	8081A/B		8081A/B			
7115	beta-BHC	8081A/B		8081A/B			
7250	Chlordane (technical)	8081A/B		8081A/B			
7105	delta-BHC	8081A/B		8081A/B			
7470	Dieldrin	8081A/B		8081A/B			
7510	Endosulfan I	8081A/B		8081A/B			
7515	Endosulfan II	8081A/B		8081A/B			
7520	Endosulfan sulfate	8081A/B		8081A/B			
7540	Endrin	8081A/B		8081A/B			
7530	Endrin aldehyde	8081A/B		8081A/B			
7535	Endrin ketone	8081A/B		8081A/B			
7120	gamma-BHC (Lindane)	8081A/B		8081A/B			

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		Aqueous		Solid		Air	
7245	gamma-Chlordane	8081A/B		8081A/B			
7685	Heptachlor	8081A/B		8081A/B			
7690	Heptachlor Epoxide (beta)	8081A/B		8081A/B			
7810	Methoxychlor	8081A/B		8081A/B			
8250	Toxaphene (total)	8081A/B		8081A/B			
7355	4,4'-DDD	8081A/B		8081A/B			
7360	4,4'-DDE	8081A/B		8081A/B			
7365	4,4'-DDT	8081A/B		8081A/B			