Quality Manual

SVL ANALYTICAL, INC.
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Effective Date: 01/20/2015

President and CEO Wayne R. Sorensen	Date
Laboratory Director John R. Kern	Date
Quality Manager Michael Desmarais	Date
Technical Director Kirby L. Gray	Date
Technical Director Nan S. Wilson	Date
Systems Manager Brandan Borgias	Date
Supervisor Inorganic Instrument Department Danny Sevy	Date
Supervisor Classical Chemistry Department Dianne Gardner	Date
Supervisor ABA Department Heather Green	Date

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1.0 QUALITY POLICY STATEMENT

SVL Analytical, Inc. (SVL) recognizes that an effective quality system is paramount to providing analytical data that is scientifically meaningful, legally defensible, technically accurate, and based upon the highest ethical standards. To reinforce the above objectives, SVL has committed itself to follow and be in compliance with the 2009 TNI Standards.

The emphasis of SVL's Quality Manual (QM) is to define control procedures for receipt, handling, and storage of samples; preparation and storage of standards; calibration and maintenance of analytical equipment; performance of analytical methods; customer service; and the generation, review, and reporting of analytical data.

At SVL, quality assurance begins with the definition of Data Quality Objectives (DQOs) and continues on through data reporting. Control procedures are defined for every step of the program as detailed in SVL's Standard Operating Procedures (SOPs). SVL realizes that without these controls in all phases of the analytical process, data may become suspect and hence of less value to our clients. Therefore, SVL is committed to providing data of the highest quality, usability, and defensibility for every project undertaken. SVL personnel concerned with any aspect of environmental testing are required to familiarize themselves with all quality documentation (including this manual) used at SVL and they are required to comply with all policies and procedures outlined therein.

SVL's Technical Management and Quality Manager ensure that this QM complies with all applicable TNI Quality System Standards and sees that it is reviewed annually and revised as needed. Evidence of signatory approval by senior management of this QM and SVL SOPs are available in PDF format by request.

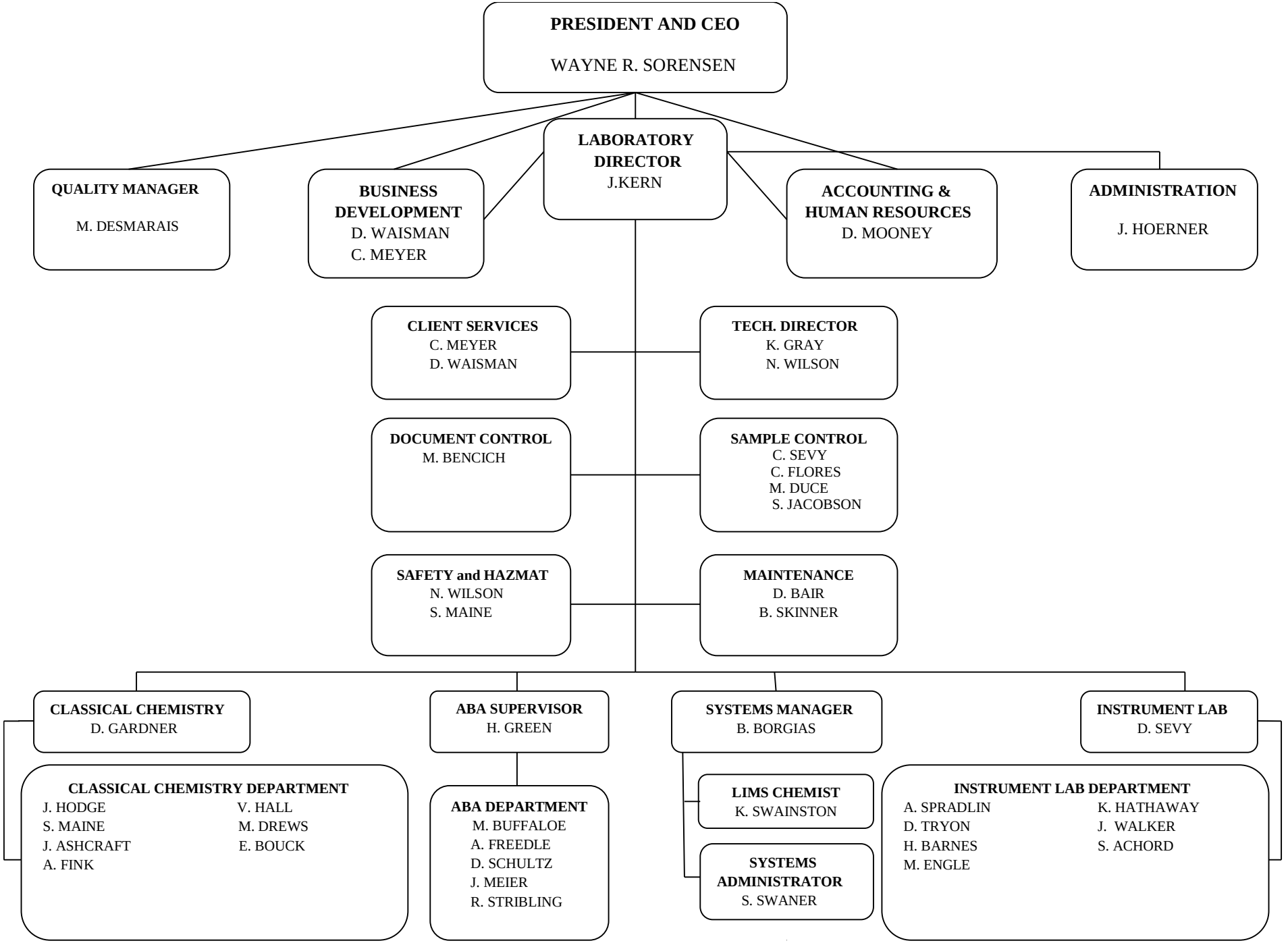
SVL's commitment to client confidentiality (including national security concerns) and their proprietary rights is paramount to all operations conducted within its quality system; as such, a signed confidentiality statement is maintained in each employees personnel file.

After reading this document employees are required to sign a signature page. By signing, the employee confirms that they have read, understood, and will comply with the Quality Manual and the TNI Standards it is based upon.

2.0 ORGANIZATION AND STRUCTURE

The organizational structure of SVL follows a traditional scheme of management with a few modifications. The President/CEO is at the top of the chain of command followed immediately by the Laboratory Director, Quality Manager, Business Development and Accounting/Human Resources. The following supervisors/departments are managed under the Laboratory Director: Business Development, Accounting/Human Resources, Administration, Maintenance, Technical Directors, Document Control Office, Client Services, Safety and HAZMAT, Classical Chemistry, ABA, Instrument Lab and Systems Manager. The Systems Administrator and LIMS Chemist report to the Systems Manager. The Classical Department reports to the Classical Department Supervisor. The Instrument Lab Department reports to the Instrument Lab Department Supervisor. The ABA, Alkalinity and TDS labs report to the ABA Department Supervisor.

2.1 Organization Chart


PRESIDENT AND CEO
WAYNE R. SORENSEN
QUALITY MANAGER
M. DESMARAIS
BUSINESS DEVELOPMENT
D. WAISMAN
C. MEYER
LABORATORY DIRECTOR
J.KERN
ACCOUNTING & HUMAN RESOURCES
D. MOONEY
ADMINISTRATION
J. HOERNER
CLIENT SERVICES
C. MEYER
D. WAISMAN
TECH. DIRECTOR
K. GRAY
N. WILSON
DOCUMENT CONTROL
M. BENCICH
SAMPLE CONTROL
C. SEVY
C. FLORES
M. DUCE
S. JACOBSON
SAFETY and HAZMAT
N. WILSON
S. MAINE
MAINTENANCE
D. BAIR
B. SKINNER
CLASSICAL CHEMISTRY
D. GARDNER
ABA SUPERVISOR
H. GREEN
SYSTEMS MANAGER
B. BORGIAS
INSTRUMENT LAB
D. SEVY
CLASSICAL CHEMISTRY DEPARTMENT
J. HODGE
S. MAINE
J. ASHCRAFT
A. FINK
V. HALL
M. DREWS
E. BOUCK
ABA DEPARTMENT
M. BUFFALOE
A. FREEDLE
D. SCHULTZ
J. MEIER
R. STRIBLING
LIMS CHEMIST
K. SWAINSTON
SYSTEMS ADMINISTRATOR
S. SWANER
INSTRUMENT LAB DEPARTMENT
A. SPRADLIN
D. TRYON
H. BARNES
M. ENGLE
K. HATHAWAY
J. WALKER
S. ACHORD

2.2 Employee List

Position	Employee	Degree	Years of Lab Experience
President and CEO	Wayne Sorensen	BS 1962	47
Laboratory Director	John R. Kern	MS 1982	31
Systems Manager	Brandan A. Borgias	PhD 1985	33
Document Control Officer	Melba Bencich		33
Client Services Manager	Christine Meyer		35
Business Development Manager	Dave Waisman	MS 1985	20
Technical Director	Kirby L. Gray	BS 1972	31
Technical Director/Safety Officer	Nan S. Wilson	BS 1996	18
Supervisor Inorganic Instrument	Danny Sevy		28
Supervisor Classical Chemistry	Dianne Gardner	BA 1987	10
Supervisor ABA	Heather Green	BS 2009	6
Systems Administrator	Scott Swaner		11
LIMS Chemist	Kale Swainston	BS 1998	16
Accounting and Human Resources	Donella Mooney		23
Quality Manager	Michael Desmarais	BS 1995	17
ICP Spectroscopist	Anne Spradlin	BA 1983	28
ICP Chemist	Matt Engle	MS 2012	2
ICP Analyst	David Tryon		10
ICP-MS and GFAA Analyst	Kevin Hathaway		28
IC Chemist	Justin Walker	BS 2014	<1
CVAA Chemist	Sam Achord	BS 2009	3
Analyst	Heidi Barnes		11
Chemist	Jim Hodge		47
Chemist	Victoria Hall	BS 2013	1
Chemist/HAZMAT Coordinator	Sherry Maine	MS 2004	13
Chemist	Matthew Drews	BS 2011	2
Chemist	Alicia Fink	BS 2014	<1
Chemist	Mikel Buffaloe	BS 2013	2
Analyst	Anita Guzman-Freedle	BS 1979	6
Analyst	Eric Bouck		6
Analyst	Debbie Schultz		12
Analyst	Robin Stribling		8
Analyst	Jerry Meier		4
Analyst	Judy Ashcraft		43
Sample Control Officer	Crystal Sevy		11
Sample Receiving	Cindy Flores		12
Sample Receiving	Mark Duce		3
Sample Receiving	Shelley Jacobson		1
Maintenance	Dan Bair		7
Maintenance	Ben Skinner		1
Receptionist	Jena Hoerner		1

2.3 Key Employee Resumes

See Resumes pg. 60.

3.0 JOB DESCRIPTIONS

3.1 Laboratory Director

The Laboratory Director supervises day-to-day operations of the laboratory. Responsible for monitoring standards of performance in quality control and quality assurance, and for monitoring the validity of the analyses performed, and data generated in the laboratory. The Laboratory Director holds a weekly staff meeting to discuss client and technical issues.

3.2 Systems Manager

The Systems Manager supervises operations of the Information Technology groups. The Systems Manager uses Excel, Crystal Reports, and other software to develop and maintain client reports and electronic data deliverables (EDDs). Element is the Laboratory's Information Management System (LIMS) and the Systems Manager works with the LIMS Chemist to make sure that Element meets the needs of SVL.

3.3 Department Supervisor

Department supervisors conduct the day-to-day operations of the analytical departments. They are responsible for department safety and analyst training. They are also responsible for review of out-going analytical data.

3.4 Quality Manager

The Quality Manager is responsible for implementation of the quality system. The Quality Manager manages the performance testing and NPDES program and conducts laboratory audits. The Quality Manager obtains and maintains laboratory accreditations, reviews and approves SOPs, conducts staff training in integrity and quality systems, and manages the CAR/PAR program. The Quality Manager is a TNI member.

3.5 Document Control Officer (DCO)

DCO is responsible for the generation and the retention of analytical reports and records, including but not limited to Chains-of-Custody and

sample shipping documents. DCO is also responsible for delivering electronic data deliverables.

3.6 Sample Control Officer (SCO)

SCO is responsible for sample receipt, job creation/verification, sample storage, and sample disposal.

3.7 Technical Director

Technical Directors provide technical support to laboratory staff and provide final reviews of analytical data packages. Other responsibilities include Level III reporting.

3.8 Safety

Safety Officer is responsible for revising the Chemical Hygiene Plan annually, conducts safety training and oversees response teams. Other duties include providing accident reports to the state.

3.9 Hazmat Officer

Hazmat Officer is responsible for overseeing SVL's hazardous waste program (including setting up 8-hour refresher courses annually).

4.0 APPROVED LABORATORY SIGNATORIES

The Laboratory Director John Kern, Systems Manager Brandan Borgias, Technical Directors Kirby Gray and Nan Wilson have full authority. Department Supervisors Dianne Gardner, Heather Green and Danny Sevy are approved laboratory signatories for analytical reports. LIMS Chemist Kale Swainston, DCO Melba Bencich and Quality Manager Michael Desmarais have report generation privileges.

5.0 RECORDS AND DOCUMENT CONTROL

All records and documents are kept for 5 years unless otherwise specified by client contract. Electronic instrument data and LIMS data are kept for 10 years.

5.1 Standard Operating Procedures (SOPs)

The Quality Manager retains the master copies of SOPs. Electronic copies are available on the laboratory's computer network. Signed and dated SOPs are available by request in PDF format. All SOPs are

scheduled for review each year. Electronic copies are available on the laboratory network on the date of the Quality Manager's final review. The SOP's effective date is two weeks after the date the Quality Manger signs the controlled copy. When a revision is created, the previous version is removed from the master file and electronic database. The retired controlled copy is retained in the SOP archive file.

5.2 Quality Manual (QM)

The Quality Manager retains the controlled copy of the QM. The QM is scheduled for review annually or when revisions are needed. Management may make hard copies available to accrediting authorities, laboratory staff and clients as needed; otherwise, the QM is available in electronic format. A signed and dated QM is available by request in PDF format. When a revision is created, copies are sent out to our accrediting bodies and previous versions are removed from use. The retired controlled copy is retained in the QM archive file.

5.3 Analytical Data

The DCO retains analytical data, including calibration records and quality control. Documents are secured in storage containers.

5.4 Training Records

The Quality Manager maintains records of analyst training and proficiency; ref, SOP SVL 1010. Documents are secured in storage containers.

5.5 Performance Testing Samples

The Quality Manager maintains records of analysis of performance testing samples and the reports associated with the analyses. Reports are stored in the Quality Managers Outlook account under Inbox/ERA.

5.6 External and Internal Audits

The Quality Manager retains records of external and internal audits. Reports are stored in Quality Managers office.

5.7 Corrective Action Reports (CARs)

CARs are kept electronically and filed by hardcopy. CARs are stored in Quality Managers office.

5.8 Laboratory Logbooks

SVL controls the issue, use, and closure of laboratory logbooks. The process is described in SOP SVL 2017. Examples of logbooks may include: the conductivity of laboratory water, preparation of reagents

and standards, preparation of samples, calibration of balances, calibration of micropipets, volumetric pipets and repipettors, maintenance of instruments, temperatures of ovens and refrigerators, etc. The Quality Manager assigns and archives logbooks. Documents are secured in storage containers. SVL is encouraging employees to switch over to electronic logbooks where possible.

5.9 Chain of Custody (COC)

The DCO is in charge of COC retention; they are currently held for five years, unless a longer time is required by contract. Sample log-in and job creation are maintained in SVL's LIMS. COCs and sample receiving check-in sheet are scanned into PDF format, which can be accessed through Element. Documents are secured in storage containers.

5.10 Analytical Reports

The DCO creates and retains both hardcopies and PDFs of analytical reports. Both types of analytical reports are stored in secured storage containers to protect them from damage.

5.11 Backup and Storage of Electronic Data

5.11.1 Electronic Data Collection: Currently the backup server is protected with an administrative password, which is changed every 6 months; it is in control of the Systems Administrator; ref, SOPs SVL 2020 and 2021.

5.11.2 Archives of Electronic Data: Data files that reside on the SVL file servers are backed up on a daily basis and kept onsite for 90 days: a full backup of the data files residing on the server is done monthly and sent to an offsite storage facility for 10 years (longer if required by contract). All software used to recover data files is also stored at the offsite facility for the same time frame.

5.11.3 Backup Storage: A secure fire-proof safe is maintained inside SVL to house the electronic data collected via the current backup system.

6.0 TRACEABILITY OF MEASUREMENTS

6.1 Chemicals and Reagents

SVL uses reagent grade or better chemicals. Some equivalent grades are "VWR Omni-Trace", "Fisher Trace Metals", "Baker Instra-Analyzed",

"Baker A.C.S.", "Baker Analyzed", "Fisher A.C.S.", and "Fisher Certified". SVL requires a certificate of analysis or purity (certificates are scanned and attached to Element), for stock standards and reagents. Upon receipt, all chemical containers are labeled and entered into SVL's LIMS.

SVL records the preparation of reagents and standards in controlled logbooks or electronically in the LIMS. The initials of the preparer, the date prepared, the lot number and amount of stock materials, the final volume, the matrix, instructions for preparation, and the expiration date are all recorded. A label is created within the LIMS with unique identifiers attached to all aliquots of the reagent/standard.

Preparation instructions are included in the SOPs for standards and reagents used in the analytical methods. SVL labels containers of prepared reagents and standards with their contents, a unique reference number, date prepared, disposal (expiration) date and a perceived hazard warning. Every aliquot is assigned a unique identifier.

SVL routinely obtains reference standards from commercial sources. These standards are used to check and document the concentration of calibration standards and validate method QC requirements.

SVL stores reagents and standards separately from samples.

6.2 Water

The primary reagent water in the laboratory is furnished by a reverse osmosis system followed by a micropore filter with an ion-exchange resin cartridge. This satisfies the specifications of ASTM Type II water. When Type I (18 MΩ-cm) water is required, SVL inserts a four-cartridge ion-exchange system or a Millipore Synergy UVR into the line. SVL measures and records the resistivity of the laboratory water each weekday.

7.0 TEST METHODS

7.1 Analyses Performed by SVL

SVL routinely performs the following analytical methods.

ANALYTE	METHOD	TECHNIQUE
Aluminum	EPA 200.7, SW846 6010B&C	ICP
Antimony	EPA 200.7, SW846 6010B&C	ICP
Antimony	EPA 200.8, SW846 6020&A	ICPMS

ANALYTE	METHOD	TECHNIQUE
Arsenic	EPA 200.7, SW846 6010B&C	ICP
Arsenic	EPA 200.8, SW846 6020&A	ICPMS
Barium	EPA 200.7, SW846 6010B&C	ICP
Barium	EPA 200.8, SW846 6020&A	ICPMS
Beryllium	EPA 200.7, SW846 6010B&C	ICP
Beryllium	EPA 200.8, SW846 6020&A	ICPMS
Boron	EPA 200.7, SW846 6010B&C	ICP
Boron	EPA 200.8, SW846 6020&A	ICPMS
Cadmium	EPA 200.7, SW846 6010B&C	ICP
Cadmium	EPA 200.8, SW846 6020&A	ICPMS
Calcium	EPA 200.7, SW846 6010B&C	ICP
Chromium	EPA 200.7, SW846 6010B&C	ICP
Chromium	EPA 200.8, SW846 6020&A	ICPMS
Chromium, Hexavalent	SM 3500 CR B&D	Colorimetry
Cobalt	EPA 200.7, SW846 6010B&C	ICP
Cobalt	EPA 200.8, SW846 6020&A	ICPMS
Copper	EPA 200.7, SW846 6010B&C	ICP
Copper	EPA 200.8, SW846 6020&A	ICPMS
Gallium	EPA 200.7, SW846 6010B&C	ICP
Gold	EPA 231.2	GFAA
Iron	EPA 200.7, SW846 6010B&C	ICP
Lanthanum	EPA 200.7, SW846 6010B&C	ICP
Lead	EPA 200.7, SW846 6010B&C	ICP
Lead	EPA 200.8, SW846 6020&A	ICPMS
Lithium	EPA 200.7, SW846 6010B&C	ICP
Magnesium	EPA 200.7, SW846 6010B&C	ICP
Manganese	EPA 200.7, SW846 6010B&C	ICP
Manganese	EPA 200.8, SW846 6020&A	ICPMS
Mercury	EPA 245.1, SW846 7470A, 7471B	CVAA
Molybdenum	EPA 200.7, SW846 6010B&C	ICP
Molybdenum	EPA 200.8, SW846 6020&A	ICPMS
Nickel	EPA 200.7, SW846 6010B&C	ICP
Nickel	EPA 200.8, SW846 6020&A	ICPMS
Potassium	EPA 200.7, SW846 6010B&C	ICP
Scandium	EPA 200.7, SW846 6010B&C	ICP
Selenium	SM 3114C	Hydride AA
Selenium	EPA 200.7, SW846 6010B&C	ICP
Selenium	EPA 200.8, SW846 6020&A	ICPMS
Silica	EPA 200.7	ICP
Silicon	SW846 6010B&C	ICP
Silver	EPA 200.7, SW846 6010B&C	ICP
Silver	EPA 200.8, SW846 6020&A	ICPMS
Sodium	EPA 200.7, SW846 6010B&C	ICP
Strontium	EPA 200.7, SW846 6010B&C	ICP
Thallium	EPA 200.7, SW846 6010B&C	ICP
Thallium	EPA 200.8, SW846 6020&A	ICPMS
Tin	EPA 200.7, SW846 6010B&C	ICP
Titanium	EPA 200.7, SW846 6010B&C	ICP
Uranium	EPA 200.8	ICPMS
Vanadium	EPA 200.7, SW846 6010B&C	ICP

ANALYTE	METHOD	TECHNIQUE
Vanadium	EPA 200.8, SW846 6020&A	ICPMS
Zinc	EPA 200.7, SW846 6010B&C	ICP
Zinc	EPA 200.8, SW846 6020&A	ICPMS
Acidity	SM 2310 B	Automated Titration
Alkalinity	SM 2320 B	Automated Titration
Ammonia	EPA 350.1	Automated Colorimetry
Bromide	EPA 300.0	Ion Chromatography
Chemical Oxygen Demand	EPA 410.4	Colorimetry
Chloride	EPA 300.0	Ion Chromatography
Color	SM 2120 B	Colorimetry
Conductivity	EPA 120.1	Wheatstone Bridge
Corrosivity	SM 2330 B	Langelier Index
Cyanide, Total	EPA 335.4, SW 846 9012 B	Automated Colorimetry
Cyanide, Free	ASTM D-7237-10	Amperometry
Cyanide, WAD	SM 4500 CN I	Automated Colorimetry
Dissolved Organic Carbon	SM 5310 B	Combustion
Fluoride	EPA 300.0	Ion Chromatography
Hardness	SM 2340B, Ca as $CaCO_3$ by 200.7	ICP Sum
Ignitability	SW846 1010A	Pensky-Martin
Nitrate	EPA 300.0	Ion Chromatography
Nitrate + Nitrite	EPA 353.2	Automated Colorimetry
Nitrate + Nitrite	EPA 300.0	Ion Chromatography
Nitrite	EPA 300.0	Ion Chromatography
Odor	SM 2150B	Sniff Panel
ortho-Phosphate	SM 4500 P E	Colorimetry
pH (aqueous)	SM 4500-H^+ B	Electrometric
pH (soil)	EPA 9045C&D	Electrometric
Paste pH	EPA 600/2-78-054	Electrometric
Phosphate, Total	SM 4500 P E	Persulfate Digestion
Residue, Filterable (TDS)	SM 2540 C	Gravimetric
Residue, Non Filterable (TSS)	SM 2540 D	Gravimetric
Specific Conductance	EPA 120.1, SM 2510 B	Wheatstone Bridge
Sulfate	EPA 300.0	Ion Chromatography
Sulfide	SM 4500 S^{-2} F	Titrimetric
Surfactants (MBAS)	SM 5540 C	Colorimetry
Total Nitrogen	D 5176-91	Combustion
Total Solids	SM 2540 B	Gravimetric
Total Kjeldahl Nitrogen	EPA 351.2	Automated Colorimetry
Total Organic Carbon	SM 5310 B	Combustion
Total Volatile Solids	EPA 160.4, SM 2540 E	Gravimetric
Turbidity	EPA 180.1	Nephelometric
TCLP (Toxicity Characteristic Leaching)	SW846 1311	Extraction
SPLP (Synthetic Precipitation Leaching)	SW846 1312	Extraction
STLC (Soluble Threshold Limit Concentration)		Extraction
MWMP (Meteoric Water Mobility)	ASTM E2242-12	Extraction

ANALYTE	METHOD	TECHNIQUE
CA-WET (California Waste Extraction Test)		Extraction
CEC (Cation Exchange Capacity)	SW846 9081, 9080	Exchange
Textural Analysis (Particle Size)	ASA "Methods of Soil Analysis" Number 9, Part 1	
Specific Gravity	ASA 9	Displacement
TOM/TOC	USDA, HB60(24)	Colorimetry
ANP (Acid Neutralization Potential)	EPA 600/2-78-054	Combustion
NCV (Net Carbonate Value)	EPA 600/2-78-054	Combustion
NAG (Net Acid Generation)	EPA 600/2-78-054	Combustion
ABA (Acid Base Account)	ASTM E 1915-05 & EPA 600/2-78-054	Combustion
Total Sulfur + Sulfur Forms	EPA 600/2-78-054	Combustion
Total Carbon	ASTM E 1915-05	Combustion
Textural Class	EPA 600/2-78-054	Hydrometer
Arsenic Speciation	K.S. Subramanian et al.	GFAA
Iron Speciation	HACH-8146	Colorimetry
Loss on Ignition	Soil & Plant Analysis Council	Gravimetric
Percent Silica	ASTM D-2795 and D-3682-78	Colorimetry
Tot Suspended Particulates	40 CFR 50, App B amend 12/6/82	Gravimetric
Flash Point	SW-846 1010, ASTM D93-80	Pensky-Martin

6010B, 6020 and 7471A are maintained for those states that haven't implemented the EPA request to use the current promulgated method.

7.2 References

2009 TNI Standard.

Methods for the Determination of Metals in Environmental Samples Supplement I, EPA/600/R-94/111, May 1994.

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

Field and Laboratory Methods Applicable to Overburden and Minesoils, EPA 600/2-78-054.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW 846), Third Edition, Update IV, January 2008.

Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

Standard Methods for the Examination of Water and Wastewater, 19th Edition, 1995.

Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1999.

Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005.

Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 2012

ASTM Book of Standards, part 31.

Soil Testing and Plant Analysis, 3rd Edition, Soil Sciences Society of America, 1990.

American Society of Agronomy, "Methods of Soil Analysis" Number 9, Parts 1 and 2.

U.S. Department of Agriculture, Handbook #60.

U.S. Department of the Interior, Bureau of Reclamation, Procedure for Determining Moisture, Ash, and Organic Content of Soil, USBR 5430-89.

Manual for the Certification of Laboratories Analyzing Drinking Water, Fifth Edition.

40 CFR Method Update Rule, April 17, 2012.

8.0 NEW WORK

The Business Development group discusses new work with clients before the work is received. If the work being requested involves tests not usually performed by SVL, the project is discussed with Department Supervisors to determine if the work can be accepted. Quotes and projects are logged so that there is no confusion about what is expected by the client. If work is received that does not adhere to the guidelines put forth in the quote or project, the client will be contacted for clarification. It is SVL's responsibility to inform the client that appropriate tests and/or calibration methods have been selected that are capable of meeting the client's requirements. Occasionally SVL will receive a work order with no prior notification that requests unusual tests, or tests to be conducted in a time frame not suitable for the work requested. When this occurs, the SCO reviews the job with the Laboratory Director,

Client Services and/or Department Supervisors to determine if the work can or should be accepted. Routine work from established clients normally is not reviewed with the clients before jobs are set up, unless there is a problem with sample integrity or information on the COC.

SVL reviews and makes available in LIMS, the parameters associated with a client's project (project or work order memos shall be attached when special instructions are involved). A schedule is accessible for the work that has been received; this allows the staff to plan workloads and to track jobs. A Laboratory/Technical Director or Client Services member shall review all work orders. Adjustments to work schedules and staff deployment are made based upon the workload. Department supervisors keep equipment and supplies on hand for routine work and for many non-routine tests as well. For further detail regarding the above, see SOP SVL 1027.

8.1 Sample Acceptance Policy

8.1.1 Samples received at SVL will be accepted for testing if the following criteria are all met at the time of sample receipt:

8.1.2 A proper SVL or client COC will accompany the sample shipment and must be completed in full (unless a project number is specified and is on file with SVL), including but not limited to; the client's name, address, phone number/fax number/email address, contact person, unique sample identification of individual samples, sample locations (if applicable), date and time of collection, collector's name, preservative type, sample matrix, filtered or unfiltered, number of bottles, analytes and/or tests to be performed, method of analysis, and any comments concerning sample specifics or QC requirements.

8.1.3 The use of correct sample containers (with proper preservation) for the sample matrices collected and ensuring that sufficient sample volume is provided for the tests requested (including extra volumes for QC requirements).

8.1.4 Accurate labeling of sample bottles using coded, water resistant labels and permanent ink, with said labels being cross referenced with information contained in the COC.

8.1.5 Adherence to holding time requirements as required by test or method requested.

8.1.6 In the event that a sample is received in non-compliance with this policy, the sample in question will be segregated and the client notified by telephone or email. The client may direct SVL to continue on with analysis of the non-conforming sample(s). Non-conformities will be noted on the sample receipt/chain of custody and within the final report if applicable; ref, SOP SVL 2001.

8.1.7 New clients will be informed of this policy through Client Services or Sample Receiving. They will be provided with a copy of the QM (hard copy or electronically) or a hand out on sample acceptance (located in SVL's waiting room or in Sample Receiving). As a reminder current clients/samplers will receive a copy of the sample acceptance policy if they submit samples that do not meet SVL's requirements.

9.0 CALIBRATION

9.1 Thermometers

Calibration of thermometers is described in SOP SVL 1004.

Quality Control Services calibrates SVL's NIST-certified thermometers.

SVL calibrates in-house liquid-in-glass thermometers against a NIST-certified thermometer annually. Digital thermometers are calibrated against a NIST certified thermometer quarterly. The IR gun is calibrated against a NIST certified thermometer quarterly. The calibrated thermometers are labeled with the appropriate correction factors.

9.2 Balances

Servicing and calibrating balances is described in SOP SVL 1025.

Quality Control Services calibrates SVL's balances.

SVL checks the calibration of a balance before each day of use with at least two weights traceable to a NIST traceable standard. For analytical balances, the measured weight must agree with the certified weight within 0.1%. Balances that fail the criterion are checked with Class-1 weights. If they fail again, they are removed from service.

9.3 Balance Weights

Calibration of balance weights is described in SOP SVL 1025.

Quality Control Services calibrates SVL's set of Class-1 weights, with Reference Standards Traceable to NIST.

SVL uses certified Class-1 weights to certify the Class-4 weights used for the daily calibration of balances.

9.4 Micropipets

The calibration of micropipets is described in SOP SVL 1026.

SVL checks the calibration of variable-volume micropipets weekly. Fixed-volume micropipets are checked quarterly. If a measurement is out of control the mean of three measured volumes is taken and must agree with the expected value within 3%. Micropipets that fail this criterion are repaired or removed from service.

9.5 Repipettors

The calibration of repipettors is described in SOP SVL 1026.

SVL checks the calibration of repipettors quarterly. The measured volume must agree with the expected value within 3%. Repipettors that fail this criterion are repaired or removed from service.

9.6 Refrigerators

SVL records the temperature of sample, standard, and reagent storage refrigerators each weekday. The process is described in SOP SVL 2004. The temperature must meet the 0-6ºC as described in SOP SVL 2001. If a temperature is outside this criterion, the temperature is recorded again after one hour. If the temperature is still outside the acceptance range, samples, standards, and reagents are transferred to alternate refrigerators or coolers.

9.7 Ovens

SVL records the temperature of ovens every day that the oven is in use. The required temperature of each oven is stated in the applicable SOPs.

9.8 Inductively Coupled Plasma Mass Spectrometer (ICP-MS)

SVL calibrates its ICP-MS in accordance with EPA methods 200.8 and 6020A. A tune standard analysis is performed prior to calibration. Five calibration standards and a calibration blank are analyzed at the beginning of a sequence. The software creates a linear calibration curve that must have a correlation coefficient of at least 0.995. Calibration

points are verified against the curve. The low calibration standard should be within ± 30% and the remaining calibration standards within ± 10% of the indicated concentration. An Initial Calibration Verification (ICV) from a secondary source follows to verify the calibration. An Initial Calibration Blank (ICB) indicates the system is clean. A Reporting Limit Check Standard (RLCS) indicates that the results derived at the reporting limit can be recovered within our acceptance criteria. Analysis of a Continuing Calibration Verification (CCV) and a Continuing Calibration Blank (CCB) follow after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOPs SVL 4111, 4112 and 4132.

9.9 Inductively Coupled Plasma Spectrometer (ICP)

SVL calibrates ICPs in accordance with EPA methods 200.7 and 6010C. A single calibration standard and a calibration blank are analyzed at the beginning of a sequence. Interference check standards are run to show that interelement correction factors are current. An RLCS indicates that the results derived at the reporting limit can be recovered within our acceptance criteria. An ICV from a secondary source follows to verify the calibration. An ICB indicates the system is clean. Analysis of a CCV and a CCB follow after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOP SVL 4102 & 4135. RLCSs are analyzed at the end of drinking water and 6010C runs.

9.10 Graphite Furnace Atomic Absorption Spectrometer (GFAA)

SVL calibrates it's GFAA in accordance with EPA method 231.2 for gold and K.S. Subramanian et al. for arsenic speciation. Three calibration standards and a calibration blank are analyzed at the beginning of a sequence. Perkin-Elmer instruments create a linear calibration curve that must have a correlation coefficient of at least 0.995. Calibration points are verified against the curve, the low calibration standard should be within ±30% and the remaining calibration standards within ±10% of the indicated concentration. An ICV from a secondary source follows to verify the calibration. An ICB indicates the system is clean. An RLCS indicates that the results derived at the reporting limit can be recovered within our acceptance criteria. Analysis of a CCV and a CCB follow after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOPs SVL 4115 and 4082.

9.11 Mercury Analyzer (CVAA)

SVL calibrates its CVAA in accordance with EPA methods 245.1, 7470A, and 7471B. Six calibration standards and a calibration blank are analyzed at the beginning of a sequence. The instrument creates a linear calibration curve that must have a correlation coefficient of at least 0.995. Calibration points will be verified against the curve (see SVL 1020). The low calibration standard should be within ±30% and the remaining calibration standards within ±10% of the indicated concentration. An ICV from a secondary source follows to verify the calibration. An ICB indicates the system is clean. An RLCS indicates that the results derived at the reporting limit can be recovered within our acceptance criteria. Analysis of a CCV and a CCB follow after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOP SVL 4010.

9.12 Flame Atomic Absorption Spectrometer (FLAA)

SVL calibrates FLAAs in accordance with analytical method requirements. The acceptance criteria are defined in SOP SVL 4105.

9.13 Ion Chromatograph (IC)

SVL calibrates ICs in accordance with EPA method 300.0. Five calibration standards and a calibration blank are analyzed. The instrument creates a quadratic calibration curve that must have a correlation coefficient of at least 0.995. Calibration points will be verified against the curve (see SVL 1020). The low calibration standard should be within ±30% and the remaining calibration standards within ±10% of the indicated concentration. An ICV from a secondary source follows to verify the calibration. An ICB indicates the system is clean. An RLCS indicates that the results derived at the reporting limit can be recovered within our acceptance criteria. A CCV and a CCB follow after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOPs SVL 4122 and 4133.

9.14 Flow-Injection Auto Analyzer (FIA)

SVL calibrates FIAs in accordance with EPA methods 335.4 (Total Cyanide), 350.1 (Ammonia), 351.2 TKN, 353.2 (Nitrate and Nitrite), 9012 B (Total Cyanide), and Standard Methods 4500-CN-I (WAD Cyanide), and ASTM D-7237-10 (Amperometric Free Cyanide). A minimum of five calibration standards and a calibration blank are analyzed at the beginning of each analytical sequence. The instrument software creates a linear or quadratic calibration curve that must have a correlation coefficient of at least 0.995. Calibration points will be

verified against the curve (see SVL 1020). The low calibration standard should be within ±30% and the remaining calibration standards within ±10% of the indicated concentration. An LCS and ICV from a secondary source verifies the calibration curve. An ICB indicates the system is clean. An RLCS indicates that the results derived at the reporting limit can be recovered within our acceptance criteria. Analysis of a CCV and a CCB follow after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOPs SVL 4012, SVL 4045, SVL 4099, SVL 4048, SVL 4075, and SVL 4131.

9.15 Total Organic Carbon Analyzer (TOC)

SVL calibrates TOC analyzers in accordance with SM 5310 B. Six calibration standards for total carbon are analyzed and a linear curve is constructed, the curve must have a correlation coefficient of at least 0.995. Calibration points will be verified against the curve (see SVL 1020). The low calibration standard should be within ±30% and the remaining calibration standards within ±10% of the indicated concentration. An ICV from a secondary source verifies the calibration curve. An ICB indicates the system is clean. An RLCS indicates that the results derived at the reporting limit can be recovered within our acceptance criteria. A CCV and CCB are analyzed at the beginning of each analytical sequence, after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOP SVL 4116.

9.16 UV/Visible Spectrophotometers (UV/VIS)

SVL calibrates its UV/Visible spectrophotometer in accordance with the applicable published methods. A minimum of three calibration standards and a calibration blank are analyzed at the beginning of each analytical sequence. The calibration curve must have a correlation coefficient of at least 0.995. Calibration points will be verified against the curve (see SVL 1020). The low calibration standard should be within ±30% and the remaining calibration standards within ±10% of the indicated concentration. An ICV from a secondary source follows to verify the calibration. An ICB indicates the system is clean. A CCV and CCB are analyzed at the beginning of each analytical sequence, after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOPs 4037, 4040, 4042, 4043, 4044, 4123 and 4125.

9.17 LECO Carbon/Sulfur Analyzer

ABA, Total Sulfur, and Total Carbon are determined from analysis of a small aliquot of crushed sample using a LECO furnace. In addition, organic and inorganic carbon and pyrolysis loss and residual sulfur may be determined by roasting a sample, analyzing it by LECO, and calculating the difference between the pre and post roast carbon and sulfur values. Three sets of three calibration standards for carbon and sulfur are analyzed to prepare a calibration curve that must have a correlation coefficient of at least 0.995. Calibration points will be verified against the curve (see SVL 1020). The low calibration standard should be within ±30% and the remaining calibration standards within ±10% of the indicated concentration. An ICV from a secondary source follows to verify the calibration. An ICB indicates the system is clean. An RLCS indicates that the results derived at the reporting limit can be recovered within our acceptance criteria. A CCV and CCB are analyzed at the beginning of each analytical sequence, after every ten samples and at the end of the analytical sequence. The acceptance criteria are defined in SOPs SVL 4097, 4061 and 4129.

9.18 pH and Ion Selective Electrode Meters (ISE)

SVL calibrates pH and ISE meters in accordance with the applicable published methods.

9.19 Class A Glassware

Class A glassware is verified, assigned a unique identifier and logged in upon receipt as described in SOP SVL 1026.

10.0 SAMPLING, SAMPLE RECEIVING, AND STORAGE

10.1 Sampling

SVL does not conduct sampling. Sampling procedures that lead to contamination of client's samples in the field are beyond SVL's control.

Sample preservation is critical for sample integrity. Chemical and biological reactions may occur that begin to change some chemical species upon sample collection. Unfortunately, for most samples, immediate analysis is neither economically feasible nor logistically possible. Although no chemical preservative exists that is valid for every parameter, SVL strongly recommends the preservation methods, container type, sample size and estimated maximum holding times for

collection of water and wastewater samples summarized in Table 1. Solid samples are best preserved by cooling the sample to a range between 0- 6°C.

Table 1

Analysis	Volume Required (mL)	Container	Preservative	Holding Time
Color	50	P,G	Cool to ≤ 6 °C	48 Hours
Conductance	100	P,G	Cool to ≤ 6°C	28 Days
Hardness	100	P,G	HNO_3 to pH<2	6 Months
Odor	300	G only	Cool to ≤ 6°C	24 Hours
pH	25	P,G	None Required	* ASAP
Temperature	1000	P,G	None Required	* ASAP
Turbidity	100	P,G	Cool to ≤ 6 °C	48 Hours
Filterable Residue (TDS)	100	P,G	Cool to ≤ 6 °C	7 Days
Non-Filterable Residue (TSS)	100	P,G	Cool to ≤ 6 °C	7 Days
Total Residue	100	P,G	Cool to ≤ 6 °C	7 Days
Volatile Residue	100	P,G	Cool to ≤ 6 °C	7 Days
Settleable Matter	1000	P,G	Cool to ≤ 6 °C	48 Hours
Dissolved Metals	200	P,G	Filter on site; HNO_3 to pH<2	6 Months
Total Metals	100	P,G	HNO_3 to pH<2	6 Months
Chromium (VI)	200	P,G	Cool to ≤ 6 °C	24 Hours/ 28 days**
Mercury, Dissolved	100	P,G	Filter; HNO_3 to pH<2	28 Days
Mercury, Total	100	P,G	HNO_3 to pH<2	28 Days
Acidity	100	P,G	Cool to ≤ 6 °C	14 Days
Alkalinity	100	P,G	Cool to ≤ 6 °C	14 Days
Bromide	100	P,G	None Required	28 Days
Chloride	50	P,G	None Required	28 Days
Cyanide	500	P,G	Cool to ≤ 6 °C; NaOH to pH>12	14 Days
Fluoride	300	P	None Required	28 Days
Ammonia	400	P,G	Cool to ≤ 6 °C H_2SO_4 to pH<2	28 Days
Total Kjeldahl Nitrogen	500	P,G	Cool to ≤ 6 °C H_2SO_4 to pH<2	28 Days
Nitrate plus Nitrite	100	P,G	Cool to ≤ 6 °C H_2SO_4 to pH<2	28 Days
Nitrate	100	P,G	Cool to ≤ 6 °C	48 Hours
Nitrite	50	P,G	Cool to ≤ 6 °C	48 Hours

Analysis	Volume Required (mL)	Container	Preservative	Holding Time
Ortho-Phosphate Dissolved	50	P,G	Filter on site; Cool to ≤ 6 °C	48 Hours
Total Phosphate	50	P,G	Cool to ≤ 6 °C; H_2SO_4 to pH<2	28 Days
Total Dissolved Phosphate	50	P,G	Filter on site; Cool to ≤ 6 °C; H_2SO_4 to pH<2	28 Days
Silica	50	P only	Cool to ≤ 6 °C	28 Days
Sulfate	50	P,G	Cool to ≤ 6 °C	28 Days
Sulfide	500	P,G	Cool to ≤ 6 °C add 2 mL zinc acetate plus NaOH to pH>9	7 Days
COD	50	P,G	Cool to ≤ 6 °C H_2SO_4 to pH<2	28 Days
Total Organic Carbon	25	40 mL amber vials	Cool to ≤ 6 °C H_2SO_4 to pH<2	28 Days
Phenolics	500	G only	Cool to ≤ 6 °C H_2SO_4 to pH<2	28 Days
MBAS	1200	P,G	Cool to ≤ 6 °C	48 Hours

* pH and temperature should be measured in the field whenever possible. They are subject to rapid change. Measurements of pH and temperature made in the laboratory will almost always be out of holding time.

** If preserved in the following manner add 0.45 mL buffer solution to each vial. Adjust the pH to 9.3 – 9.7 using about 2 drops of 10 N sodium hydroxide and about 3-5 drops of 1N sodium hydroxide.

SVL has formed alliances with other laboratories for the analysis of organic parameters. The recommended containers and preservatives are

Analysis	Amount Required	Container	Preservative	Holding Time Until Extraction	Holding Time After Extraction Until Analysis
Mercury, Low Level***					
524.2 (Volatile Organic Compounds)	3x40mL vials	G,T	Cool to ≤ 6 °C; HCl to pH<2	14 days	NA
608 (Pesticides and/or PCBs)	3 L	amber G,T	Cool to ≤ 6 °C	7 days	40 days
624 (Volatile Organic Compounds)	3x40mL vials	G,T	Cool to ≤ 6 °C; HCl to pH<2	14 days	NA
625 (Semi-volatile Organic Compounds)	3 L	amber G,T	Cool to ≤ 6 °C	7 days	40 days

Analysis	Amount Required	Container	Preservative	Holding Time Until Extraction	Holding Time After Extraction Until Analysis
Mercury, Low Level***					
1664 Hexane Extractable Materials	2L	G only	Cool to ≤ 6 °C H_2SO_4 or HCl to pH<2	28 days	NA
8081A (Pesticides)	8 oz (soil) 1L (aqueous)	amber G,T	Cool to ≤ 6 °C	14 days 7 days	40 days
8082 (PCBs)	8 oz (soil) 1 L (aqueous)	G,T	Cool to ≤ 6 °C	14 days 7 days	40 days
8260B (Volatile Organic Compounds)	4 oz (soil) 3x40mL (aq)	G,T	Cool to ≤ 6 °C; HCl to pH<2	14 days	NA
8270C (Semi-volatile Organic Compounds)	8 oz (soil) 1 L (aqueous)	amber G,T	Cool to ≤ 6 °C	14 days	40 days
8015 (TPH-Gasoline)	4 oz (soil) 3x40 mL (aq)	amber G,T	Cool to ≤ 6 °C; HCl to pH<2	14 days	35 days
8015AZ ****	8 oz (soil)	G,T	Cool to ≤ 6 °C	48 hours	14 days for extraction and analysis
8260BAZ****	4 oz (soil)	G,T	Cool to ≤ 6 °C	48 hours	NA
8015 (TPH-Diesel Motor Oil)	1 L (aq) 8 oz (soil)	amber G,T	Cool to ≤ 6 °C: HCl to pH<2	14 days	40 days

*** Call for sampling and hold time requirements.

**** TPH 8015AZ and 8260AZ (soils) have a 48 hour hold time before extraction.

10.1 Sampling Cont'd

Field blanks allow for identification of systemic and random sample contamination that may result from the sampling equipment, storage containers, sampling agents, or chemicals added to preserve samples. Field blanks consist of a sample container of distilled or deionized water with the appropriate chemical preservative. Preservation, filtration, storage, handling, and analysis are performed as if the field blanks were samples. To achieve accurate and meaningful data, field blank containers should be filled with analyte-free water and the appropriate preservative at the sampling site.

Sources of sample contamination include unclean sample containers and filters; impure solvents and reagents; and use of cleaning products inappropriate for the proposed analysis. Hair, tobacco smoke, and dust also are appreciable sources of contamination, so sampling should be conducted in as careful a manner as possible.

Before filtering samples for dissolved parameters, the filter paper should be rinsed with de-ionized or distilled water and with a small portion of sample. The filtration apparatus should also be rinsed with de-ionized or distilled water between samples. Handle filter paper only on the edge, using appropriate forceps (plastic for trace metals analysis).

Use the proper sample container for the parameter specified. Samples for trace metals analysis must not come into contact with any metallic surface; samples for organic analysis must not come into contact with any plastic surface.

Sampling personnel should complete a COC form that documents sampler, sample identification, sampling date and time, sample location (state of sample origin if applicable), matrix type, number of sample containers, type of preservation, whether samples have been filtered, and the parameters to be analyzed.

10.1.1 Sub-sampling

In the event that SVL must undertake sub-sampling, SVL will use the appropriate container (uniquely identified) and the proper preservation. If SVL undertakes the sub-sampling of matrices that are required to be performed in the field, SVL will identify those samples on the analytical report; ref, SOP SVL 2018.

10.2 Sample Receiving and Storage

SOPs SVL 2001, SVL 2003, and SVL 2004 describe sample receiving, job creation, and sample storage, respectively.

SVL takes a temperature reading from the sample shipping containers (coolers) upon receipt and opening. Each sample is checked for visible damage and the presence of an intact custody seal (if required). SVL gives each group of samples a unique job number (e.g., " W1E0027"). Sample ID's are automatically assigned a serial number suffix (-01 thru -99) appended to the work order number they belong to. The work order number is auto-generated by the LIMS and follows the format W YAnnnn, where Y is the last digit of the year, A corresponds to the month in which the work order was created (A=Jan., B=Feb.…L=Dec), and nnnn is a serial number for the work order in a particular month. Individual sample containers are assigned a designator (A, B, C …) and these are tracked in the LIMS so the particular container used for an analysis can be tracked. For an example "W1E0027-03 D" would be the fourth container for the third sample in the 27th work order of May 2011.

Job numbers remain with the samples throughout the analytical process. Each sample is assigned a unique, sequential identification number. Samples are labeled with a bar code (containing both the sample and job numbers) before storing the sample.

Samples that require refrigeration are stored in walk-in coolers (which are kept between 0ºC and 6°C), except during times of sample preparation or analysis. Samples that do not require refrigeration are stored in an ambient temperature storage room. The laboratory does not refrigerate soil samples that were not received on ice. Samples are retained by SVL for a minimum of 30 days (or longer if required by the client) after an analytical report has been issued to the client. At the end of the specified period, samples are returned to the client or discarded in an appropriate manner.

Sample custodians, technicians and analysts use the custody log feature of the LIMS to track sample movement during receipt, preparation, and disposal. SVL personnel are responsible for logging the samples into their custody, where they assume accountability for the sample(s). When use of the sample is complete, personnel must scan samples back into the appropriate home location or another employee may assume custody by scanning/logging the sample into their custody via the LIMS.

10.3 Sample Disposal and Hazardous Waste

Procedures for sample disposal are described in SOP SVL 1001. Disposal procedures follow federal and state regulatory requirements. SVL's hazardous waste program is described in SOP SVL 1008.

11.0 EQUIPMENT AND INSTRUMENTS

SVL uses the following instruments to generate analytical data and to calibrate other instruments.

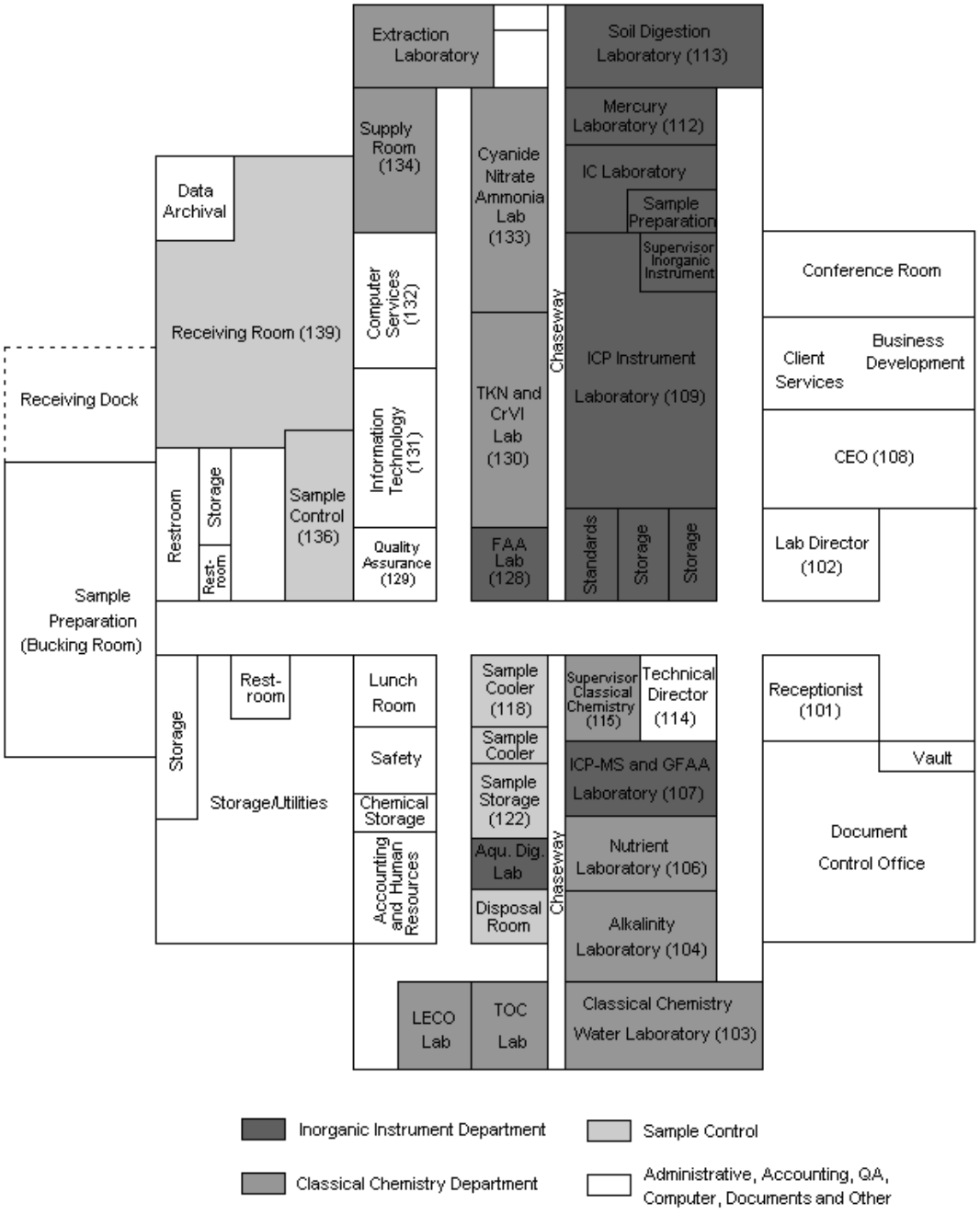
11.1 SVL performs instrument maintenance as recommended by the manufacturer. SVL maintains service contracts with vendors for its major analytical instrumentation. Maintenance logbooks are kept to provide a record of major and minor repairs; as well as, preventative maintenance.

11.2 The analysts and supervisors will determine if a repair has created a need to update instrument MDLs, linear ranges, calibrations etc.

INSTRUMENT	MANUFACTURER	MODEL	SERIAL NUMBER
Spectrometer (ICP-MS)	Perkin-Elmer	ELAN 5000	W0660402
Spectrometer (ICP-MS)	Agilent	7700 Series	JP10490758
Spectrometer (ICP) Thermo 1	Thermo Electron	iCAP 6500 Duo	IC5D20130703
Spectrometer (ICP) Thermo 2	Thermo Electron	iCAP 6500 Duo	IC65DC133703
Spectrometer (ICP) Thermo 3	Thermo Electron	iCAP 7400 Duo	IC74DC141807
Spectrometer (ICP) Optima A	Perkin-Elmer	Optima 8300	078N2080202
Atomic Absorption Spectrometer with Graphite Furnace	Perkin-Elmer	Analyst 600	601S3090501
Atomic Absorption Spectrometer with Vapor Generation Assembly	Varian	AA 55B	EL03048142
Mercury Analyzer with Autosampler	CETAC	M-6100	021202QT6
Mercury Analyzer with Autosampler	CETAC	M-7500	110801QTA
11 Digestor Blocks	Environmental Express	Hot Block	
Ion Chromatograph	Dionex	ICS900	08041118
Ion Chromatograph	Dionex	ICS90	04090417
Ion Chromatograph	Dionex	ICS900-C	09040981
Ion Chromatograph	Dionex	ICS-1100	12120925
Automated Flow Analyzer	O-I-Analytical	FS3100-2	Multi-component
Automated Flow Analyzer	O-I-Analytical	FS3100	Multi-component
2 Micro Distillation Units	Lachat	ID 001	A2000-828 and 081100001017
3 MIDI Distillation Units	BSL		
2 Ammonia Distillation Units	Andrews Glass		
Ammonia/N analyzer	Astoria Pacific	A2	200104
Automated Flow Analyzer	Alpkem	Alpkem TKN	200220
Block Digestor	Westco Scientific	Easy Digest 40/20	As. # INS0030HW
Auto Titrator with Autosampler 4	Metrohm	Titrino 809 Titrando	1809001007108
Auto Titrator with Autosampler 5	Metrohm	Titrino 809 Titrando	1809001013143
UV/Visible Spectrophotometer A	Genesys	20	3SGN243026
UV/Visible Spectrophotometer B	Genesys	20	3SGN341012
UV/Visible Spectrophotometer	Genesys	10	2D5G261004
Turbidimeter A	Hach	2100N	95041453
Turbidimeter B	Hach	2100N	080906024269
COD Reactor	VELP Scientifica	ECO 25	101448
COD Reactor	VELP Scientifica	ECO 25	171440
pH Meter	Accumet	AB15	AB92325857
pH Meter	Accumet	AB15	AB92326969
pH Meter	Beckman	11 pH Meter	0224055
pH Meter B	Thermo	Orion A III	J06383
pH Meter	Thermo	Orion 320	019525
pH Meter C	Thermo	Orion A III	J06171
Dissecting Microscope	Nikon	104	

INSTRUMENT	MANUFACTURER	MODEL	SERIAL NUMBER
Polarizing Microscope	Nikon	106	
Centrifuge	Beckman	GS-6 Centrifuge	
Centrifuge	MISTRAL	3000i	51149
Centrifuge	IEC	K	70652271
Flashpoint detector	Precision Scientific	74537	108A-2
Conductance Meter	Fisher	AB30	AB 92329154
Conductance Meter	Fisher	AB30	AB 92338713
Conductance Meter	Orion	115	002176
Elemental Analyzer B	LECO	SC632	3208
Elemental Analyzer A	LECO	SC632	3526
Carbon/Nitrogen Analyzer (TOC)	Shimadzu	TOC-VCSH-N	H51104135009 C5
Carbon/Nitrogen Analyzer (TOC)	Shimadzu	TOC-LCSN/TNM-L	H54105000234
Semi-Micro Balance	Mettler	AE-240	K89952
Semi-Micro Balance	Mettler	AE-240	G43270
Analytical Balance	Mettler	PJ 360	F89531
Analytical Balance	Mettler	PJ 360	G49684
Analytical Balance	Mettler	PB30	A04506
Analytical Balance	Mettler	PJ360	F89533
Analytical Balance	Ohaus	N1D110	1122352966
Analytical Balance	Ohaus	RD60LS	3374276-7HQ
Analytical Balance	Ohaus	EOF110	F2221120252601
Analytical Balance	Ohaus	AR2140	1203121033
Analytical Balance	Ohaus	AR1530	1203200181P
Analytical Balance	Ohaus	AS 313	8028301193
Analytical Balance	Ohaus	AV-114	8029081142
Analytical Balance	Leco	050	329
Analytical Balance	Sartorius	CPA1245	26250271
IR Thermometer	VWR	1832 Degree	101839552
IR Thermometer	Raytek	Ranger ST	98660090
Thermometer	HBI	145ºC to 205ºC	4B1321
Thermometer	Thermco	145ºC to 205ºC	3268
Thermometer	Ertco	-20ºC to 110ºC	5283
Thermometer	HB	-20º C to 150ºC	L94280
Thermometer	HB	-1º C to 201ºC	3846

12.0 FACILITIES



12.1 SVL is an analytical laboratory specializing in the performance of tests and methods used in the characterization of environmental and mining samples. Since 1972, SVL has analyzed water, soil, sediment, sludge, oil, paint, rock, animal tissue, vegetation, air filters, and various other sample types. SVL occupies a 25,000 square foot laboratory facility architecturally designed and specifically organized to ensure efficient operation and meet the needs of a large capacity analytical laboratory. Building access, security and safety features have been carefully considered. Access through the outside laboratory entrance and to internal areas is limited to laboratory staff and other essential personnel. Visitors are logged in/out and made aware of safety protocols during their stay at SVL.

13.0 STANDARD OPERATING PROCEDURES

SVL performs work in accordance with the requirements of its SOPs. SVL's SOPs are listed below and describe all aspects of its work performance including Safety and Quality Assurance (1000 Series), Sample and Document Management (2000 Series) and Inorganic Analysis (4000 Series).

SOP NUMBER	DESCRIPTION
SVL 1001	SAMPLE DISPOSAL
SVL 1002	WRITING AND REVISING STANDARD OPERATING PROCEDURES
SVL 1004	CALIBRATING THERMOMETERS
SVL 1005	INTERNAL QUALITY ASSURANCE AUDITS
SVL 1007	SOIL STERILIZATION
SVL 1008	DISPOSAL OF HAZARDOUS WASTE
SVL 1010	TRAINING
SVL 1011	PERFORMING AN MDL STUDY
SVL 1015	PROCUREMENT, RECEIVING, AND SUBCONTRACTING
SVL 1017	RECORDS RETENTION AND PROTECTION
SVL 1019	CORRECTIVE ACTION
SVL 1020	CALIBRATION FOR ANALYTICAL METHODS
SVL 1021	MANUAL INTEGRATION
SVL 1023	SOFTWARE VERIFICATION
SVL 1025	CALIBRATING BALANCES
SVL 1026	CALIBRATING MICROPIPETS, REPIPETTORS, AND GLASSWARE
SVL 1027	CLIENT SERVICES
SVL 1028	CALCULATIONS FOR ANALYTICAL METHODS
SVL 1029	PERFORMANCE TESTING SAMPLES
SVL 1030	INITIAL, PERIODIC AND AFTER-MAINTENANCE CHECKS

SOP NUMBER	DESCRIPTION
SVL 1031	COMPUTER AND INFORMATION SECURITY POLICY
SVL 1032	CHEMICAL REAGENTS, PREPARED STANDARDS, AND QC SOLUTIONS
SVL 1033	ACCEPTANCE LIMITS AND TRENDING
SVL 2001	SAMPLE RECEIVING
SVL 2003	SVL JOB CREATION
SVL 2004	SAMPLE STORAGE AND SECURITY
SVL 2006	DATA CORRECTIONS
SVL 2007	CASE FILE ASSEMBLY
SVL 2009	DATA REVIEW
SVL 2013	DATA PACKAGE PRODUCTION
SVL 2015	LEVEL 3 – CLP DATA PACKAGE
SVL 2017	LOGBOOK CONTROL
SVL 2018	PREPARATION AND SUBSAMPLING OF EARTH, ROCK, AND TISSUE SAMPLES
SVL 2019	REANALYSIS PROCEDURES
SVL 2020	COMPUTER-RESIDENT SAMPLE DATA CONTROL
SVL 2021	DATA BACKUP AND RESTORE
SVL 2022	SAMPLE RECEIVING – FOREIGN SOILS
SVL 4010	EPA 245.1, SW-846 7470A and 7471A; DETERMINATION OF MERCURY (CVAA)
SVL 4012	EPA 335.4, SM 4500 CN E and SW-846 9012B; TOTAL CYANIDE BY MICRODIST™ and MIDI DISTILLATION FOLLOWED BY AUTOMATED COLORIMETRY
SVL 4013	GLASSWARE WASHING FOR CLASSICAL CHEMISTRY
SVL 4021	FILTER DIGESTION
SVL 4022	PERCENT SOLIDS/ PERCENT MOISTURE
SVL 4024	SM 2120 B; COLOR
SVL 4025	EPA 120.1 and SM 2510 B; CONDUCTIVITY
SVL 4026	EPA 180.1; TURBIDITY
SVL 4028	SM 4500 H^+ B; pH
SVL 4029	SPECIFIC GRAVITY
SVL 4031	SM 2310 B; ACIDITY
SVL 4032	SM 4500 S^{2-} F; SULFIDES BY TITRATION
SVL 4034	SM 2540 C and SM 2540 D; TOTAL DISSOLVED SOLIDS AND SUSPENDED SOLIDS
SVL 4035	SM 2540 B and EPA 160.4; TOTAL AND VOLATILE SOLIDS
SVL 4037	SM 5540 C; METHYLENE BLUE ACTIVE SUBSTANCES
SVL 4040	SM 4500 P E; TOTAL PHOSPHORUS (AQUEOUS SAMPLES)
SVL 4042	SM 4500 P E; ORTHO-PHOSPHATE (AS P)
SVL 4043	EPA 410.4; CHEMICAL OXYGEN DEMAND
SVL 4044	TOTAL ORGANIC MATTER
SVL 4045	EPA 351.2; TOTAL KJELDAHL NITROGEN
SVL 4048	EPA 353.2; NITRATE/NITRITE AS N: AUTOMATED CADMIUM RE REDUCTION
SVL 4049	SW-846 9081; CATION EXCHANGE CAPACITY

SOP NUMBER	DESCRIPTION
SVL 4060	LOSS ON IGNITION (SVL METHOD)
SVL 4061	DETERMINATION OF ACID GENERATION POTENTIAL (AGP), ACID NEUTRALIZATION POTENTIAL (ANP), AND ACID-BASE ACCOUNT (ABA)
SVL 4065	METEORIC WATER MOBILITY EXTRACTION
SVL 4068	SW-846 1312; SYNTHETIC PRECIPITATION LEACHING PROCEDURE (SPLP)
SVL 4075	SM 4500 CN I; WAD CYANIDE BY MIDI DISTILLATION FOLLOWED BY SEMI-AUTOMATED COLORIMETRY
SVL 4078	EPA METHOD 3020A; SAMPLE DIGESTION FOR TOTAL METALS IN AQUEOUS SAMPLES FOR ICP-MS
SVL 4079	EPA METHOD 3010A; SAMPLE DIGESTION FOR TOTAL METALS IN AQUEOUS SAMPLES FOR ICP
SVL 4080	EPA METHOD 3005A; SAMPLE DIGESTION FOR TOTAL RECOVERABLE METALS IN AQUEOUS SAMPLES FOR ICP
SVL 4082	ARSENIC SPECIATION As(III) AND As(V)
SVL 4084	SM 2320 B; DETERMINATION OF ALKALINITY AND pH USING THE AUTOTITRATOR
SVL 4093	CASSETTE FILTER DIGESTION
SVL 4094	EPA METHOD 3050B; SAMPLE DIGESTION FOR METALS IN SOILS
SVL 4095	SW-846 1010; FLASHPOINT DETERMINATION (PENSKY-MARTENS CLOSED TESTER)
SVL 4096	SW-846 9045 C and 90045 D; pH DETERMINATION FOR SOILS
SVL 4097	ASTM 1915-05; TOTAL SULFUR, TOTAL CARBON
SVL 4099	EPA 350.1; AMMONIA BY SEMI-AUTOMATED COLORIMETRY
SVL 4102	EPA 200.7 and SW-846 6010C; ANALYSIS OF METALS BY METHODS 6010C AND 200.7 USING THE PERKIN-ELM OPTIMA ICP
SVL 4105	SM 3114 B; SELENIUM BY HYDRIDE
SVL 4106	METHOD 200.2; SAMPLE DIGESTION FOR TOTAL RECOVERABLE METALS IN AQUEOUS SAMPLES BY ICP AND ICP-MS
SVL 4108	SAMPLE PREPARATION FOR DISSOLVED AND POTENTIALLY DISSOLVED METALS IN AQUEOUS SAMPLES
SVL 4111	EPA METHOD 200.8; ANALYSIS OF METALS BY ICP-MS
SVL 4112	SW-846 6020A; ANALYSIS OF METALS BY ICP-MS
SVL 4114	SW-846 1311; TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
SVL 4116	SM 5310 B; TOTAL ORGANIC CARBON
SVL 4118	CALIFORNIA WASTE EXTRACTION TEST (CA-WET)
SVL 4119	PREPARATION OF QC SOLUTIONS FOR METALS ANALYSIS
SVL 4120	ASTM D-5176; TOTAL NITROGEN
SVL 4121	SM 2150 B; DETERMINATION OF THRESHOLD ODOR NUMBER (TON)
SVL 4122	EPA 300.0; INORGANIC ANIONS BY ION CHROMATOGRAPHY USING THE DIONEX DX100 AND ICS-90
SVL 4123	ASTM D-2795 and D-3682-78 SOLID SILICA
SVL 4124	EPA 231.2; OPERATIONOF PERKIN/ELMER GFAA: ANALYSIS OF GOLD BY GRAPHITE FURNACE
SVL 4125	SM 3500 Cr B; HEXAVALENT CHROMIUM
SVL 4127	pH DETERMINATION FOR PASTE
SVL 4128	SOIL ELECTRICAL CONDUCTIVITY BY ASA-9

SOP NUMBER	DESCRIPTION
SVL 4129	NET CARBONATE VALUE (NCV)
SVL 4130	NET ACID GENERATION (NAG)
SVL 4132	ANANLYSIS OF METALS BY THE AGILENT ICP-MS (EPA METHOD 200.8)
SVL 4133	DETERMINATION OF THIOCYANATE BY ION CHROMOTOGRAPHY USING DIONEX ICS-90 AND ICS-900
SVL 4134	ANALYSIS OF METALS BY AGILENT ICP-MS (SW-846 METHOD 6020A)
SVL 4135	ANALYSIS OF METALS BY METHODS 6010C AND 200.7 USING THE THERMO iCAP 6000 SERIES ICP SPECTROMETER
SVL 4136	TEXTURAL CLASS BY EPA-600/2-78-054
SVL 4137	EXTRACTIONS COMPENDIUM
SVL 4138	ASTM D-7275 – RECOVERY of AQUEOUS CYANIDES by EXTRACTION from MINE ROCK and SOIL after REMEDIATION of PROCESS RELEASES

13.1 Deviations

Occasionally, a deviation from an SOP is required to generate an accurate result for a given test or client. This may occur when a client specifically requires a modification, or when the sample matrix interferes with the analysis. The Laboratory Director or a Department Supervisor may authorize a deviation. The analyst documents details of the deviation from the SOP on the instrument raw data printout or the job bench sheet with a notation in the work order memo in Element. The deviation will be indicated on the report.

13.1.1 In the event that an SOP needs to be immediately amended an email will be sent to the Quality Manager outlining the necessary change. The change can go into effect immediately prior to the SOP being amended.

14.0 QUALITY CONTROL

14.1 Quality Control Parameters

SVL uses a number of quality control parameters to validate calibration, and to measure contamination, accuracy, and precision. Each SVL SOP indicates the parameters required for the method being used.

14.1.1 Blanks

Method Blank Is an aliquot of analyte-free water that is put through all the steps of a specific method along with the samples. It is sometimes called a Laboratory Reagent Blank.

Calibration Blank The zero-concentration standard analyzed as part of a calibration curve.

Field Blank Randomly selected sample container that is filled with analyte-free water and the appropriate chemical preservative in the field.

Trip Blank Is a specific type of field blank. A trip blank is not opened in the field. It is a check on sample contamination from the time the container is sealed at the lab or supplier. It is used to verify the container's integrity during sample transport and the container's time on site (it should always be with sampling group).

The acceptance criterion for a blank may be set by the published method, by client DQOs, or by historical statistics. In the absence of these directives, the acceptance criterion may default to less than the reporting limit.

14.1.2 Matrix Spike

Is an aliquot of sample to which a known amount of analyte has been added prior to sample preparation or digestion. It is a measure of the effect of the sample matrix on the analytical method. It is sometimes called the "Laboratory Fortified Matrix".

The recovery is calculated by:

% Recovery = 100 x (MS – S) / SA

Where the MS = Spiked Sample Result
S = Sample Result
SA = Spike Added

Acceptance criteria for the matrix spike recovery may be determined by the published method, by client DQOs, or set between 70-80% to 120-130%. For those methods without guidelines the QA Manager will set default limits for the acceptance range. Individual SOPs will have the recovery range acceptance requirements. There are no requirements if the concentration of the analyte in the original sample is greater than five times the concentration of the spike.

14.1.3 Analytical Spike or Post-Digestion Spike

Is an aliquot of sample to which a known amount of analyte has been added after sample preparation. It is a measure of the effect of the matrix on a digestate or extract.

14.1.4 Laboratory Control Sample (LCS)

Is a solution or material of known concentration that is added to an analyte-free matrix and then analyzed to evaluate the recovery and accuracy of a method. It is sometimes called a Laboratory Fortified Blank.

Acceptance criteria for the LCS recovery may be determined by the published method, by the manufacturer of the standard, by client DQOs or the QA Manager will set default limits.

14.1.5 Sample Duplicate

A second similar aliquot of a sample treated exactly the same through preparation and analysis. The Relative Percent Difference (RPD) between the values of the duplicates is a measure of the precision of the analytical method.

$$RPD = 100 \times | S - D | / [(S + D)/2]$$

The acceptance criterion for the RPD is usually set at 20.

14.1.6 Matrix Spike Duplicate (MSD)

A second similar aliquot that is spiked, it is treated exactly the same as the first matrix spike (MS) through preparation and analysis. The RPD between the recovery values is a measure of the precision of the analytical method.

$$RPD = 100 \times | MSD - MS | / [(MSD + MS) / 2]$$

14.1.7 Interference Check Sample (ICS)

A sample with known concentrations of elements used to determine if the inter-element correction factors are valid.

14.1.8 Initial Calibration Verification (ICV)

A standard made from a second source from the calibration standards. It is analyzed immediately after the calibration to determine the validity of the calibration standards.

14.1.9 Continuing Calibration Verification (CCV)

A calibration standard (primary or secondary source) analyzed after every ten samples, and at the end of an analytical sequence to verify that the calibration is still valid.

14.1.10 Reporting Limit Check Standard (RLCS)

A check standard that is constructed out of either a primary or secondary source made up at same concentration as the reporting limit. An acceptance range of ±30% for single analyte methods and ±50% for multi-analyte methods was made the default. RLCS results are batched as a Standard Reference Material (SRM) which can be pulled into Element for control charting purposes.

14.1.11 Initial Calibration Blank (ICB)

A matrix matched deionized water sample ran to prove the system is clean with no carry-over.

14.1.12 Continuing Calibration Blank (CCB)

A matrix matched deionized water sample ran to prove the system is clean with no carry-over.

14.1.13 Serial Dilution

Dilute a sample by a minimum of five fold (1+4). Agreement within 10% between the concentration for the undiluted sample and five times the concentration for the diluted sample indicates the absence of interferences.

14.1.14 Quality Control Sample (QCS)

A solution of method analytes of known concentrations which is used to fortify an aliquot of blank solution or sample matrix. The QCS is obtained from a source external to the laboratory and different from the source of calibration standards.

14.1.15 Instrument Performance Check (IPC)

A solution of method analytes, used to evaluate the performance of an instrument system with respect to a defined set of method criteria.

14.2 Control Charts

SVL utilizes Element to provide personnel with the up to the minute ability to trend inputted QC results. It is recommended that analysts and technicians regularly consult trending charts to provide themselves with real time information. By trending an analysis, the analyst or technician can look at a current or past snapshot of QC recoveries and possibly determine when prep procedures or QC samples were done incorrectly or when they may have used contaminated or expired components. Trending can also be used to show when an instrument's components begin to degrade or fail.

The process is defined in SOP SVL 1033. RLCSs, prep blanks, LCSs, duplicates and matrix spikes are tracked. A standard X bar control chart is used to plot results. Upper and lower warning limits of ±2s (where s equals standard deviation) and upper and lower control limits of ±3s are calculated using at least 20 measurements (if possible) during a 6 month period.

14.3 Acceptance Limits

Acceptance limits for quality control parameter recoveries may be set by published analytical methods, DQOs or be default limits set by the QA Manager. Individual SOPs will provide the accepted recoveries for each method. Acceptance limits are also outlined in SOP SVL 1033.

14.4 General Frequency of Quality Control Checks

For those methods that do not have published QC requirements, SVL will use the following QC and frequency if applicable per batch of 20 samples:

Initial Calibration Verification once per calibration.

Initial Calibration Blank once per calibration.

Reporting Limit Check Standards at a minimum of 1 per analytical run.

Method or Instrument Blanks at a frequency of 5%.

Laboratory Fortified Blank or LCS at a frequency of 5%.

Matrix Spiked Samples at a frequency of 10%.

Matrix Spike Duplicates at a frequency of 5%.

Continuing Calibration Verification every ten samples.

Continuing Calibration Blank every ten samples.

14.5 Maintenance

SVL breaks maintenance down into the following categories: initial maintenance, periodic maintenance, and after-maintenance performance checks. The requirements for performing maintenance or filling out maintenance logbooks can be found in SOP SVL 1030. Initial checks can be either checks performed during instrument setup or daily checks performed before the start of operations. Periodic checks are those checks that are performed on set time intervals (i.e. weekly, monthly, biannually, etc). After-maintenance checks are done after repairs have been completed or when an instrument has been moved to a new location. This is done in order to document acceptable ongoing instrument performance.

14.6 Uncertainty of Measurement

SVL uses control charting as a means of determining when selected parameters (batch QC) are out of control. Warning and unacceptable control limits are defined at 2 and 3 sigma, respectively. See QM 14.2 and SOP SVL 1033.

Almost all approved methods used at SVL contain a section related to precision and bias. Random uncertainties cannot be determined statistically and can only be estimated by a trained analyst. Uncertainty represents a bias associated with analytical measurements. The presence and magnitude of bias can be determined by assessment of SVL's QC sample results on our analytical reports.

SVL reports data to 2 or 3 significant figures, dependent upon the sensitivity required by our clients, with the number of decimal places reported determined by the sensitivity of the method.

14.6.1 Rounding

Rounding of analytical results is dependent upon the number of significant figures used by a method. Rounding for percent recovery on QC samples is also dependent upon the number of significant figures. Element is setup and our analysts are directed

to round up to the significant figure assigned to that method. SVL uses the following rounding rule: A result of 5 or greater rounds the results up to the significant figure assigned in Element.

15.0 CORRECTIVE ACTION

The SVL Corrective Action Program is defined in SOP SVL 1019.

Any employee may initiate a Corrective Action Report (CAR) to support the quality system. Some examples are: The need for an SOP revision, incorrect results released to clients, an overdue MDL study, overdue or improper training, incorrect data reduction or review, improper instrument setup or calibration, or use of an incorrect analytical method.

If there is a non-acceptable result on a Performance Test Sample, the Quality Manager documents the failure as a CAR and works with the analysts and supervisors to discover the root cause of the failure. If there are findings from an internal or external audit, the Quality Manager issues a CAR to appropriate staff members so they can prepare a corrective action plan to rectify the issues.

Root cause analysis is the goal of corrective action and as such a cause will be identified, and a process outlined, so that a failure will not re-occur or its re-occurrence will be minimized.

15.1 Preventative Action

A “preventative action” is a pro-active process for dealing with a problem before it happens. It is taken to eliminate the cause of an undesirable situation in order to prevent its occurrence rather than a reaction to the identification of a problem or nonconformity. These actions are taken to reduce the probability that a potential problem will occur. They may also include contingencies to reduce the “seriousness” should a future problem occur. Subjects for “preventative action” may be implemented to address a weakness in the quality system that is not yet causing nonconformities and can be initiated internally or externally (client complaints). The focus for preventative actions should be to avoid creating nonconformities, but may also lead to improved laboratory efficiencies.

SVL uses the CAR template to document ideas, plans or actions whether developed internally or externally. These reports are audited at

a future date to ensure that the changes sought have been implemented and are effective.

16.0 TRAINING

SVL conducts annual training in legal and ethical responsibilities for all staff members. SVL provides training sessions that are developed in order to provide staff members with the analytical tools necessary for ever changing environmental regulatory requirements. New employees will be given various types of introductory training as soon as possible after their hire date.

SVL management and supervisors train staff members in laboratory safety. At a minimum this consists of an annual review of the Chemical Hygiene Plan. It also includes seminars on important safety issues throughout the year.

Staff members also receive training in the quality system and QM. At a minimum this consists of an annual review of the QM.

Department supervisors ensure that staff is adequately trained to perform the analyses assigned to them. The process is defined in SOP SVL 1010. Training includes, as appropriate, quality control requirements, instrument operation, instrument maintenance, software operation, reading the published method, reading the applicable SVL SOPs, and completion of an Initial Demonstration of Capability (IDOC). When an IDOC is not defined by the analytical method, the Quality Manager will create default criteria and outline them in the training summary forms which will be included in their personnel files. Upon completion of training, a Demonstration of Capabilities Certificate is placed within their personal file.

SVL Management defines the required elements for training for analytical methods. A Supervisor or a fully trained analyst provides training, when possible. If no fully trained analyst exists, an analyst may learn a new analysis by reading the appropriate method and instrument manual, then performing an IDOC.

During the training period, an analyst may produce data for clients (after completion of a successful blank and four separately prepared LCSs) under the supervision of a fully trained analyst; if there is not a trained analyst the Department Supervisor will review and sign off on all aspects of the work performed. A Department Supervisor or a fully trained analyst must review and sign all trainee work produced.

16.1 To document continued proficiency, an analyst must perform one of the following tasks annually:

16.1.1 Successfully analyze a blind performance sample.

16.1.2 Complete another IDOC.

16.1.3 Successfully analyze a blank and four separately prepared LCSs or duplicates (for those methods where a LCS is not commercially available).

16.2 Analysts and technicians who do not successfully complete a DOC within a year must complete an IDOC before being re-certified for a method.

17.0 ETHICS AND CONFIDENTIALITY

17.1 SVL is committed to providing its clients with accurate and defensible data and meeting all client requirements for data quality and integrity. To achieve our commitment, and as a condition for employment with SVL, all employees agree to follow SVL's policy regarding ethics and data integrity characterized but not limited to the items listed below.

17.1.1 All reported data, including dates and times, shall represent actual values obtained and are not modified or manipulated in any manner for which allowances have not been made for in the referenced method.

17.1.2 There will be no misrepresentation of another analyst's identity.

17.1.3 Altering the contents of logbooks and/or data sheets to misrepresent data is prohibited.

17.1.4 Altering any operating procedures or QC to make data "fit" is prohibited.

17.1.5 Failing to comply with SOPs without proper documentation and approval from the Laboratory Director and/or Quality Manager is prohibited.

17.1.6 Any attempt to misrepresent data or events as they actually occur in the course of data production, review or reporting is prohibited.

17.1.7 Deleting files, whether electronic or hard copy of raw data that was used in a reported value is prohibited.

17.1.8 Engaging in, or being a party to, any practice that ultimately misrepresents data or narratives in any way is prohibited.

17.2 SVL has established a zero-tolerance policy for improper, unethical, or illegal activities. Improper actions are defined as unapproved deviations from contract-specific or method-specific analytical practices, whether intentional or unintentional. Unethical or illegal actions are defined as the deliberate falsification of analytical or quality assurance results where failed method or contractual requirements are made to appear acceptable. Some examples of improper, unethical, or illegal practices are listed below. Comments in parentheses should each be read as beginning with the phrase "including but not limited to…"

17.2.1 Improper use of manual integrations to meet calibration or method quality control criteria.

17.2.2 Intentional misrepresentation of the date or time of analysis.

17.2.3 Falsification of results to meet method requirements.

17.2.4 Reporting results without analysis.

17.2.5 Selective exclusion of data to meet quality control criteria (dropping calibration points).

17.2.6 Unwarranted manipulation of computer software.

17.2.7 Improper alteration of analytical conditions (changing voltages or run times).

17.2.8 Misrepresentation of quality control samples (not preparing them as samples).

17.2.9 Intentionally reporting results from one sample for those of another.

18.2.10 Reporting calibration or quality control data not linked to the reported samples.

17.3 Confidentiality

SVL's commitment to client confidentiality (including national security concerns) and any associated proprietary rights comes first and foremost. We understand the nature of doing business in a litigious society and will seek to protect our client's interest in all aspects of our work.

18.0 DATA REVIEW

SVL uses a three-tier system for data review via the LIMS. The first level is conducted by the analyst, the second level by a peer or supervisor, the third by a signatory, DCO, Technical Director or the Laboratory Director. Reviews take place upon the review of raw data or within the LIMS (which uses a system of locks to assure data is secure from accidental overwritting). Most data is available in PDF, which can be reviewed at any work station. The process is governed by SOP SVL 2009.

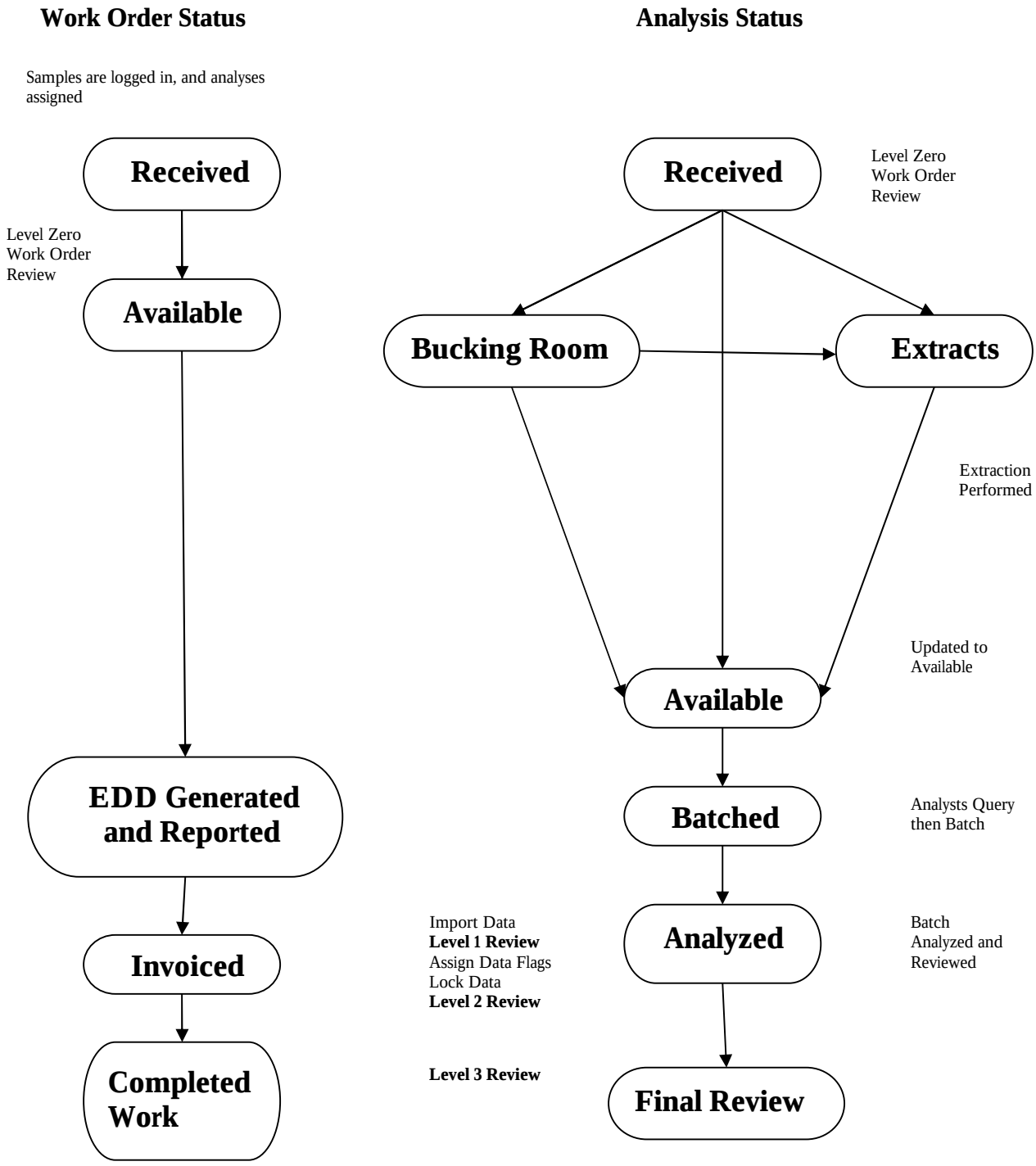
In the case that erroneous data does leave the lab, the Laboratory Director or Client Services will contact the affected clients as soon as all of the facts are available. SVL will work with the clients in seeking a new or alternative strategy to meet the client's needs.

18.1 Electronic Signatures

For all levels of review up to the final review Element provides an audit trail of who has uploaded and reviewed results. Employees are directed to log in and out of Element so that they are identified when conducting data uploads or reviews; it is not permissible to use another employee's password or misrepresent an analyst or reviewer by not logging in to a computer system under the correct username and password (see SOP SVL 1031).

The electronic signature affixed to the Final Report will be assigned by the Document Control Office dependent upon which reviewer signed the Work Order Review Checklist.

18.2 Data Review Flow Chart



19.0 REPORTING

SVL has a single standard report format for nearly all results (SVL_Sample) generated by Element. This includes a case narrative, sample report, and QC report.

Reports are also available in a number of routine and custom hardcopy formats. EDDs can be provided in ASCII, spreadsheet, and database formats, including EQWin, GIS/Key, and EnviroData Solutions. If a client has a specific format, SVL is usually able to provide data compatible with their preferred format.

Data that will be used to create EPA CLP-like deliverable packages may be done in Element or can be loaded into a third party data review and reporting system MARRS that will generate the forms required to complete a data package. SVL has the capability of providing a hardcopy and EDD format. EDDs are available in standard EPA CLP formats, as well as popular spreadsheet and database files.

20.0 AUDITS AND VERIFICATION PRACTICES

20.1 Performance Testing Program

SVL participates in two WS, two SOIL, and two WP Performance Testing (PT) studies each year. SVL uses the first WP Study to meet the DMRQA requirements of our clients. The PT samples are logged in as single-blinds and ran as if they were normal samples in all aspects. The Quality Manager is responsible for preparing all PT samples. QuiK™ Response samples are used when SVL does not pass an analyte required by our accreditation.

20.2 Internal System Audits

The Quality Manager conducts a minimum of one internal system audit per year per lab. The audit provides an overview of the implementation of procedures and policies set forth in the laboratory's QM and SOPs; ref, SOP SVL 1005. Other audits (that may be limited in scope) may be undertaken at any time in response to external audits, CARs, or at the request of the Laboratory Director.

The Quality Manager prepares an internal audit plan based on information garnered from previous audits both internal and external, CARs, method changes, new instrumentation and requests or complaints from clients. The Quality Manager may use written

checklists and/or quizzes to assess an analyst's knowledge of the QM, methods and current SVL SOPs.

The Quality Manager will interview the analyst(s) and conduct reviews of records, logbooks, and data packages.

At the close of the audit, a post-audit meeting is held to discuss the audit findings. The assessor or Laboratory Director can close a finding during this discussion if the laboratory staff can satisfactorily demonstrate that the finding is inappropriate or easily remedied.

The Quality Manager will deliver the audit report to the President, Laboratory Director, Technical Director, supervisor and appropriate staff. A report will contain at a minimum the following parameters: Date and location of the audit, personnel involved in the audit, laboratory operations audited, any minor or major findings that require corrective action (major findings require the issuance of a CAR) and the assessor's summation.

20.3 Reference Materials

Companies like ERA, High Purity, Fisher and Baker have been approved (see SVL's approved vendor list) to provide SVL with reference materials and reagents. SVL uses a second source verification for all calibrated methods. When there is not a secondary source provider available, SVL will verify and then purchase a separate lot from the primary vendor (lots must not be from the same parent batch).

20.4 Internal Quality Control Schemes

SVL has instituted a Reporting Limit Check Standard (RLCS) to verify recovery at the reporting limit; this check has been instituted at SVL for SDWA, CWA and Solid Waste analytical runs. SVL has also instituted a calibration curve verification policy where calibration standard recoveries are fitted back into the curve. A standard at the reporting level must be within 30% of the true value and the remaining standards must be within 10% of their true values. Any exception to this rule will be outlined in the appropriate SOP.

20.5 Data Audits

The Quality Manager performs a data audit of several data packages each year. Data audits can also be triggered by audits, CARs or requests from the Laboratory Director. The purpose behind the data audits is to alert SVL to any errors, systemic problems or trends that may be developing.

21.0 MANAGEMENT REVIEW

The Management of SVL conducts a review of the adequacy of the quality system weekly. The reviews take into account reports from supervisory personnel, Client Services, Technical Directors, Document Control Officer, Systems Manager, LIMS Chemist, Quality Manager and President. Recent internal audits, external audits, the results of PT samples, changes to the volume or type of work undertaken, feedback from clients, instrumentation issues, personnel issues and CARs are a few of the items discussed. Conclusions or action items are addressed; any changes deemed necessary are then incorporated into revisions to the QM and SOPs as soon as practicable and communicated to relevant employees to provide direction for day-to-day operations. Notes from these meetings are kept in an electronic file located on SVL's network.

22.0 CONTRACTS

SVL has established a Project/Bid Review Sheet to meet the TNI requirements of Section 4.4 "Review of Requests, Tenders, and Contracts." Any differences between the request or tender and the contract shall be resolved before any work commences. Each contract will be acceptable to both the laboratory and the customer. Records of reviews (including significant changes) are maintained in the appropriate client files. Customers will be informed of any deviation from the contract including those by subcontractors. If a contract needs to be amended a new Project/Bid Review sheet will be utilized with all applicable parties being informed of the changes.

23.0 SUBCONTRACTING AND PURCHASING

23.1 Subcontracting

Prior to subcontracting work to another laboratory, the Laboratory Director or Client Services will ensure that the subcontracted laboratory is NELAP accredited, or is certified by the appropriate state (for the tests being subcontracted) if required. SVL will advise the customer in writing or email as to the need for subcontracting and will receive in return the client's approval (to be placed in the client's file). The Quality Manager upon being provided sub-contractor information will verify that the subcontracting laboratory has an active Quality Assurance Program (QAP) that meets SVL's and our client's

DQOs. The Sample Custodian is responsible for verifying that the subcontracting lab received the correct samples and that they were assigned the requested analyses. The subcontracting laboratory will be identified on the final report.

23.2 Purchasing

SVL maintains a vendor file which contains the vendors approved to supply products to SVL.

SVL ensures that purchase orders contain the required technical and quality specifications prior to submission. If a method or instrument requires specific technical and quality criteria (like grade or purity) then the Department Supervisor will ensure this is the product indicated on the purchase order. Identification of the product is by description and catalog number (see appropriate method SOPs).

SVL tests reagents and standards prior to analyzing samples and reporting data. New reagents and standards will be used in a laboratory fortified blank at RLCS levels; if the QC requirements are met then those reagents are deemed to be acceptable; ref, SOPs SVL 1015 and SVL 1032.

24.0 SERVICE TO THE CLIENT

SVL seeks to have an excellent working relationship with our clients. In order to monitor client's concerns, SVL will place both positive and negative feedback in the client's file. If clients do not provide feedback, Client Services will ask questions or provide clients with a written survey to assess any unspoken concerns.

24.1 Complaints

The Client Services Department strives to resolve all complaints from clients regarding analytical reports or service. Client Services will contact the appropriate Director, or Department Supervisor to investigate and resolve issues. Actions may include reanalysis of samples and/or explanations surrounding technical issues/lab procedures.

24.2 Reanalysis

Reanalysis, whether requested by a client or by SVL personnel, must have reasonable justification for it to be valid. Before proceeding with the reanalysis of sample, it is important to understand what SVL's or the

client's objective is in requesting the reanalysis. The SOP will outline procedures to be followed when a reanalysis is requested. It will discuss the documentation (reanalysis request form and work order memos) associated with the reanalysis. This documentation will provide the laboratory with a means of tracking changes to our work orders and providing the necessary information for historical reconstruction. Definitions for words used in this SOP may be found in the QA Manual. SVL does not conduct reanalysis in order to "result hunt". Reanalysis is conducted by SVL at the request of clients or SVL personnel in order to confirm a possible error on the part of SVL or by any of the sample custodians listed on the chain of custody. SVL will report out (at the Lab Director's discretion) all sample results when a reanalysis is requested by a client, such data will be accompanied by a case narrative. When reanalysis is requested on a method that has multiple analytes, the sample shall be reanalyzed for all of the analytes originally requested (at the supervisors discretion the other analytes may not be re-reported if it is shown that they are scientifically indistinguishable from the original results) under that method. Work order memos will be established when a client requests a reanalysis and should be updated throughout the reanalysis run and review. Case narratives will be written up to explain any discrepancies between the original test results and the reanalysis conducted (any reissued report will contain a case narrative). Samples that are reanalyzed in-house will have the reason for the request clearly identified on the reanalysis request form. Whether internal or external, the reanalysis request form must be filled out completely to assist with the historical re-construction of the data and to assist in writing up case narratives or CARs; ref, SOPs SVL 2019 and SVL 1019.

25.0 TRANSFER OF ANALYTICAL REPORTS, RECORDS, and SAMPLES

In the event that SVL Analytical, Inc. goes out of business or there occurs a transfer of ownership, the following plans will apply.

All current clients and past clients going back 5 years, longer if bound by contract, will be contacted by registered mail, return receipt requested, at their current or last known address, and made aware of the permanent closure or transfer of ownership of SVL.

Clients will be requested to respond in writing by return mail, fax or email within 10 business days with the instructions as to the final disposition of (in

the case of closure) or as to how they wish to proceed with the new ownership, concerning: their reports, records and/or samples, including work that is in progress.

Options for the client may include complete transfer of all reports, records and samples to their business location, or complete destruction of all documents and samples. SVL does not take ownership of client samples at any time or under any circumstances, and title to all reports, records and samples resides with the client. SVL will not be responsible for disposal of hazardous materials.

Methods of reports and records transfer may be by hard copy purge file, hard copy reports only, or by electronic data deliverables (EDD) for all date accessible records stored in SVL's database. No customized EDDs will be available.

Should a client decide to stay with the new ownership, any business relationship between the two parties will constitute a new relationship independent of any involvement by SVL. The maintenance of reports and records, and the completion of the work in progress (but not completed by SVL) shall be under the sole control of the new owner. SVL will be relinquished from any and all responsibilities concerning the business relationship between the parties.

26.0 GLOSSARY

Calculations are for definitions may be found in SOP SVL 1028.

Acceptance Criteria: Specified limits placed upon characteristics of an item, process, or service defined in required documents.

Accuracy: The degree of agreement of a measured value with the true or expected value of the quantity of concern.

Acid Base Accounting (ABA): The Acid-Base Account is determined by calculation from the ANP and AGP results. The Acid-Base Account may be reported as the ABA, Acid Base Potential (ABP), or Net Neutralizing Potential (NNP) at a client's request.

Acid Generating Potential (AGP): The acid generating potential is established by determining three sulfur content numbers, the "Total Sulfur", "Non-Extractable Sulfur", and "Non-Sulfate Sulfur" or "Non-Sulfate Sulfur-HCl". Total Sulfur is determined from analysis of a 0.2 g aliquot taken from a sample that has undergone a 200 mesh screening. Non-Extractable Sulfur is

determined after digestion with 2N nitric acid, then filtered, and analyzed by a LECO analyzer. Non-Sulfate Sulfur is determined after digestion with hot water, then filtered, and analyzed by a LECO analyzer. Non-Sulfate Sulfur-HCl is determined after digestion with a 2:3 HCl solution, then filtered, and analyzed by a LECO analyzer.

Acid Neutralizing Potential (ANP): The amount of neutralizing bases, including carbonates, present in overburden materials is found by treating a sample with a known excess of standardized hydrochloric acid. The sample and acid are heated to insure that the reaction between the acid and the neutralizers goes to completion. The calcium carbonate equivalent of the sample is obtained by determining the amount of unconsumed acid by titration with standardized sodium hydroxide.

Aliquot: A portion of a sample.

Alkalinity: A measure of the acid-neutralizing ability of the sample.

Analytical Spike: An aliquot of sample to which a known amount of analyte has been added after sample preparation. It is a measure of the effect of the matrix of a digest or extract. It is sometimes known as a post-digestion spike.

Batch: Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same reagents. For SVL's purposes a batch will not include more than 20 samples.

Bias: A systematic error inherent in a method or caused by some idiosyncrasy of the measurement system. Temperature effects, extraction efficiencies, contamination, mechanical losses, and calibration errors create bias. Bias may be either positive or negative.

Blank: An artificial sample designed to monitor the introduction of contamination into the process. For aqueous samples, reagent water is used as a blank matrix.

Blind Sample: A sample submitted for analysis whose concentration is unknown to the analyst.

Buffers: Solutions of a weak acid and a salt of the acid or weak base and a salt of the base that are capable of maintaining pH on addition of acid or base.

Calibration: Comparison of an instrument response with a standard or a certified instrument. Commonly it is performed with a set of known standards plotted versus a response.

Calibration Blank: See Section 14.0 Quality Control.

Calibration Curve: Graphical plot of instrument response against amount of analyte in standards. The relationship can usually be modeled as linear or quadratic.

Completeness: The percentage of measurements that meet quality control acceptance criteria for requested determinations. Percentage completeness is defined by client DQOs.

Continuing Calibration Verification (CCV): See Section 14.0 Quality Control.

Continuing Calibration Blank (CCB): See Section 14.0 Quality Control.

Control Chart: A graphical plot of test results with respect to time or sequence of measurement, together with limits within which they are expected to lie when the system is in a state of statistical control.

Custody Log: A system for tracking samples from the time they enter the lab until a final report is generated.

Digestion: Solubilizing of metal analytes through heating with a variety of acids or oxidizers.

Dissolved Analytes: An aqueous sample that has been passed through a 0.45 µm filter. The filtered portion is then run for dissolved analysis.

Double Blind Sample: A sample known by the submitter but submitted to an analyst in such a way that its identification as a check sample is unknown.

Duplicate Sample: See Section 14.0 Quality Control.

Extraction: The process of removing analytes through the addition of acids or water from a solid/semi-solid matrix. SVL performs TCLP, SPLP, CA-WET and Meteoric Water Mobility extractions.

Field Blank: See Section 14.0 Quality Control.

Field Duplicate: Duplicate samples obtained in the field and analyzed in the lab to assess field precision in sampling.

Hardness: Dissolved metal content of water, expressed as calcium carbonate equivalents.

Homogeneity: The degree to which a property or substance is evenly distributed throughout a material.

Initial Calibration Verification (ICV): See Section 14.0 Quality Control.

Instrument Detection Limit (IDL): The smallest concentration detectable on a specific instrument. It is statistically determined by analysis of at least seven replicates of a blank that has not been digested.

Interference Check Sample (ICS): A sample with known concentrations of elements used to determine if the inter-element correction factors of the ICP are accurate.

Inter-element Correction Factor (IECs): The effect one element has on other elements due to wavelength overlap. These effects are accounted for and subtracted out resulting in a less biased result.

Internal Standard: Pure analyte(s) added to a sample, extract, or standard solution in known amount(s) and used to measure the relative responses of other method analytes that are components of the same sample or solution. The internal standard must be an analyte that is not in the sample.

Initial Calibration Blank (ICB): See Section 14.0 Quality Control.

Instrument Performance Check (IPC) Solution: A solution of method analytes, used to evaluate the performance of the instrument system with respect to a defined set of method criteria. The CCV or LCS may fit this criteria.

Laboratory Control Sample (LCS): See Section 14.0 Quality Control.

Laboratory Fortified Blank (LFB): Another term for a laboratory control sample.

Laboratory Fortified Matrix (LFM): Another term for a matrix spike.

Laboratory Information Management System: A software-based laboratory and information management system that offers a set of key features that support a modern laboratory's operations.

Laboratory Reagent Blank (LRB): Another term for a method blank.

Langlier's Index: An analytical measure of the corrosivity of water.

Limit(s) of Detection (LOD): A laboratory's estimate of the minimum amount of an analyte in a given matrix that an analytical process can reliably detect in their facility.

Limit(s) of Quantitation (LOQ): The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence.

Linear Calibration Range (LCR): The calibration range over which the instrument response to analyte is linear.

Linear Dynamic Range (LDR): The concentration range over which the instrument response to analyte is linear.

Manual Integration: Anytime a chromatogram is altered by an analyst from the original software determined chromatogram, usually performed by adjusting how the baseline was assigned.

Material Safety Data Sheet: Written information provided by vendors concerning a chemical's toxicity, health hazards, physical properties, fire and reactivity data including storage, spill and handling precautions.

Matrix: The substrate of a test sample.

Matrix Spike (MS): See Section 14.0 Quality Control.

Matrix Spike Duplicate (MSD: See Section 14.0 Quality Control.

Maximum Contaminant Levels: Regulatory action levels for primary drinking water analytes.

Mean: The sum of all observations divided by the number of observations.

Method: A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order they are to be performed.

Method Blank: See Section 14.0 Quality Control.

Method of Standard Addition: Commonly used to determine the concentration of an analyte in a complex matrix. The matrix may contain other components that interfere with the analytical signal causing inaccuracy in the determined concentration. Known concentrations are added to a volume of sample to develop a curve based upon the interferences from that sample, so that a reliable concentration can be derived for the sample.

Method Detection Limit (MDL): The smallest concentration detectable on an instrument with 99% certainty by a specific method. It is statistically determined by analysis of seven replicates of a low-level standard, prepared in the same way as a sample.

NTU: Nephelometric turbidity unit.

Net Carbon Value (NCV): A method used in the determination of Acid Generation Potential and Acid Neutralizing Potential using the Net Carbonate Value method AGP is calculated via sulfur pyrolysis and ANP is calculated using digestion with hydrochloric acid.

Net Acid Generation (NAG): A solution of hydrogen peroxide is added to rock samples which have been reduced to pass through a -200 mesh screen. The sample and the hydrogen peroxide are heated to ensure the reaction goes to completion. The hydrogen peroxide reacts with the sulfides, carbonates and other materials in the sample to produce a net pH.

Performance Test (PT) sample: A sample, the composition of which is unknown to the laboratory is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.

pH: The negative log of activity of the hydrogen atom.

Precision: The degree of agreement of independent measurements under specified conditions.

Quality Assurance: A system of activities used to ensure defined standards of quality.

Quality Control: A system for verifying and maintaining the desired level of accuracy and precision of an analytical method.

Quality Control Sample (QCS): A solution of method analytes of known concentrations which is used to fortify an aliquot of LRB or sample matrix. The QCS is prepared from a secondary source. The ICV fits these criteria.

Relative Standard Deviation (%RSD): The Standard Deviation divided by the Mean and multiplied by 100.

Relative Percent Difference (%RPD): The difference between two values divided by the average of the values, expressed as a percent.

Reporting Limit (RL): The smallest concentration usually reported for an analyte. It is usually at least three times the Method Detection Limit.

Reporting Limit Check Standard (RLCS): See Section 14.0 Quality Control.

Residues: Remainder after removal of water or other liquids, see solids and total solids.

Retention Time: Elapsed time between the injection of sample to the elution of the sample.

Run Logs: A log book for each instrument listing consecutively what was run, the method, when, by whom, and what file name the raw data is filed under.

Serial Dilution: See Section 14.0 Quality Control.

Standard Operating Procedure (SOP): A written procedure that defines a laboratory operation or analytical method.

Sub-sample: A portion taken from a sample.

Standard Deviation: The square root of the variance. A measure of the average spread around the mean.

Titration: Any number of methods for determining volumetrically the concentration of a desired substance in solution by adding a standard solution of known volume and strength until the reaction is complete, usually as indicated by a change in color due to an indicator.

Total Recoverable Metals: Follow the digestive method outlined in 40 CFR 136 Appendix C Section 9.4. Results are reported as "total metals". This is SVL's default total metals method unless both total and total recoverable metals are requested.

Traceability: The ability to trace the history, application, or location of an entity (e.g., standard, reagent, sample). SVL tracks the entities from the moment it enters the premises until the time it is disposed of.

Trip Blank: See Section 14.0 Quality Control.

Tuning Solution: A solution which is used to correct instrument performance prior to calibration and sample analysis.

Variance: The value approached by the average of the sum of the squares of deviations of individual measurements from the mean.

27.0 CERTIFICATIONS

SVL maintains certification for analysis of drinking water in the following states:

Arizona
Florida
Idaho
Nevada
Washington

SVL maintains certification for analysis of CWA and SW-846 samples in the following states:

Arizona
California
Florida
Nevada
Washington

NELAC Certification Awarded – Primary Accreditation Florida

27.1 Copies of the Scopes of Accreditation can be located at www.svl.net .

28.0 RESUMES

WAYNE R. SORENSEN

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID 1991- Present
President / CEO - Administers company policies and formulates business strategies.

SVL Analytical, Inc. – Kellogg, ID 1987-1991
Laboratory Director: Responsible for all analytical and operational activities of the laboratory; supervised personnel

SVL Analytical, Inc. – Kellogg, ID 1973-1987
Analytical Chemist: Analyzed soils and water for metals by flame atomic absorption and graphite furnace (7000 methods), for mercury by cold vapor atomic absorption (methods 7470 and 7471); for cyanide (method 9012), fluoride (method 340.2), phosphate (method 365.2), pH (method 150.1), turbidity (method 180.1), and conductivity (120.1); analyzed soils and house dusts for lead, arsenic, cadmium; analyzed hi-vol filters for metals by flame atomic absorption; performed baseline study analyses for permitting mine sites; conducted analysis for Remedial Investigation and Feasibility Study for Bunker Hill Superfund Site..

The Bunker Hill Company - Kellogg, ID October 1969-April 1973
Supervised a large integrated mine, mill and smelter analytical laboratory and trained personnel.

Kennecott Copper, Ray Mines Division March 1968-October 1969
Chief Chemist: Supervised an assay lab, trained assayers for new analytical methods and conducted applied research.

Kennecott Copper, Western Mining Division Research Center May 1965-March 1968
Analytical Chemist: Analytical methods development and applied metallurgical research on copper.

EDUCATION:

Utah State University - Logan, UT 1958-1962
B.S. Chemistry (minor: mathematics, physics)

Salt Lake Trade Tech - Salt Lake City, UT 1965
Basic Industrial Statistics

John R. Kern

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID October 2007 - present

Laboratory Director: Manage and direct the activities of the laboratory; establish ethical norms; evaluates personnel performance; conduct QA/QC reviews of incoming work and completed reports; work with the QA Manager to evaluate compliance with SOPs and methods.

P3 Scientific - Oakdale, MN September 2005 - April 2007

Laboratory Manager – Chemistry: Management and operation of a laboratory at a cGMP/GLP compliant CRO, providing analytical (organic and inorganic analysis) and microbial services to the chemical industry.

Arena Pharmaceuticals, - Inc. San Diego, CA January 2003 - August 2005

Associate Director, Analytical Chemistry – Pharmaceutical Development: Direct the analytical chemistry laboratory within the pharmaceutical development unit at a start-up biotech/pharmaceutical company.

LC Resources - McMinnville, OR 1991 - 2003

Laboratory Director: Started and built up a contract research laboratory specializing in HPLC and LC/MS/MS services for the pharmaceutical and chemical industries. Oversaw the growth of the lab from 2 to 20 employees, with annual sales of over 3 million. Directly responsible for the day-to-day operation of the lab including project management, experimental design, preparation of proposals, client interface, contracts, budget, oversight of QA and QC departments, SOP and protocol preparation. This position involved extensive interaction with major pharmaceutical companies in negotiating contracts, planned studies, allocating resources, report preparation, and discussing technical issues. Experience was also gained in the direction of projects involving analysis of a wide variety of pharmaceutical products from OTC to complex proteins, and drugs in biological matrices.

Syntex USA, Inc. – Palo Alto, CA 1984 - 1991

Senior Chemist: Development of analytical methods for the analysis of active pharmaceutical ingredients (AIP) and determining release specifications. Prepared analytical sections for IND and NDA applications. Supervised laboratory staff and project team membership.

EDUCATION:

Montana State University - 1982

M.S. Chemistry

Eastern Michigan University - 1978

B.S. Biochemistry

KIRBY L. GRAY

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID Dec. 2004-present
Technical Director - Conducts QA/QC reviews of commercial and EPA (ILMO5.4) incoming work and completed reports: supervises laboratory activities related thereto: primary contact with EPA (SMO); verifies SDGs, and responsible for MARRS (electronic data deliverable system) in coordination with DCO prior to reporting.

SVL Analytical, Inc. - Kellogg, ID March 1987-2004
Inorganic Instrumental Chemistry Department Supervisor -- Responsible for sample analysis by ICP, GFAA, FLAA, IC and CVAA.

Radersburg Mining Co. - Toston, MT September 1986-March 1987
Chemist: -- Responsible for fire assay, FLAA, and sample preparation.

IDHW, State of Idaho - Kellogg, ID August1986
Environmental Technician: --Operated X-ray fluorescence meter and collected soil samples.

Sunshine Mining Co. - Kellogg, ID May 1984-May 1986
Chemist -- Responsible for fire assay, FLAA, and classical chemistry.

The Bunker Hill Co. - Kellogg, ID May 1972-May 1982
Material Recovery Supervisor -- Responsible for operation and maintenance of water treatment plant, sulfuric acid plant, baghouse, cadmium refinery, and electric reverbatory furnace at a lead smelter.

EDUCATION:

University of Idaho - Moscow, ID Sept 1968-May 1972
B.S. Geological Engineering

North Idaho College-Coeur d'Alene, ID Sept 1966-June 1968
Engineering major

NAN WILSON

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID March 2003 -- present

Technical Director October 2007 – present: Conducts QA/QC reviews of incoming work and completed reports, supervises laboratory activities.

Laboratory Director October 2006—October 2007: Manage and direct the activities of the laboratory; establish ethical norms; evaluates personnel performance; conduct QA/QC reviews of incoming work and completed reports; work with the QA department to evaluate compliance with SOPs and methods.

QA Coordinator April 2006-October 2006: maintain Quality Systems, draft & approve SOPs, coordinate Quality System Audits, coordinate PT testing.

QA Chemist September 2004 – March 2006: maintain Quality Systems, draft SOPs, assisted with Quality System Audits.

Safety Director September 2004-October 2006: maintain Chemical Hygiene Plan, coordinate safety training and record keeping.

Organics Department Chemist March 2003-August 2004: Analyzes samples for volatile organic compounds by GC.

LC Resources—McMinnville, OR September 1997-January 2003

Manager, Pharmaceutical Analysis January 2001-January 2003: Supervised HPLC method development; coordinated work for chemists and technicians; directed method validation; wrote SOPs and validated protocols; prepared client reports; trained chemists and technicians on SOPs and computer software; presented data and reports; responsible for client contact; administered Millennium32 chromatography software
Chemist September 1997-January 2001: Developed HPLC methods for pharmaceuticals; operated, calibrated, and maintained HPLC, UV/Vis, pH meters, balances, pipettes; wrote client reports; administered Millennium32 chromatography software

SVL Analytical—Kellogg, ID 1987-1996

Laboratory Technician—Performed meteoric water mobility tests; analyzed for acid base accounting; alkalinity, acidity, pH, sulfur forms by LECO, carbonate, oil and grease, TSS, TDS, gravimetric and colorimetric methods

Willamette University—Salem, OR 1995-1996

Laboratory Teaching Assistant—Assisted organic chemistry students in successfully carrying out lab experiments

EDUCATION:

Willamette University—Salem, OR 1992-1996

B.A. Chemistry and Russian

Simferopol State University—Simferopol, Ukraine 1995

Semester abroad

ADDITIONAL COURSES:

Laboratory Safety Institute, Tuscon AZ 2005

Two Day Lab Safety Short Course

Brandon A Borgias

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. – Kellogg, ID 1991-Present
Systems Manager, Computational Chemist – Oversees the Laboratory's Information Management System (LIMS) and works with our clients on custom reporting and electronic deliverables.

Cray Research– San Ramon, CA Jan 1989-1990
Software Technical Support Analyst 0 Co-administrator of network, composed of eight file servers and over 50 client work stations distributed throughout the western U.S. Unix (Sun OS and Cray UNICOS) operating systems experience

University of California, UCSF – San Francisco, CA 1985-1989
Postdoctoral Scholar – Developed computer programs (FORTRAN) for the refinement and analysis of macromolecular structure. VAX, Sun, and Cray computers and VMS and UNIX operating systems.

EDUCATION:

University of California, Berkley – Berkley, CA 1979-1985
Ph.D. Chemistry

Reed College – Portland, OR 1975-1979
B.S. Chemistry/Physics

MICHAEL S. DESMARAIS

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID Oct. 2006 - Present

Quality Assurance Manager -- Coordinates and develops quality assurance and training programs for the laboratory, maintains laboratory accreditations, writes standard operating procedures, reviews data, conducts audits, performs root cause analysis.

SVL Analytical, Inc. - Kellogg, ID June 2004 – Oct. 2006

Chemist Inorganic Instrument Department – Responsible for analysis of samples for trace metals by EPA methods 200.7 and 6010B. Interprets and reports data.

SVL Analytical, Inc. - Kellogg, ID April 2004 – June 2004

Chemist Organic Chemistry Department – Responsible for analysis of samples for pesticides and PCBs by EPA methods 608, 8081A, and 8082. Interprets and reports data.

U.S. Army Engineer District-Alaska – Umiat, AK May 2003 - Sept. 2003

Alaska Dept. Environmental Conservation approved field chemist. Established field laboratory, developed and implemented QA/QC under USACE and ADEC requirements. Surveyed, sampled and tested soils and waters under a Total Environmental Restoration Contract (TERC).

North Creek Analytical Oct. 1997 - Dec. 2002

Senior Metals Chemist and Health/Safety Officer - Developed, revised and implemented safety and HAZMAT procedures. Developed and documented standard operating procedures. Maintained analytical instrumentation and analyzed samples for trace metals (ICP, AA and GFAA) and BTEX/GRO.

EDUCATION:

Eastern Washington University – Cheney, WA 1996-1997

Graduate coursework in Hydrology and Fisheries.

Washington State University – Pullman, WA August 1993-June 1995

B.S. in Physical Science (emphasis in Chemistry, Geology, and Environmental Science).

Yakima Valley Community College 1991

A.A.

Dianne Gardner

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID May 2011 - Present

Classical Chemistry Department Supervisor -- Supervises the staff and operation of SVL's TDS, Nutrient, TKN, cyanide, NOX/NH4, Leco, and extraction labs. Ensures that EPA, ASTM and Standard Method methods are correctly followed. Requisitions instrumentation and supplies. Reviews manually entered lab data prior to entry into Element (LIMS). Reviews level 1 data entry prior to submission to DCO for reporting.

SVL Analytical, Inc. -- Kellogg, ID January 2007- May 2011

Instrument Department Analyst – Responsible for analysis of digested samples by ICP-AES and ICP-MS for trace metals by EPA methods 200.7, 200.8, 6010B, 6020B, and EPA SOW ILMO5.4. Interprets and up loads data to Element (LIMS). Back up analyst for GFAA.

SVL Analytical, Inc. - Kellogg, ID – April 2004 to January 2007

Classical Chemistry Department Chemist—Analyzed soil and aqueous samples for Cyanide.

EDUCATION:

Cedarville University – Cedarville, OH June 1987

B.A. Chemistry

North Idaho College – Coeur D'Alene, ID 1997

Coursework in Microbiology

DANNY J. SEVY

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID Dec 2004-present
Instrument Department Supervisor – Supervises staff and operation of SVL's ICP-AES, ICP-MS, CVAA, GFAA, FLAA, and IC labs and their respective sample preparation labs. Ensures that EPA and Standard Method methods are correctly used, including EPA SOW ILMO5.4. Approves lab data in Element (LIMS) prior to submission to DCO for reporting.

SVL Analytical, Inc. - Kellogg, ID 1996-2004
Inorganic Instrument Operator -- Performs metals analysis by ICP and IC.

SVL Analytical, Inc. - Kellogg, ID 1994-1996
Classical Chemistry Analyst -- Performed classical Wet Chemistry analyses on water and soil sample, including the preparation and analysis of cyanide and nitrate/nitrate (as N) tests for soil and water samples.

SVL Analytical, Inc. - Kellogg, ID 1988-1994
Instrument Operator -- Analyzed samples using Cold Vapor Atomic Absorption and Ion Chromatography

SVL Analytical, Inc. - Kellogg, ID 1987-1988
Laboratory Technician -- Performed inorganic sample preparation and operated CVAA and GFAA instruments.

EDUCATION:

Perkin Elmer April 2008
Inorganic Workshop Series

Perkin Elmer July 2004
ICP-MS with Elan Software & Elan DRC Accessory Training Course

Perkin Elmer November 2001
Optima Instrument Series with ICP WinLab Software

OI Corporation January 2001
Operation of FS-3000 Auto-analyzer

North Idaho College - Coeur d' Alene, ID 1989-1990
Chemistry and Mathematics courses

Heather Green

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. -- Kellogg, ID June 2011 – Present
Acid/Base Department Supervisor – Responsible for analysis and technicians within the department. Responsible for method interpretation and development.

SVL Analytical, Inc. -- Kellogg, ID Sept. 2010 – June 2011
Leco Analyst – Responsible for the following methods: ABA, AGP, ANP, NCV, NAG, total carbon and total sulfur.

SVL Analytical, Inc. -- Kellogg, ID Sept. 2009 – Sept, 2010
Classical Chemistry Floater – Responsibilities will include becoming certified in multiple disciplines in order to back-up primary analysts and technicians.

Bio Medics Plasma Center - Moscow, ID – Nov. 2007 to May 2009
Duties included: calibrating equipment, screening donors, conducting historical surveys and performing various test on blood samples.

Worked under highly regulated guidelines with strict adherence to SOPs.

EDUCATION:

University of Idaho, Moscow, ID 2005-09
B.S. Microbiology

Sherry Maine

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID Sept. 2011 - Present
Safety/Hazmat Officer - Responsible for revising the Chemical Hygiene Plan annually, conducts safety training and oversees response teams. Other duties include providing accident reports to the state and overseeing SVL's hazardous waste program (including setting up 8-hour refresher courses annually).

SVL Analytical, Inc. - Kellogg, ID Nov. 2005 - Present
Classical Chemistry Department Chemist—Analyzes and interprets soil and aqueous samples for: Total and ortho phosphorous, COD, TOC/TN, sulfide, MBAS, ammonia, nitrate/nitrite, TKN, hexavalent chromium, TOM, LOI and gravimetric silica.

UNR-Chem. – Reno, NV Aug. 2001 – June 2004
She synthesized and analyzed compounds to determine their chemical structure. She also tested soils and water for inorganic analysis.

Nestle/Simplot – Nampa, ID April 1999 – July 2001
Quality Assurance Technician – Tested and evaluated product throughout entire course of production.

ESI – Grandview, ID Dec. 1995 – Aug. 1997
Hazardous Waste Technician - Identified incoming hazardous waste samples (GC and ICP technician). Assisted in the development of formulas to stabilize hazardous waste in accordance with federal standards.

EDUCATION:

University Of Nevada – Reno, NV 2004
M.S. Chemistry

Northwest Nazarene College – Nampa, ID 1995
B.S. Chemistry

Southern Nazarene University – Bethany OK 1986-1989
Took classes towards a nursing degree.

CRYSTAL SEVY

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID 2006-Present
Sample Receiving Department Supervisor— Supervises SVL's sample receiving staff and is Sample Custodian for samples received under EPA SOW ILMO5.4. Responsible for setting up Work Orders within Element (LIMS), case narratives and point of contact with clients and their representatives. Works closely with SVL's Client Services and Technical Director to ensure that projects are setup and priced correctly.

SVL Analytical, Inc. - Kellogg, ID 1996-2006
Sample Receiver—Verifies sample temperature, integrity and security on receipt; creates laboratory jobs; ensures proper sample storage prior to analysis supervises sample disposal; ships sample containers to clients.

MELBA BENCICH

PROFESSIONAL EXPERIENCE:

SVL Analytical, Inc. - Kellogg, ID, February 1988 - Present
Document Control Manager – Supervises data reporting using Element (LIMS) for commercial clients and SDG reporting for EPA's CLP SOW ILMO5.4.

Shoshone Insurance – Kellogg. ID, 1984 – 1988
Duties included accounting, customer service relations and updating manuals

Travel People – Coeur d' Alene, ID, 1982 – 1984
Travel Consultant

Farmer's Insurance – Kellogg, ID 1982-1984
Duties included accounting, customer service relations and updating manuals

The Bunker Hill Company – Kellogg, ID, 1974 – 1981
Data Control Analyst

EDUCATION:

North Idaho College – Coeur d' Alene, ID, 1967 – 1968

General studies

International Correspondence School, 1980

Mathematics

29.0 QUALITY MANUAL RELEASES

Date
January 2010
January 2011
February 2012
February 2013
February 2014
January 2015

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