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Operation-Specific

Quality Assurance Management Plan

IT ANALYTICAL SERVICES DIVISION

Revision 0

September 1, 1993

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QUALITY ASSURANCE MANAGEMENT PLAN
IT ANALYTICAL SERVICES DIVISION

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TABLE OF CONTENTS

Page

0.0 COVER SECTION

Table of Contents 3
List of Figures 8
List of Tables 9
List of Acronyms 10
Appendix List 13

1.0 MANAGEMENT COMMITMENT AND ORGANIZATION

1.1 Statement of Management Position on Quality 17
1.2 IT Analytical Services (ITAS) Division Organizational Structure 18
1.2.1 ITAS Operating Units 18
1.2.2 Organization Charts 18
1.2.3 Equipment 18
1.2.4 Facility Security 18
1.3 Quality Organization 19
1.3.1 Vice President, Quality and Health Services, IT Corporation 19
1.3.2 Vice President, IT Analytical Services, IT Corporation 19
1.3.3 Division Technical Director, IT Analytical Services 20
1.3.4 Division Director, Quality Assurance/Quality Control, IT Analytical Services 20
1.3.5 Division Operations Director, IT Analytical Services 21
1.3.6 Field Analytical Services Director 21
1.3.6.1 Field Analytical Services Business Unit/Office Manager 21
1.3.6.2 FAS Project Manager 21
1.3.6.3 FAS Field Analytical Specialist 22
1.3.7 Laboratory Director (Operating Unit Director) 22
1.3.7.1 Systems Manager 22
1.3.7.2 Operations Manager 22
1.3.7.3 Quality Assurance/Quality Control Coordinator 23
1.3.7.4 Technical Director 24
1.3.7.5 Group Leader/Team Leader 24
1.3.7.6 Project Manager 25
1.3.7.7 Analyst 25
1.3.7.8 Sample Custodian 26
1.3.7.9 Document Control Coordinator 26
1.3.7.10 Data Reporting Staff 26

9413282.0191

TABLE OF CONTENTS (continued) *Page*

2.0 QUALITY ASSURANCE PROGRAM DESCRIPTION
2.1 Introduction 27
2.2 Objectives of the QA Program 28
2.3 Quality Assurance Documents 29

3.0 ASSOCIATE TRAINING AND QUALIFICATION
3.1 Associate Qualifications 31
3.2 Orientation and Training of Laboratory Staff 32
3.2.1 Quality Assurance Orientation 32
3.2.2 Quality Assurance Training 33
3.2.3 Health and Safety Orientation 33
3.2.4 Health and Safety Training 33
3.2.5 QA/QCC Training 34
3.2.6 Lead Auditor Certification 34
3.3 Training Records 34

4.0 PROCUREMENT OF ITEMS AND SERVICES
4.1 Selection of Vendors 35
4.2 Procurement of Quality Related Items 35
4.2.1 Role of ITAS Division Purchasing 36
4.2.2 Procurement Procedures 36
4.2.3 Radioactive Reference Materials 37
4.3 Procuring Services 37
4.4 Internal QC Requirements 38
4.4.1 Water 38
4.4.2 Compressed Air and Gases 38
4.4.3 Glassware Preparation 39

5.0 DOCUMENT CONTROL AND RECORDS
5.1 Quality Assurance Management Plan (QAMP) 41
5.2 Operation-Specific QAMP (OS-QAMP) 41
5.3 Manuals of Practice (MOP) 41
5.4 Standard Operating Procedures (SOPs) 42
5.5 Quality Assurance Project Plans (QAPjP) 42
5.6 Project and Quality/Operations Records Management 43
5.6.1 Project Records 43
5.6.2 Quality/Operations Records 44
5.6.3 Record Validation 44

94132B2.0190

TABLE OF CONTENTS (continued) *Page*

6.0 USE OF COMPUTER HARDWARE AND SOFTWARE
6.1 Use of Hardware 45
6.2 Security 45
6.3 Use of Software 46
6.3.1 Industry Standard Software 46
6.3.2 ITAS Developed Software 47
6.3.3 Control of Software Changes 47
6.3.4 Software Review and Reverification 47
6.3.5 Software Validation and Verification Documentation 48
6.4 Computer Viruses 48

7.0 WORK PROCESSES AND OPERATIONS
7.1 Standard Operating Procedures 49
7.2 Analytical Methods 49
7.3 Detection Limits 49
7.4 Variance from Stated Methods 50
7.5 Assessment of Work Processes 50

8.0 DATA COLLECTION AND PRODUCTION OPERATIONS
8.1 Field Collection and Shipment 51
8.2 Sample Containers, Shipping Containers, Preservatives, and Holding Times 52
8.2.1 Sample Containers 52
8.2.2 Shipping Containers 52
8.2.3 Sample Preservatives 53
8.2.4 Sample Holding Times 53
8.2.5 Turnaround-Time (TAT) 54
8.3 Sample Receipt and Initiation of Testing Program 54
8.3.1 Sample Receipt 54
8.3.2 Sample Log-in 55
8.3.3 Sample Storage 55
8.3.4 Internal Sample Chain-of-Custody 55
8.3.5 Sample Disposal and Return Chain-of-Custody 56
8.4 Calibration Procedures and Criteria 56
8.4.1 Calibration System 56
8.4.2 Reference Standards 57
8.4.2.1 Physical Reference Standards 57
8.4.2.2 Chemical Reference Standards 57
8.4.2.3 Standard Verification 57

94 1 3282-0189

TABLE OF CONTENTS (continued)

Page

8.0 DATA COLLECTION AND PRODUCTION OPERATIONS (continued)

8.4.3 Operational Calibration 58
8.4.4 Periodic Calibration 58
8.4.5 Calibration Failure 58
8.4.6 Calibration Records 58
8.5 QC Sample Analysis 58
8.5.1 QC Levels 59
8.5.2 Field QC Samples 60
8.5.2.1 Trip (Travel) Blank (TB) 60
8.5.2.2 Field Blank (FB) 60
8.5.2.3 Rinsate Blank (RB) 60
8.5.2.4 Field Duplicate (FD) 60
8.5.2.5 Field Matrix Spike Analyses 61
8.5.2.6 Collocated Samples 61
8.5.2.7 Replicated Sample Analyses 61
8.5.2.8 Split Sample 61
8.5.3 Laboratory QC Samples 62
8.5.3.1 Method Blank (MB) 62
8.5.3.2 Reagent Blank (RB) 62
8.5.3.3 Duplicate Sample Analyses 62
8.5.3.4 Continuing Calibration Standard (CCS) 62
8.5.3.5 Surrogate Standard (SS) 63
8.5.3.6 Laboratory Matrix Spike (MS) 63
8.5.3.7 Laboratory Matrix Spike Duplicate (MSD) 63
8.5.3.8 Laboratory Control Sample (LCS), Blank Spike (BS), or QC Check Standard . 63
8.5.3.9 Analytical Spike (AS) 64
8.5.3.10 Internal Standard Spike (IS) 64
8.5.4 Matrix QC Samples 64
8.5.5 Radiological QC Samples 64
8.5.5.1 Yield Monitors 64
8.5.6 Performance Evaluation Samples (PEs) 64
8.6 Data Reduction, Verification, and Reporting 65
8.6.1 Data Reduction 65
8.6.2 Data Verification 66
8.6.3 Data Reports 68
8.6.3.1 Certificate of Analysis 68
8.6.3.2 Data Package 69
8.6.3.3 Electronic Data Transfer (EDT) 69
8.6.3.4 Verbal Results 70
8.6.3.5 Data Reporting 70

94132B2-0188

TABLE OF CONTENTS (continued) *Page*

8.0 DATA COLLECTION AND PRODUCTION OPERATIONS (continued)

8.7 Data Validation 70
8.8 Preventive Maintenance 71
8.8.1 Responsibilities 71
8.8.2 Frequency of Maintenance 71

9.0 QUALITY ASSESSMENT AND RESPONSE

9.1 Internal QC 73
9.2 Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness . . . 73
9.2.1 Laboratory QC Measurements 73
9.2.2 Matrix QC Measurements 73
9.2.3 Precision and Accuracy Limits 74
9.3 Nonconformance, Corrective Action, and Deficiency 74
9.3.1 Nonconformance 74
9.3.1.1 Nonconformance Memo (NCM) 75
9.3.1.2 Condition Upon Receipt Variance Report (CUR) 75
9.3.2 Corrective Action 76
9.3.3 Deficiency 76
9.3.4 Responsibilities 76
9.4 QA/QC Audits 77
9.4.1 Performance Audits 77
9.4.1.1 Internal Performance Evaluation 77
9.4.1.2 External Performance Evaluation 78
9.4.1.3 Double-Blind Performance Evaluation 78
9.4.2 Surveillances 78
9.4.3 Quality Systems Audits 79
9.4.4 Project Audit 81
9.4.5 Findings, Observations, Comments, and Recommendations 81
9.4.6 Audit Ranking 82
9.4.7 Client Satisfaction Survey 82
9.5 Quality Reports to Management 82
9.6 Management Review of the Quality Assurance Program 83

9413282.0187

LIST OF FIGURES

Figure	Title	Page
1.2-1	ITAS Organizational Chart	85
3.1-1	Example Associate Qualification Form	86
3.2-1	Example Individual Training Record	87
3.2-2	Example New Employee Quality Assurance Orientation Form	88
3.2-3	Example ITAS Lead Auditor Certification Form	89
5.0-1	Example Procedural Change Form	90
5.4-1	ITAS Standard Administrative SOP Format	91
5.4-2	ITAS Standard Technical SOP Format	92
8.0-1	Data Collection Process Flow Chart	93
8.1-1	ITAS Analysis Request/Chain-of-Custody Form	94
8.3-1	Condition Upon Receipt Variance Report	95
8.6-1	Data Review Process	96
8.6-2	Data Review Checklist - Metals	97
8.6-3	Data Review Checklist - General Chemistry	99
8.6-4	Data Review Checklist - Air	101
8.6-5	Data Review Checklist - Radiochemistry	103
8.6-6	Data Review Checklist - GC/MS	105
8.6-7	Data Review Checklist - GC	107
8.6-8	Data Review Checklist - HPLC	109
8.6-9	Data Review Checklist - Dioxins/Dibenzofurans	111
8.6-10	Example ITAS Certificate of Analysis (Pages 1 and 2)	113
9.3-1	ITAS Nonconformance Memo (Pages 1 and 2)	115
9.3-2	Example Nonconformance Log	117
9.4-1	ITAS Client Satisfaction Survey Form (Pages 1 and 2)	118
9.5-1	Example Outline of QA/QCC Monthly Report to Management	120

9413282.0186

LIST OF TABLES

Table	Title	Page
2.1-1	ITAS Quality Assurance Management Plan Requirements Matrix	121
2.3-1	ITAS Quality Assurance Documents	125
8.2-1	Inorganic Sample Container, Preservatives, and Holding Times	128
8.2-2	Organic Sample Container, Preservatives, and Holding Times	143
8.2-3	Radiological Sample Containers, Preservatives, and Holding Times	154
8.4-1	Summary of Inorganic Method Calibrations	157
8.4-2	Summary of Organic Method Calibrations	169
8.4-3	Periodic Equipment Calibrations	182
8.5-1	Inorganic Laboratory Quality Control Samples	183
8.5-2	Organic Laboratory Quality Control Samples	216
8.5-3	Field Quality Control Samples	240
8.5-4	Laboratory Quality Control Samples	241
9.2-1	Laboratory Quality Control Samples/Measurements	242
9.2-2	Matrix Quality Control Samples	243
9.2-3	Precision and Accuracy Measurements	244

9413282.0185

LIST OF ACRONYMS

AA	Atomic Absorption
ANSI	American National Standards Institute
AR/COC	Analysis Request/Chain-of-Custody
AS	Analytical Spike
ASTM	American Society for Testing and Materials
BFB	Bromofluorobenzene
BLK	Blank
BS	Blank Spike
BSD	Blank Spike Duplicate
CCC	Continuing Calibration Compounds
CCS	Continuing Calibration Standard
CEO	Chief Executive Officer
CF	Calibration Factor
CHP	Chemical Hygiene Plan
CLP	Contract Laboratory Program
COC	Chain-of-Custody
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
CS	Check Standard
CUR	Condition Upon Receipt
CVAA	Cold Vapor Atomic Absorption
DFTPP	Decafluorotriphenylphosphine
DOC	Dissolved Organic Carbon
DOT	Department of Transportation
DQO	Data Quality Objective
DRC	Data Review Checklist
EDT	Electronic Data Transfer
EMSL-LV	Environmental Monitoring Laboratory-Las Vegas
EPA	U. S. Environmental Protection Agency
FAS	Field Analytical Services
FB	Field Blank
FD	Field Duplicate
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
GFAA	Graphite Furnace Atomic Absorption Spectroscopy
HDPE	High Density Polyethylene
HPLC	High Performance Liquid Chromatography
HRGC	High Resolution Gas Chromatography
HRMS	High Resolution Mass Spectrometry

94132B2.0183

LIST OF ACRONYMS (continued)

HTV	Holding Time Violation
IATA	International Air Transportation Association
ICAO	International Civil Aviation Organization
ICP	Inductively Coupled Argon Plasma Spectroscopy
ID	Identification
IR	Infrared Spectroscopy
IS	Internal Standard
ISO	International Standard Organization
IT	IT Corporation
ITAS	IT Analytical Services
JPR	Job Performance Review
LCL	Lower Control Limit
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
LRMS	Low Resolution Gas Chromatography
LST	Laboratory Safety Training
LWL	Lower Warning Limit
MB	Method Blank
MBAS	Methylene Blue Active Substance
MDA	Minimum Detectable Activity
MDL	Method Detection Limit
MOP	Manual of Practice
MS	Matrix Spike
MSA	Method of Standard Additions
MSD	Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
NBS	National Bureau of Standards
NCM	Nonconformance Memo
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards Technology
NMOC	Non-Methane Organic Compounds
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OS-QAMP	Operation-Specific Quality Assurance Management Plan
PAH	Polynuclear Aromatic Hydrocarbons (or PNA)
PCB	Polychlorinated Biphenyls
PE	Performance Evaluation
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit

LIST OF ACRONYMS (continued)

PUF	Polyurethane Foam
QA	Quality Assurance
QAMP	Quality Assurance Management Plan
QAPjP	Quality Assurance Project Plan
QAPP	Quality Assurance Program Plan
QA/QC	Quality Assurance/Quality Control
QA/QCC	Quality Assurance/Quality Control Coordinator
QAS	Quality Assurance Summary
QC	Quality Control
RB	Reagent Blank
RCRA	Resource Conservation Recovery Act
RF	Response Factor
RPD	Relative Percent Difference
RRF	Relative Response Factor
RSD	Relative Standard Deviation
RSO	Radiation Safety Officer
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SPCC	System Performance Check Compounds
SRM	Standard Reference Material
SS	Surrogate Standard
TAT	Turnaround Time
TB	Trip Blank
TCLP	Toxicity Characteristic Leaching Procedure
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TOX	Total Organic Halogens
TQM	Total Quality Management
UCL	Upper Control Limit
UN	United Nations
USEPA	United States Environmental Protection Agency
UWL	Upper Warning Limit
VOA	Volatile Organic Analytes
VOST	Volatile Organic Sampling Train
WS	Water Supply
WP	Water Pollution

9413282.0182

APPENDIX LIST

APPENDIX	SECTION	CONTENTS
AUSTIN	AUSTIN-0	List of Appendix Sections, Tables, and Figures
	AUSTIN-1	Organizational Chart
	AUSTIN-2	Instrument List
	AUSTIN-3	Standard Operating Procedure List
	AUSTIN-4	Methods
	AUSTIN-5	Detection Limits
	AUSTIN-6	Performance Evaluation Programs
	AUSTIN-7	Preventive Maintenance
	AUSTIN-8	Additional Operation-Specific Information
CERRITOS	CERRITOS-0	List of Appendix Sections, Tables, and Figures
	CERRITOS-1	Organizational Chart
	CERRITOS-2	Instrument List
	CERRITOS-3	Standard Operating Procedure List
	CERRITOS-4	Methods
	CERRITOS-5	Detection Limits
	CERRITOS-6	Performance Evaluation Programs
	CERRITOS-7	Preventive Maintenance
	CERRITOS-8	Additional Operation-Specific Information
CINCINNATI	CINCINNATI-0	List of Appendix Sections, Tables, and Figures
	CINCINNATI-1	Organizational Chart
	CINCINNATI-2	Instrument List
	CINCINNATI-3	Standard Operating Procedure List
	CINCINNATI-4	Methods
	CINCINNATI-5	Detection Limits
	CINCINNATI-6	Performance Evaluation Programs
	CINCINNATI-7	Preventive Maintenance
	CINCINNATI-8	Additional Operation-Specific Information
EDISON	EDISON-0	List of Appendix Sections, Tables, and Figures
	EDISON-1	Organizational Chart
	EDISON-2	Instrument List
	EDISON-3	Standard Operating Procedure List
	EDISON-4	Methods
	EDISON-5	Detection Limits
	EDISON-6	Performance Evaluation Programs
	EDISON-7	Preventive Maintenance
	EDISON-8	Additional Operation-Specific Information

9413282.0181

APPENDIX LIST (continued)

APPENDIX	SECTION	CONTENTS
KNOXVILLE	KNOXVILLE-0	List of Appendix Sections, Tables, and Figures
	KNOXVILLE-1	Organizational Chart
	KNOXVILLE-2	Instrument List
	KNOXVILLE-3	Standard Operating Procedure List
	KNOXVILLE-4	Methods
	KNOXVILLE-5	Detection Limits
	KNOXVILLE-6	Performance Evaluation Programs
	KNOXVILLE-7	Preventive Maintenance
	KNOXVILLE-8	Additional Operation-Specific Information
OAK RIDGE	OAK RIDGE-0	List of Appendix Sections, Tables, and Figures
	OAK RIDGE-1	Organizational Chart
	OAK RIDGE-2	Instrument List
	OAK RIDGE-3	Standard Operating Procedure List
	OAK RIDGE-4	Methods
	OAK RIDGE-5	CRDLs, MDLs, PQLs, and MDAs
	OAK RIDGE-6	Performance Evaluation Programs
	OAK RIDGE-7	Preventive Maintenance
	OAK RIDGE-8	Additional Operation-Specific Information
PITTSBURGH	PITTSBURGH-0	List of Appendix Sections, Tables, and Figures
	PITTSBURGH-1	Organizational Chart
	PITTSBURGH-2	Instrument List
	PITTSBURGH-3	Standard Operating Procedure List
	PITTSBURGH-4	Methods
	PITTSBURGH-5	Detection Limits
	PITTSBURGH-6	Performance Evaluation Programs
	PITTSBURGH-7	Preventive Maintenance
	PITTSBURGH-8	Additional Operation-Specific Information
RICHLAND	RICHLAND-0	List of Appendix Sections, Tables, and Figures
	RICHLAND-1	Organizational Chart
	RICHLAND-2	Instrument List
	RICHLAND-3	Standard Operating Procedure List
	RICHLAND-4	Analytical Methods
	RICHLAND-5	Minimum Detectable Activity
	RICHLAND-6	Performance Evaluation Studies
	RICHLAND-7	Preventive Maintenance Schedules
	RICHLAND-8	Additional Operation-Specific Information

9413282.0180

APPENDIX LIST (continued)

APPENDIX	SECTION	CONTENTS
SPECIAL ANALYSIS LABORATORY	SAL-0	List of Appendix Sections, Tables, and Figures
	SAL-1	Organizational Chart
	SAL-2	Instrument List
	SAL-3	Standard Operating Procedure List
	SAL-4	Methods
	SAL-5	Detection Limits
	SAL-6	Performance Evaluation Programs
	SAL-7	Preventive Maintenance
	SAL-8	Additional Operation-Specific Information
ST. LOUIS	ST. LOUIS-0	List of Appendix Sections, Tables, and Figures
	ST. LOUIS-1	Organizational Chart
	ST. LOUIS-2	Instrument List
	ST. LOUIS-3	Standard Operating Procedure List
	ST. LOUIS-4	Methods
	ST. LOUIS-5	CRDLs, MDLs, PQLs, and MDAs
	ST. LOUIS-6	Performance Evaluation Programs
	ST. LOUIS-7	Preventive Maintenance
	ST. LOUIS-8	Additional Operation-Specific Information
FIELD ANALYTICAL SERVICES	FAS-0	List of Appendix Sections, Tables, and Figures
	FAS-1	Organizational Charts
	FAS-2	Instrument List
	FAS-3	Standard Operating Procedure List
	FAS-4	Methods
	FAS-5	Detection Limits
	FAS-6	Performance Evaluation Programs
	FAS-7	Preventive Maintenance
	FAS-8	Additional Operation-Specific Information

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1.0 MANAGEMENT COMMITMENT AND ORGANIZATION

1.1 Statement of Management Position on Quality

IT Corporation (IT) is committed to providing quality services for environmental management; services which meet the needs of our clients, satisfy regulatory requirements, and are commensurate with the current state of the art. To satisfy our clients' quality objectives, to meet regulatory requirements, and to comply with IT corporate-wide requirements, IT Analytical Services (ITAS) Division has adopted a comprehensive Quality Assurance (QA) Program. The principles and practices of the Program apply to every Associate at every level within ITAS; they are fundamental to the way we do business and to the services we provide.

The Quality Assurance Management Plan (QAMP) is an overall statement of Program policy. This Plan provides guidance to ITAS Associates in fulfilling their responsibilities and serves as a statement to external parties of ITAS' commitment to quality.

The ITAS QAMP recognizes that some QA activities must be detailed and adopted on an operation-specific basis. To document individual laboratory QA practices, the ITAS QAMP requires the preparation of this Operation-Specific QAMP.

Implementation of the QA Program is the responsibility of all ITAS Associates. Management at every level has the commitment, duty, and authority to lead the development and implementation of a structured management system that provides the framework to support the QA Program. Management will assure that the principles and practices of the QA Program are implemented and followed.

A Quality Assurance/Quality Control Coordinator (QA/QCC) is assigned to each ITAS operating unit to verify that the QA Program is implemented as intended by the Associates performing the work on a daily basis. The QA/QCC has the authority and duty to stop work if and when necessary to satisfy QA Program requirements.

To verify that the QA Program is successfully implemented at each ITAS operating unit, independent assessments are directed or conducted by the Division Director, Quality Assurance/Quality Control. In addition, operating units are subject to assessments by the Vice President, Quality and Health Services, and by various regulatory authorities and other

94132B2-0196

outside agencies.

1.2 IT Analytical Services (ITAS) Division Organizational Structure

1.2.1 ITAS Operating Units

The ITAS Division consists of twelve operating units at the following locations:

- ITAS-Austin Laboratory (Austin, Texas)
- ITAS-Cerritos Laboratory (Cerritos, California)
- ITAS-Cincinnati Laboratory (Cincinnati, Ohio)
- ITAS-Edison Laboratory (Edison, New Jersey)
- ITAS-Knoxville Laboratory (Knoxville, Tennessee)
- ITAS-Oak Ridge Laboratory (Oak Ridge, Tennessee)
- ITAS-Pittsburgh Laboratory (Pittsburgh, Pennsylvania)
- ITAS-Special Analysis Laboratory (Knoxville, Tennessee)
- ITAS-St. Louis Laboratory (St. Louis, Missouri)
- ITAS-Richland Laboratory (Richland, Washington)
- ITAS-Field Analytical Services-West (Martinez, California)
- ITAS-Field Analytical Services-East (Knoxville, Tennessee)

ITAS is a laboratory network dedicated to the analysis of hazardous, radioactive, and mixed waste material. Radiochemical analyses are performed at the ITAS laboratories located in Oak Ridge, Richland, and St. Louis. Field Analytical Services (FAS) groups, located in California and Tennessee, serve as a key link between field operations and the analytical laboratories.

1.2.2 Organization Charts

The organizational structure for the ITAS Division is displayed in Figure 1.2-1. The organizational structure for each ITAS operating unit is displayed in Appendix Section 1. The quality-related responsibilities of the members of the ITAS Division and of the ITAS operating units are outlined in Section 1.3.

1.2.3 Equipment

A listing of instrumentation used by each ITAS operating unit is shown in Appendix Section 2.

1.2.4 Facility Security

Each ITAS laboratory is a limited access, secure facility. To ensure that only authorized personnel are able to enter the building from an entrance that is not

9413282-0197

monitored, entry into each building is limited in one or more of the following ways at a minimum:

- The use of key pads or electronic locks activated by swipe or magnetic cards which are issued only to authorized personnel
- Locking doors and issuing keys only to authorized personnel
- During business hours, entry is possible only through the main entrance. This entrance is monitored at all times by the receptionist. All guests are required to sign in using the visitor logbook and obtain a visitors badge.
- Alarm systems to detect unauthorized entrance

1.3 Quality Organization

The achievement of quality in all activities is the responsibility of each ITAS Associate. Quality related responsibilities within the operational unit provide for the implementation of the QA Program and completion of quality control (QC) activities.

The quality related responsibilities in IT and the ITAS Division are described in the following sections. The quality-related responsibilities may be reassigned by dividing the activities among different individuals or enhanced by adding activities, but they may not be eliminated.

1.3.1 Vice President, Quality and Health Services, IT Corporation

- Reports directly to the Chief Executive Officer (CEO), IT Corporation
- Approves the ITAS QAMP and the ITAS Operation-Specific QAMP
- Provides independent QA review by participating in or conducting assessments of ITAS operations
- Participates in finding solutions to quality problems not readily resolved within ITAS

1.3.2 Vice President, IT Analytical Services, IT Corporation

- Reports directly to the CEO, IT Corporation
- Approves the ITAS QAMP, the ITAS Operation-Specific QAMP, and ITAS Manuals of Practice (MOP)
- Assumes the ultimate responsibility for the QA Program within ITAS operations
- Assigns specific quality-related responsibilities within the operating units to the ITAS Laboratory and FAS Directors
- Periodically determines the effectiveness of the QA Program, recommending changes to the

94132B2-0198

Division Director, QA/QC

1.3.3 Division Technical Director, IT Analytical Services

- Reports directly to the Vice President, IT Analytical Services
- Maintains and disseminates as appropriate to the laboratories current information on regulations and approved methodologies performed by ITAS laboratories
- Acts as a technical consultant, interfacing with the Division Director, QA/QC for quality related issues to assure uniform technical excellence across ITAS operations
- Provides guidance and training to all Laboratory Technical Directors
- Approves the ITAS QAMP, the ITAS Operation-Specific QAMP and appendices, and ITAS MOPs. Also reviews other quality and technical documents produced by ITAS for accuracy, completeness, and applicability to relevant technical goals, regulations, and methodologies
- Guides implementation of the QA Program through training programs

1.3.4 Division Director, Quality Assurance/Quality Control, IT Analytical Services

- Reports directly to the Division Technical Director with a QA "dotted line" responsibility to both the Vice President, IT Analytical Services and the Vice President, Quality and Health Services, IT
- Reviews and approves ITAS QA documents
- Approves the ITAS QAMP, the ITAS Operation-Specific QAMP and appendices, and ITAS MOPs
- Provides guidance and training to all laboratory QA/QCCs
- Oversees independent assessments (audits) of ITAS laboratories to identify areas where improvement is needed to comply with the QA Program
- Verifies completion of corrective actions required to correct nonconformances identified during assessments
- Acts as the focal point for improvements and changes to the QA Program, approves and initiates these changes
- Discusses unresolved nonconformances identified during assessments or brought to the Director's attention by the QA staff for resolution with the ITAS Operational Directors, Vice President, IT Analytical Services and/or Vice President, Quality and Health Services, IT
- Suspends further processing in operational units that are out-of-control until the nonconformance is

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1.3.5 Division Operations Director, IT Analytical Services

- Reports directly to the Vice President, IT Analytical Services
- Approves the ITAS Operation-Specific QAMP
- Assumes responsibility and provides resources for implementation of the QA Program within the operational units
- Assigns specific quality-related responsibilities within the operational units to resolve problems
- Periodically determines the effectiveness of the QA program

1.3.6 Field Analytical Services Director

- Reports directly to the Vice President, IT Analytical Services with operational responsibility to the Division Operations Director
- Implements the QA Program within the operation
- Approves quality related documents
- Periodically determines the effectiveness of the QA Program within the operation
- Responsible for the issuance of analysis reports for the operation
- Maintains adequate staffing documented on organization charts

1.3.6.1 Field Analytical Services Business Unit/Office Manager

- Reports directly to the FAS Director
- Implements the QA Program within the business unit/office
- Reviews and approves quality related documents
- Conducts project reviews to assure compliance with QA Programs
- Chairs the business unit/office Quality Team
- Coordinates performance of client satisfaction surveys with client QA Officer
- Approves the ITAS Operation-Specific QAMP and the applicable appendix

1.3.6.2 FAS Project Manager

- Directs preparation of quality related documents for projects
- Designs project QA programs to meet project objectives
- Establishes analytical project data quality objectives
- Coordinates with the laboratory to ensure that quality issues are addressed at all stages of a project

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- Assures that project quality requirements are met

1.3.6.3 FAS Field Analytical Specialist

- Prepares project quality documents
- Implements project quality requirements for task performance and documentation
- Prepares and maintains records documenting quality control problems implemented for a project
- Adheres to the ITAS QA Program for governing project activities unless superceded by a project/program-specific plan

1.3.7 Laboratory Director (Operating Unit Director)

- Reports directly to the Vice President, IT Analytical Services with operational responsibility to the Division Operations Director
- Implements the QA Program within the laboratory
- Approves quality related documents
- Approves the ITAS Operation-Specific QAMP and the appropriate appendix
- Periodically determines the effectiveness of the QA Program within the operation
- Maintains adequate staffing documented on organization charts

1.3.7.1 Systems Manager

- Reports directly to the Laboratory Director
- Supervises daily activities of the Project Management, Laboratory Information Management System (LIMS) Operation, Sample Control, Administrative, and Report/Proposal Production Groups
- Oversees the log-in of all samples received, completion of chain-of-custody records, and initiation of project records
- Supervises sample storage facilities
- Works with Operations Manager and/or Group Leaders to assure the requirements of the project are met in a timely manner
- Supervises the verification of software for data processing
- Ensures compliance with QA Program within the laboratory

1.3.7.2 Operations Manager

- Reports directly to the Laboratory Director
- Supervises daily activities of the Operational Groups
- Supervises QC activities performed as a part of routine analytical operations

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- Supervises the preparation and maintenance of laboratory records
- Oversees the preventive maintenance program
- Supervises laboratory participation in interlaboratory accreditation and proficiency programs
- Ensures compliance with QA Program within the laboratory
- In the absence of a Group Leader, assumes their quality responsibilities

1.3.7.3 Quality Assurance/Quality Control Coordinator

- Reports directly to the Laboratory Director or the Laboratory Technical Director as defined by the organizational chart
- Develops and defines the Total Quality Program for the laboratory within Division and Corporate guidelines
- Monitors laboratory practices to ensure conformance with the ITAS QA Program, regulatory requirements and client specified contractual obligations
- Recommends resolutions for ongoing or recurrent nonconformances within the laboratory
- Shuts down out-of-control analyses or laboratory groups if necessary until the nonconformance is corrected and notifies the appropriate Laboratory Director and/or the Division Director, QA/QC
- Reviews data quality measures, including statistical data to verify that the laboratory is meeting stated quality goals
- Closes findings and observations of QA audits
- Performs two QA Systems Audits per year (one full systems audit and one follow-up audit)
- Establishes and supervises laboratory QA training programs
- Assists in the preparation of and approves Quality Assurance Project Plans (QAPjPs)
- Serves as the focal point for the reporting and disposition of nonconformances
- Performs monthly surveillances of the laboratory (except during months when a systems audit or follow-up audit is performed)
- Maintains certification and accreditation programs
- Arranges for insertion of QC samples into the laboratory sample stream and reviews the results
- Performs statistical analyses utilizing results of the QC sample analyses and reviews the data to assure

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compliance with stated quality objectives

- Assists in the performance of QA Systems Audits
- Maintains controlled documents
- Prepares monthly quality report to management
- Performs Client Satisfaction Surveys

1.3.7.4 Technical Director

- Reports directly to the Laboratory Director
- Provides technical overview of laboratory activities
- Establishes and supervises the training of analysts in good laboratory practices and analytical methodologies
- Writes and reviews Standard Operating Procedures (SOPs), assuring compliance with regulations and approved methodology
- Serves as technical consultant to Project Management and analytical staff in choosing the correct methods, QC and analytical techniques
- Evaluates analytical techniques, procedures, and instrumentation and provides recommendations for improvement to the Laboratory Director
- Recommends standards for purchasing instrumentation, equipment, reagents, gases, and chemicals in accordance with SOPs and approved methodologies
- Defines the calibration and preventive maintenance programs
- Approves customer requested variances to methods
- Responsible for specific Division SOPs and method improvement variances
- In some laboratories, supervises the QA/QCC as defined by the organizational chart
- Ensures compliance with QA/QC Program within the laboratory

1.3.7.5 Group Leader/Team Leader

- Reports directly to the Operations Manager or the Laboratory Director in the absence of an Operations Manager
- Serves as the lead analyst within the group (e.g. GC/MS, GC, AA/ICP, General Chemistry, etc.) and supervises daily activities of all other analysts within their group
- Organizes and schedules the analytical testing program with consideration for sample holding times
- Supervises QC activities performed as a part of routine analytical

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operations

- Implements data verification procedures
- Supervises the preparation and maintenance of laboratory records
- Evaluates instrument performance and supervises the calibration and preventive maintenance programs
- Oversees or performs review and approval of all analytical data and submits it to the Project Manager for reporting
- Reports out-of-control or nonconforming situations to the appropriate managers (e.g. Operations Manager, Laboratory Director, Technical Director, and/or Project Manager) and the QA/QCC.
- Supervises maintenance of instruments and scheduling of repairs
- Ensures compliance with QA Program within the laboratory

1.3.7.6 Project Manager

- Monitors analytical and QA project requirements
- Assists the Systems Manager, QA/QCC, and Technical Director with interpretation of work plans or QAPjP requirements
- Assists the Systems Manager in establishing goals, priorities, schedules, and work assignments
- Keeps the laboratory and the client informed of project status
- Approves customer requested variances to methods
- Monitors, reviews, and evaluates the progress and performance of projects
- Reviews data packages for completeness and compliance to client needs
- Prepares Quality Assurance Summaries (QASs)
- Generates and signs analytical reports (or designee)

1.3.7.7 Analyst

- Implements the QA Program within the laboratory
- Performs analytical procedures and data recording in accordance with accepted methods
- Performs and documents calibration and preventive maintenance (may also be performed by a calibration control group)
- Performs data processing and data verification
- Immediately reports out-of-control or nonconforming situations to the Group Leader and QA/QCC

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- Maintains control charts or tables

1.3.7.8 Sample Custodian

- Ensures implementation of proper sample receipt procedures, including maintenance of chain-of-custody
- Logs samples into the LIMS system
- Ensures that all samples are stored in the proper environment
- Assists Waste Management staff with sample disposal

1.3.7.9 Document Control Coordinator

- Receives and initiates chain-of-custody for data packages received from the laboratory
- Maintains custody of data packages

1.3.7.10 Data Reporting Staff

- Accurately transfers data from verified laboratory data packages or laboratory report forms to Certificates of Analyses or other deliverables
- Performs a thorough QA review of all Certificates of Analysis or final reports to verify the accurate transcription of data
- Prepares electronic data transfers (EDTs)

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2.0 QUALITY ASSURANCE PROGRAM DESCRIPTION

2.1 Introduction

IT has defined Quality as "meeting the requirements of our clients, both internal and external". To achieve Quality, a Total Quality Management (TQM) process has been established and is being implemented throughout the company. Part of this implementation is through Division QA Programs.

It is the purpose of the ITAS QA Program, as expressed in the QAMP, to provide data which are of known and acceptable quality. To achieve this, a system is described which controls the following:

- Preservation of samples
- Receipt and handling of samples
- Processing and analysis of samples
- Analytical equipment
- Data verification
- Data reporting
- Records management
- Management review

ITAS recognizes that all laboratory and field Associates affect data quality. This Plan has been prepared so that all IT Associates will be cognizant of the policies adopted by ITAS for the production of analytical data and will be aware of their responsibilities. Specific implementation instructions for quality practices are documented in SOPs for each ITAS operating unit.

As cross referenced in Table 2.1-1, the ITAS QA Program meets the basic requirements of the following references:

- Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80, Office of Monitoring Systems and Quality Assurance, Office of Research and Development, United States Environmental Protection Agency, EPA 600/4-83-004, February 1983
- Quality Assurance Program Requirements for Environmental Programs, American Society for Quality Control, Energy Division, Environmental Waste Management Committee, ANSI/ASQC-E4-19xx (Formerly EQA-1), July 1992
- Quality Assurance Program Requirements for Nuclear Facilities, The American Society of Mechanical Engineers, ANSI/ASME NQA-1-1989 edition

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- Quality Assurance, Office of Nuclear Energy & Office of Environmental Safety and Health, United States Department of Energy, DOE ORDER 5700.6C, August 1991

- Performance Criteria for Radiobioassay, ANSI N 13.30, September 1989

- Measurement Quality Assurance for Radioassay Laboratories, ANSI N 42.2, Revised May 21, 1992, Revision 10A

- Quality Systems-Model for Quality Assurance in Design/Development, Production, Installation, and Servicing, ISO 9001 (ANSI/ASQC Q91-1987)

Additional guides utilized by the radiochemistry laboratories include:

- USNRC Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operation) - Effluent Streams and the Environment

- ASTM Standard Guide C 1009 - 83. Establishing a Quality Assurance Program for Analytical Chemistry Laboratories within the Nuclear Industry

For the purposes of this Plan, the ITAS Quality System is composed of QA and QC activities. The terms are defined and used as follows:

- Quality System - "The collective plans, activities, and events that are provided to ensure a product, process, or device will satisfy given needs." ***ANSI/ASQC Standard A3***

- Quality Assurance - "All those planned or systematic actions necessary to provide confidence that a product or service will satisfy given needs."***ANSI/ASQC Standard A3***

- Quality Control - "A process which measures actual quality performance, compares with standards, and acts on the difference!" ***Juran, 1974***

2.2 Objectives of the QA Program

The overall objective of the QA Program for ITAS operations is to provide data of known quality that meet client requirements. In general, to accomplish this, each laboratory must:

- Maintain an effective, ongoing QC Program to measure and verify laboratory performance

- Meet data requirements for accuracy, precision, and completeness through the use of proven methodologies

- Provide sufficient flexibility to allow controlled changes in routine methodology to meet specific data requirements

- Monitor operational performance of the laboratory on a routine basis and provide corrective action as needed

- Recognize and promptly correct for any

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factors which adversely affect quality

- Maintain complete records from sample submittal through laboratory analysis, data verification, reporting, and sample disposal

In order to meet these objectives, two levels of management controls are required. Controls at the organizational level include all activities that support common or standardized functions such as Associate qualifications and training, document control, and material procurement. Controls at a project level consist of the project-specific QA program activities necessary to produce the desired type and quality of product.

2.3 Quality Assurance Documents

Table 2.3-1 summarizes the ITAS QA documents, the purpose of each, and the required approvals for each. Document control, distribution, and revision is discussed in Section 5.

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3.0 ASSOCIATE TRAINING AND QUALIFICATION

All quality related activities performed by ITAS shall be accomplished by Associates qualified on the basis of education, experience, and training. The following definitions are relevant to the discussion of training in this section:

- Training - In-depth instruction to develop proficiency in the application of requirements, methods, and procedures. Such instruction may be internal or external classroom sessions, courses, or on-the-job assignments.

- Indoctrination - To instruct in fundamentals so as to provide understanding of principles involved.

- Qualification (Personnel) - The characteristics or abilities gained through training or experience or both, that enable an individual to perform a required function.

- Certification - The action of determining, verifying, and attesting, in writing, to the qualifications of personnel (Associates) or material.

- Orientation - The act or process of acquainting individuals with the existing situation, environment, or condition.

3.1 Associate Qualifications

Each operating unit shall have job descriptions for all positions. These job descriptions shall specify the minimum qualifications in terms of education and experience, knowledge, and skills necessary for an Associate to carry out work. The operational supervisors shall compare each Associate's performance with the qualifications established in his/her job description at least annually. This should be done in conjunction with the Associate's Job Performance Review (JPR).

ITAS normally expects necessary knowledge and fundamental chemical laboratory skills to have been demonstrated by formal academic training to include course work in general chemistry, qualitative analysis, quantitative analysis, and instrumental analysis. Qualifications of all professional Associates shall be documented by resumes which include academic credentials, employment history, experience, and professional registrations. A copy of a current resume shall be included in each Associate's training file. When applicable, each professional Associate shall be formally qualified to perform their lab functions by their supervisor. Applicability is dependent upon the Associate's job function. Associates must be formally qualified if their work involves sample management, sample preparation, clean-up, or analysis

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procedures, or project management. Record of personnel qualification must be documented in the Associate's training file. An example form is shown in Figure 3.1-1.

3.2 Orientation and Training of Laboratory Staff

Training is performed to maintain proficiency, promote improvement, and to stimulate professional development. ITAS staffs include professional Associates who are scientists. Such Associates shall be assigned duties within the capabilities of their education and experience by the appropriate supervisor and shall be qualified to perform and train others on specified procedures based on this experience.

ITAS Associates are qualified through indoctrination and experience which is documented in resumes and training files. Each new Associate shall be supervised in their activities by experienced Associates until, in the opinion of the supervisor, they are capable of independently performing their duties. This authorization to perform independently shall be documented in the training files on a personnel qualification form. In addition, training for management Associates shall include professional, managerial, communication, and interpersonal skills. On-going or periodic assessments will be performed to determine training needs and effectiveness of instruction.

An individual training record (example shown in Figure 3.2-1) shall be maintained for each Associate. This form must be reviewed and updated, as necessary, by the Associate on an annual basis.

3.2.1 Quality Assurance Orientation

Each newly hired ITAS Associate is required to go through QA orientation. The QA/QCC shall conduct this orientation in accordance with SOPs within two weeks of the Associate's report-to-work date. The QA/QCC shall review the following topics (at a minimum) with the new Associate:

- Overview of ITAS QA Program
- ITAS philosophy on data integrity and meeting client requirements
- ITAS QA documents
- Pertinent regulatory QA requirements
- Data recording practices
- Nonconformance and corrective action
- Chain-of-Custody procedures

An example form used for documenting QA orientation is shown in Figure 3.2-2.

Following QA orientation, the Associate is required to take a written QA examination

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to demonstrate an understanding of the laboratory QA program and to determine if any areas covered require further training.

3.2.2 Quality Assurance Training

Training in the nature and goals of the QA Program shall be provided at least once a year to all laboratory Associates. Formal training sessions will be conducted and documented by the QA/QCC. The training program shall address regulatory requirements as appropriate, basic QC practices, responsibilities of the technical staff, responsibilities of the QA/QCC, the reporting of nonconformances, and the performance of audits. In addition, each laboratory Associate shall become familiar with the laboratory QA Program by reading pertinent sections of the ITAS QAMP and the Operation-Specific QAMP, and QC procedures appropriate to his/her position.

3.2.3 Health and Safety Orientation

Each newly hired ITAS Associate, contract worker, or working visitor is required to go through a health and safety orientation before they are allowed to work in the laboratory (as per the laboratory Chemical Hygiene Plan). This orientation is to be performed as soon as possible after or within one week of the Associate's report-to-work date. The Associate's immediate supervisor or the laboratory Health and Safety Coordinator should perform this orientation, which includes viewing videotapes on the OSHA Laboratory Standards and "basic" laboratory safety. The Associate will receive information on the following:

- Safety Policy and Program
- Laboratory Emergency (Contingency) Plan
- Safety Equipment
- Material Safety Data Sheets (MSDSs) (content and location)

The supervisor will supply basic job-related information on:

- Chemical Safety
- Electrical Safety
- Thermal Safety
- Mechanical Safety
- Waste Disposal

All health and safety orientations will be documented.

3.2.4 Health and Safety Training

Health and safety training at ITAS is required for all Associates, contracted workers, and temporary help. This training is to be given within 90 days of the start-to-work date and will be provided by Division Health and Safety or by qualified instructors in the laboratories.

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Documentation is maintained in the Associate's training records.

ITAS health and safety training includes the following:

- Laboratory Safety Training (LST)- required for each Associate every two years, at a minimum
- Chemical Hygiene Plan (CHP) Training- each Associate is required to attend an annual refresher

3.2.5 QA/QCC Training

All QA/QCCs shall receive training from the Division Director, QA/QC, so that they are proficient in the requirements of the ITAS QA Program and it's application. Formal training, directed by the Division Director, QA/QC, is performed on an annual basis. Continued proficiency of QA/QCCs shall be maintained through active participation in QA audits and the preparation and review of QA documents. Evaluation of QA/QCC proficiency shall be conducted on an annual basis by the Division Director, QA/QC, as secondary reviewer of the QA/QCC's JPR.

3.2.6 Lead Auditor Certification

ITAS has developed a program for certifying Lead Auditors. QA/QCCs are the primary participants in this program which is described in the ITAS System Procedure No. 8907-QAC-04, "Standard Operating Procedure for Auditors Certification at ITAS Laboratories." All internal ITAS systems audits are lead by an ITAS certified Lead Auditor. Lead Auditor certification is documented with an example form shown in Figure 3.2-3 and with a certificate signed by the Division Director, QA/QC.

3.3 Training Records

Each ITAS Associate has an individual training file maintained by the QA/QCC. The documents included in the training file are the following:

- Associate's resume (current and in ITAS format)
- Individual training record
- Reference to qualifying sample sets
- QA examinations
- Professional certificates (copies)
- Attendance records of training courses
- Personnel qualification records

Each Associate shall review their training file annually, at a minimum, to ensure completeness and correctness of contained information.

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4.0 PROCUREMENT OF ITEMS AND SERVICES

This chapter defines the ITAS requirements for the procurement of items and services. This program will provide for:

- Assurance that purchased items and services meet established requirements and perform as expected
- Evaluation and selection of vendors
- Inclusion of applicable technical and administrative requirements in procurement documents

4.1 Selection of Vendors

Prospective vendors will be evaluated and selected based on the following criteria as appropriate:

- Evaluation of the vendor's history of providing an identical or similar product which performs satisfactorily in actual use.
- Objective evaluation of the vendor's current quality records supported by documentation
- Direct audit of the vendor's technical and quality capability

The QA/QCC shall determine the needed level of qualification based on the importance of the item or service being purchased. Vendors which provide test and measuring equipment, standards, quality related service contracts, or subcontracted laboratory services (quality related items) shall be subject to the more rigorous controls below.

For the procurement of test and measuring equipment it is recognized that the environment in which the measurement system is placed may have a bearing on its performance. Therefore, the QA/QCC may substitute an acceptance testing plan to assure that the measurement system is able to meet specifications in the laboratory environment, in lieu of other supplier qualification activities.

4.2 Procurement of Quality Related Items

The quality of instruments, equipment, standards, reagents, solvents, other chemicals, gases, water, and laboratory containers used in analyses must be known so that their effect upon analytical results can be defined. Items purchased by an ITAS operating unit shall meet the requirements and specifications of client contracts or analytical methods, as detailed in laboratory-specific SOPs. At a minimum, all reagents shall meet the specifications established by the Committee on Analytical Reagents of the American

Chemical Society. If these are not available, a comparable or next best grade shall be used.

Quality specifications shall be included or referenced in the purchasing documents for the procurement of applicable items. The QA/QCC shall approve vendors or items purchased. This approval will be maintained by purchasing from a "QA Approved" list of vendors and items. If items which may affect laboratory quality are requested from non-preapproved vendors, QA approval must be obtained prior to placing the order.

When ordering such items, a system shall be put in place in each laboratory to assure the quality of the item received. Each laboratory shall assign individuals responsible for purchasing materials and controlling them in the laboratory. Duties of the responsible individuals include:

- Specifying in purchase orders or requisitions, suitable grades of materials (grade shall be defined by the QA/QCC or responsible manager)
- Verifying upon receipt that materials meet requirements and that, as applicable, material certificates are provided and maintained in the laboratory Quality/Operations records system
- Identifying and storing materials
- Verifying that material storage is properly maintained, and removing materials from use when shelf life has expired

4.2.1 Role of ITAS Division Purchasing

ITAS Division Purchasing supports the ITAS operations by:

- Maintaining contractual requirements of materials contracts
- Negotiating new contracts
- Identifying potential vendors and subcontractors
- Identifying vendors for unique or scarce materials

In order to enhance standardization of the product within the laboratory network, ITAS Division Purchasing shall pursue National Contracts for:

- Laboratory supplies of known quality and proven reliability
- Instrumentation
- Standards from traceable, certified sources

4.2.2 Procurement Procedures

The specifications for standards, chemical reagents, solvents, gases, water, and other items specified in approved analytical methods shall be met by the laboratory and

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written in method SOPs. In addition, each laboratory must have the following items included in SOPs that cover:

- Checking the purity of standards, reagents, solvents, other chemicals, and water versus intended use
- Storage and expiration of standards, reagents, solvents, and other chemicals
- Requirements for laboratory containers (e.g. volumetric glassware, sample containers)
- Cleaning of glassware prior to use

Corrective actions for failure of an item to meet required specifications are:

- Review current supplies and eliminate from use
- Return to vendor
- Evaluate a new lot or alternate supplier

The Division Technical Director or the Division Director, QA/QC shall be immediately notified of any quality problems with national vendors.

4.2.3 Radioactive Reference Materials

ITAS shall procure only radioactive reference materials which are traceable to the National Institute of Standards and Technology (NIST). If the NIST traceability is not commercially accessible, the best available standard for that isotope shall be used. Certification of traceability shall be procured from the supplier. Documentation received with each standard shall include, at a minimum, the following information:

- Traceability to NIST or other certificate of analysis
- Radionuclide identification with activity and error
- Source identification or traceability number
- Date of assay
- Half-life of radionuclide(s)
- Mass and volume of standards
- Percent of impurities

Receipt, storage, use, control, and disposal of radioactive standards, as well as documentation of these activities, are described in operation-specific SOPs. Sources used to verify continuing calibration shall meet the requirements of this section.

4.3 Procuring Services

Subcontract Laboratory Services - A subcontract laboratory is defined, for the purposes of this QAMP, as a laboratory

external to the ITAS laboratory network. A subcontract laboratory will be used only in the event that an ITAS laboratory does not have the capability or capacity to perform the requested testing, or the customer so directs (in which case the customer then assumes responsibility for subcontractor performance). A subcontract laboratory will be used only after approval is obtained from the client and the quality of the laboratory is determined to be acceptable by ITAS QA/QC staff.

Once it is determined that a subcontract laboratory is required and approval is obtained from the client to use a laboratory external to the ITAS network, the QA/QCC must perform a quality systems audit of the selected subcontract laboratory. This audit must be approved by the Division Director, QA/QC and documented in both the Quality/Operations records at the laboratory and in division subcontract laboratory files. The procedure for the approval to use a subcontract laboratory is detailed in ITAS Division SOP No. IT-QC-0002.

4.4 Internal QC Requirements

4.4.1 Water

ASTM Type II grade or equivalent water at a minimum will be used in all metals, radiological, wet chemistry, and organic analyses. Type II water is obtained by the use of commercial ion-exchange deionizing units including an appropriate polishing unit. The resulting water has a maximum conductivity of 1.0 umho-cm at 25° C, minimum resistivity of 1.0 Mohm at 25° C, maximum total matter of 0.1 mg/L, a minimum color retention time of potassium permanganate of 60.0 minutes, and no detectable soluble silica. Conductivity and/or resistivity will be documented daily in a logbook or file. Maintenance documentation will be kept for both the deionizing units and the polishing unit.

For volatile analyses the water may be further purified by purging with an inert gas before use to remove traces of organic solvents.

Water monitoring procedures used by ITAS operating units are detailed in operation-specific SOPs.

4.4.2 Compressed Air and Gases

Ultra high purity compressed gases from preapproved vendors will be used when required for instrumentation. Compressed air and gasses must meet the requirements and specifications of the analytical methods performed. In-line filters will be used when appropriate to minimize contamination and moisture from the gases.

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4.4.3 Glassware Preparation

Glassware preparation procedures instituted at ITAS operating units are designed to ensure that no contaminants are introduced during sample analysis. Procedures describing glassware preparation are detailed in operation-specific SOPs.

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5.0 DOCUMENT CONTROL AND RECORDS

ITAS has designed and implemented a system to control, distribute, and revise documents affecting quality. These documents are approved by the appropriate positions (see Table 2.3-1). Controlled documents are required to be reviewed and revised, if necessary, on a scheduled basis. The frequency of this review is dependent on regulations and client requirements, but it should occur at least annually. Interim changes to controlled documents may be instituted by the use of a Procedure Change Form (example shown in Figure 5.0-1). Procedure Change Forms require the approval of the laboratory QA/QCC, the Operating Unit Director, and the Division Director, QA/QC. Procedure Change Forms remain in effect until the next revision of the document. They are described in the ITAS System Procedure No. 8906-QAC-03, "Standard Operating Procedure for Preparation and Control of Procedures and Manuals". Controlled documents include but are not limited to this Operation-Specific QAMP, the ITAS QAMP, SOPs, and internally-generated QAPjPs and QAPPs.

5.1 Quality Assurance Management Plan (QAMP)

The ITAS QAMP provides ITAS Quality Assurance policy. It is applicable to and provides direction for all ITAS operations. The Plan discusses both the administrative and technical aspects of Quality Assurance and Quality Control. It is not however, intended that the Plan provide in-depth technical discussion. The Operation-Specific QAMP and SOPs supplement the ITAS QAMP to provide the details of implementation. The QAMP has precedence in policy matters over all other ITAS quality-related documents.

5.2 Operation-Specific QAMP (OS-QAMP)

The OS-QAMP supplements and enhances the ITAS-QAMP (Section 5.1). While the ITAS-QAMP serves as an over-view document and provides ITAS QA policy, the OS-QAMP further provides detailed technical discussions and information that is common to all ITAS operating units. An appendix for each operating unit supplements the OS-QAMP. Each appendix contains information that is specific to that operating unit only.

5.3 Manuals of Practice (MOP)

MOPs are developed to provide in-depth technical discussions of specific topics. For example, a MOP for the field collection, preservation, and shipment of samples to ITAS laboratories provides specific uniform

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direction to IT Associates. The ITAS Chemical Hygiene Plan and Safety Manual are also considered MOPs. MOPs are usable across ITAS operations.

5.4 Standard Operating Procedures (SOPs)

SOPs are the foundation of the documented QA Program within ITAS. There are two levels of SOPs, division and operation-specific. Division SOPs specify methods that are common to all operating units and are standard across the network. Operation-specific SOPs detail procedures that pertain to a particular operating unit. All SOPs are written, detailed instructions describing specific laboratory operations and performance of routine laboratory tasks. They specify what is done, whose responsibility it is to perform tasks, and whose responsibility it is to verify their correctness. SOPs are sufficiently detailed to provide data of acceptable quality and integrity with a minimum loss of data due to out-of-control situations. They also provide for documentation to record the performance of all tasks and their results, and demonstrate the verification of the data each time the data are recorded, calculated, or transcribed. SOPs are written to address the major elements upon which analytical quality depends. ITAS has adopted a standard SOP format for use within the Division. The ITAS standard format for administrative SOPs is shown in Figure 5.4-1. The ITAS standard format for technical SOPs is shown in Figure 5.4-2.

5.5 Quality Assurance Project Plans (QAPjP)

Contractual and regulatory demands, or uniqueness of the scope of work of a project, may require the preparation and implementation of a project-specific QAPjP or QAPP. If a specific project requires a unique QA program, that program with full documentation must be provided to the ITAS operation for implementation. Full documentation will be provided in a QAPjP. The requirements of the project will take precedence over conventional ITAS QA practices for that work. The requirements of the project may not be less stringent than minimum ITAS QA/QC requirements unless requested by the client in writing or approved by the ITAS Division Director, QA/QC. Typical project requirements are as follows:

- The development and/or use of new or modified testing methods
- Special requirements for equipment calibration and maintenance
- Specific contract required detection limits (CRDLs)
- Defined data quality objectives (DQOs) such as accuracy and precision limits or the statistical treatment of data
- Additional or unique documentation or

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records management requirements

5.6 Project and Quality/Operations Records Management

The ITAS QA Program has been developed to provide analytical results of known quality that meet client requirements. To demonstrate that quality has been achieved, each ITAS laboratory maintains a system of records management that includes documents which demonstrate the analytical performance of the laboratory. Laboratory records are identified as either Quality/Operations records or Project records.

All operating unit records, from time of sample receipt through reporting and disposal, shall be available and stored in a manner that safeguards their integrity from tampering, physical damage, and/or loss. For ITAS, this will be separate files in file cabinets in a 24 hour per day secure area at a minimum. Any documentation that directly bears on the reported results must be retrievable if requested by the client or legally compelled by an authorized regulatory agency or court of law. This includes operational and project-specific data. Data may be stored in "real-time" as it is produced, or filed in a manner to allow prompt retrieval and assembly into a complete project file. Operation-specific SOPs shall describe how the complete set of documentation is compiled, including the flow of data forms, locations, responsibilities, and checks on the records management system implemented.

5.6.1 Project Records

Project records are documents which are specific to a project or a group of samples within an ongoing project, such as chain-of-custody and raw analytical data. Project records are stored separately in project files. Each project file shall be indexed, properly labeled, and current.

ITAS will maintain records associated with specific projects as nonpermanent records for the following time periods after completion of a project:

- Analysis performed as part of site mitigation activities - 10 years
- Records associated with facilities governed by the Resource Conservation Recovery Act (RCRA) - 5 years after closure if the analysis was performed prior to closure or for the 30-year monitoring period following closure if the analysis was performed for the purpose of closure monitoring
- Conventional analysis - 7 years

If a special contractual requirement, project requirement, or government regulation requires that records be maintained for a longer period of time, project files will be

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kept as required. For projects that must be kept beyond the periods stated above, the project index shall be marked to indicate the required retention period.

Prior to scheduled record destruction, records shall be reviewed to determine if the holding period should be extended.

5.6.2 Quality/Operations Records

Quality/Operations records are permanent (lifetime) documents which demonstrate overall laboratory operation, such as instrument logbooks, calibration data, and control charts. These records will directly affect the data for a specific project, but in general their applicability is not limited to one project. Quality/Operations files must be indexed, properly labeled, and current.

5.6.3 Record Validation

When records are transferred to a records storage area, they shall be verified by comparing the contents of the container against an inventory sheet listing the contents of the container. If there are any discrepancies, the container and inventory sheet shall be returned to the Associate submitting the records for resolution. When the document container and the inventory sheet are found to be acceptable, the responsible records custodian shall indicate approval by signature and date on the inventory sheet. Records shall be considered valid when the inventory sheet is signed by the custodian[1].

[1] NQA-1, Supplement 17S-1, Section 2.3.

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6.0 USE OF COMPUTER HARDWARE AND SOFTWARE

The purpose of defining controls for computer hardware and software is to protect the integrity of computer-resident data in the laboratory. SOPs are in place in each location so that computer resident data are accurate and defensible. The following references shall be used as guidance for implementation of this system of controls:

- Good Automated Laboratory Practices, US Environmental Protection Agency, (draft), December 28, 1990
- Quality Management and Quality Assurance Standards ISO 9000, Part 3: "Guidelines for the Application of ISO 9001 to the Development, Supply and Maintenance of Software"
- ASTM Method E3140-1 (draft): "New Standard Guide for Laboratory Information Management Systems (LIMS)"
- ANSI N413: "Guidelines for the Documentation of Digital Computer Programs"

6.1 Use of Hardware

Computer equipment used in the generation, measurement, or assessment of client data shall be appropriately designed, be of adequate capacity to function according to specifications, and shall be suitably located for operation, inspection, cleaning, and maintenance. There shall be a written description of the computer system(s) hardware. The computer shall be installed in accordance with manufacturer's recommendations and undergo validation which demonstrates the computer equipment correctly performs its stated capabilities and functions. Changes to computer hardware shall be made only after review and approval of the LIMS Manager and Laboratory Director.

Computer hardware shall be inspected, cleaned, and maintained on a regular basis at a minimum of annually. Each laboratory shall:

- Have SOPs for the maintenance and security of hardware
- Designate an Associate (usually the LIMS Manager) to be responsible for system performance

6.2 Security

Each operating unit shall have procedures in place which secure computer hardware and software systems if that system:

- Contains confidential information that requires protection from unauthorized disclosure
- Contains data in which the integrity must be protected against unintentional error or intentional fraud

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- Is used to acquire, process, or report data

When the computer system(s) contains data that must be secured, each operating unit shall ensure the system is physically secured. Physical and functional access to the system is limited to authorized Associates and introduction of unauthorized external programs or software is prohibited.

The LIMs Manager, or designee, is responsible for maintaining a list of secure, licensed software, and software not on that list is considered unauthorized.

All original software must be stored in a locked, secure area.

6.3 Use of Software

If computer software is used to acquire, process, or report client data, it is necessary to demonstrate that the software correctly performs its intended function. The following definitions are important to this discussion:

- Validation - establishing documented evidence which provides a high degree of assurance that a specific process will consistently produce a product meeting its predetermined specifications and quality attributes. This process demonstrates that the mathematical or statistical model embodied in the computer program is an acceptable representation of the process or system for which it is intended and meets all specified requirements.

- Verification - the process of checking the accuracy of manually or automatically (electronically) entered information.

In general, software is verified by comparing its performance against known results. Verification may be done in several ways (see Sections 6.3.1 and 6.3.2). Each operating unit shall have a software SOP(s) describing the following:

- Software verification and validation
- Data entry and verification
- Changing data
- Data analysis, processing, storage and retrieval
- Backup and recovery of data and software
- Electronic reporting of data
- Definition and storage times for data and software

6.3.1 Industry Standard Software

Industry standard programs are defined as programs which are widely used throughout the profession. These standard programs are brought into ITAS and used without modification. If the program has been prepared external to IT, independent validation is not required. However, the

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program must be verified prior to first use on an ITAS system. To verify the software, example problems must be processed to demonstrate that the program is fully operational. Example problems must fully test the utilized capabilities of the software.

6.3.2 ITAS Developed Software

For programs developed within ITAS and externally prepared programs which are modified by ITAS, complete validation and verification must be performed. Validation must be performed in accordance with an approved reference (Section 6.0) and IT Standard Quality Practice, ITC0010 "Software Development and Usage". The verification process is dependent upon the function of the software and should include:

- For software which only performs numerical manipulation, sample sets of numbers for which results are known should be processed and compared. In this case, known results are usually generated by performing hand calculations using the same equations and procedures as the software. Verification of the software must test the software production of the intended results. Problems must test both the theory, or basis for computation, and the ability of the software to store and manage data.

- Software which performs as part of instrument operation should be verified by processing reference materials through the instrument system. Processed instrument response shall be compared against the standards used. Verification shall be performed annually, at a minimum.

6.3.3 Control of Software Changes

Changes to software shall be controlled. Detailed software control procedures must be available in each ITAS laboratory. Standard forms are used to document and track changes. An ITAS Associate in each laboratory must be assigned to maintain software control, usually the LIMS Manager or programmer. Whenever a program is changed, reverification is necessary. If the software has had features added, previous test problems should be rerun to demonstrate their function has not been affected. New test problems should be processed as discussed above to verify added performance. If software revision changes the basic operation of the program, complete revalidation and reverification of the program is required. All changes must be completely documented.

6.3.4 Software Review and Reverification

Spreadsheets and unprotected software shall be reverified on an annual basis at a minimum. The test problems used to provide initial verification shall be reprocessed and the results compared to demonstrate that performance of the software is unchanged. If software performance has changed, the effect of the change upon intended function and usage

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since last verification shall be assessed. "Effect" must be determined on a case-by-case basis for the scope and impact of incorrectly reported results. If necessary, the data shall be reprocessed and recipients of affected data reports notified. Software programs must be validated upon creation or change and verified annually.

6.3.5 Software Validation and Verification Documentation

Software validation and verification shall be documented by the Associate performing the work, by signing and dating in indelible ink the computer output and supporting calculations. When test problems are used, the input shall be marked to indicate correct usage and the output checked to indicate acceptable comparison. If reference materials are used as the basis for validating and verifying instrument software, the "true" values or certificates for the materials shall be included with the output to demonstrate performance. The verification documentation must be reviewed and approved by the Associate's immediate supervisor, the LIMS Manager or computer programmer, and QA/QCC.

All software validations and all software verifications, whether for initial or subsequent reverification, shall be maintained in the Quality/Operations records management system. A historical file shall be maintained for each program. The file shall include the basis for the verification, such as the test problems or hand calculations, results of the software performance, the results of subsequent reverifications, applicable program code, user manuals, technical documentation and a copy of the program.

6.4 Computer Viruses

ITAS operating units shall employ the use of anti-virus software to detect and remove viruses from secure computer hardware. Any suspicion of a software virus must be immediately reported to the LIMS Manager, the Division Technical Director, and the Division Director, QA/QC.

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7.0 WORK PROCESSES AND OPERATIONS

Much of the environmental project activity is planned and designed external to the laboratory or field operation and presented in the form of a contract, work plan, or QAPjP. Laboratory and field activities are planned, implemented, and assessed to meet client requirements according to approved procedures and methodologies. Many QA systems have been put in place to document the implementation of planned activities. The planning and design of operational systems to accomplish documented implementation are detailed in operation-specific SOPs. The entire process is assessed on a regular basis for conformance to prescribed requirements.

7.1 Standard Operating Procedures

SOPs are in place in all ITAS operating units for analytical and administrative procedures from the receipt of samples in the laboratory through analysis, reporting, and subsequent sample disposal. This includes auxiliary functions as well, such as training, QA/QC, and Health and Safety procedures. The ITAS standard SOP formats are shown in Figure 5.4-1 (administrative) and Figure 5.4-2 (technical). A list of ITAS operating unit SOPs is given in Appendix Section 3.

ITAS operations prepare and maintain, in addition to the Operation-Specific QAMP, a Standard Operating Procedure Manual. The requirements of this OS QAMP for activities such as calibration, field procedures, material procurement and control, preventive maintenance, training, and QC sample analysis shall be incorporated into the SOPs as appropriate.

7.2 Analytical Methods

Whenever possible, ITAS operations utilize industry and regulatory agency recognized analytical methods from source documents published by agencies such as the U.S. Environmental Protection Agency (USEPA), American Society for Testing and Materials (ASTM), and the National Institute for Occupational Safety and Health (NIOSH). Analytical methods used by each ITAS operation are listed in Appendix Section 4.

7.3 Detection Limits

All chemical analytical methodologies have an associated detection limit below which an analyte present in the sample cannot be accurately determined. A detection limit value may be reported in one of three ways:

- As a less than (<) value
- As not detected (ND)

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- As an undetected (U) value

In all cases, the detection limit will also be reported for reference.

Detection limits indicated in methods are highly matrix dependent and are provided for guidance. Depending upon the exact sample composition, stated detection limits may not always be achievable.

The method detection limit (MDL) is defined by the USEPA as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. ITAS uses USEPA Procedure CFR 40 Part 36, Appendix B to determine detection limits. MDLs are determined annually.

For radiochemistry, whether the net result is negative, zero, or positive, the actual calculated result is reported with its associated propagated uncertainty. The detection limit is affected by many factors, such as the length of count, chemical yield, half-life, background of the instrument, counting efficiency, and the matrix interference. The minimum detection limit for radiochemical analyses is defined as the smallest activity of material that yields a net count above background with a 95 percent probability and no greater than a 5 percent probability of calling a blank a true signal. Detection limit calculations, frequency determined, and exact procedures for specific analytical methods are documented in operation-specific SOPs.

Method Detection Limits (MDLs), Practical Quantitation Limits (PQLs), and CRDLs (when applicable) are listed in Appendix Section 5.

7.4 Variance from Stated Methods

Work processes will be performed in accordance with SOPs derived from the methods referenced unless specific project requirements or needs dictate adoption of an alternate method or modification of the cited methods. For example, GC/MS procedures may be "USEPA CLP-modified" if specified by a client.

For some matrices and analytes, ITAS has developed in-house SOPs based on regulatory methods which may include modifications to improve reproducibility and/or accuracy. If an operation is performed in an alternate manner, the method shall be documented in the project records.

7.5 Assessment of Work Processes

All work processes or operations are subject to assessment as described in Section 9.4.

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8.0 DATA COLLECTION AND PRODUCTION OPERATIONS

Laboratory analyses are designed to produce data that are representative of existing conditions present at the time the sample was obtained. The data collection design includes field sampling events, sample handling and custody, analytical operations, data verification, techniques to assess limitations of data use, and data reporting requirements.

In order to provide a sample that most accurately represents the test matrix, field sample collection personnel must abide by the sample collection guidelines and procedures established by involved regulatory agencies. A significant part of the efforts of regulatory agencies include the use of "approved" sample containers, chemical and physical preservation techniques, and observance of specified holding times. Although at times the sampling may be performed by non-ITAS Associates, the importance of sampling and transportation of the sample to the laboratory is understood and must be considered during data validation. Figure 8.0-1 is a flow chart showing the data collection process. The steps presented are described in detail in the following sections.

8.1 Field Collection and Shipment

In order for data to be representative of existing conditions present at the time the sample was collected, it is imperative that all samples be collected and preserved according to the appropriate analytical method specified in the QAPjP or QAPP (if one exists). Sampling requirements must be communicated to the sampling team prior to field collection.

Field personnel are responsible for labeling each individual sample collected with the following information:

- Project number
- Unique sample number
- Sample location (including as appropriate: borehole and depth or grid coordinates)
- Sampling date and time
- Person(s) obtaining the sample
- Sample preservation
- Analysis required

An overriding consideration for the resulting analytical data is the ability to demonstrate that the samples have been obtained from the locations stated and that they have reached the laboratory without alteration. Evidence of collection, shipment, laboratory receipt, laboratory custody, and disposal must be documented

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to accomplish this. Figure 8.1-1 shows the Analysis Request/Chain-of-Custody (AR/COC) form that is used by the ITAS laboratory network.

Field personnel are responsible for initiating the AR/COC form. In addition, they are responsible for uniquely identifying and labeling samples, providing proper sample preservation, and packaging samples to preclude breakage during shipment.

The prompt shipment of samples to the laboratory is required to ensure that required holding times are met. Samples should be shipped by an overnight carrier, be hand-delivered, or transported in a manner that assures prompt delivery to the laboratory.

Some sites require an extensive radioactive screening process before a sample may be shipped. In these cases, it is imperative for the project manager to maintain good communications with the client to assure proper staffing of the laboratory in response to a decreased holding time.

Radioactive samples that are shipped to ITAS operations must be screened and found not to contain radioactivity that exceeds the level stated in the operation license of the laboratory. Samples received by an ITAS operation that contain radioactivity exceeding their license limit will immediately be returned to the project site.

8.2 Sample Containers, Shipping Containers, Preservatives, and Holding Times

8.2.1 Sample Containers

A sample container is defined as the sealed enclosure, usually made of borosilicate glass or plastic, that the sample is collected in and stored in until analysis. All sample bottles provided by ITAS operations for environmental sampling are purchased new and are certified precleaned following appropriate USEPA procedures by the manufacturer. The bottles to be supplied for inorganic analyses are listed in Table 8.2-1. The bottles to be supplied for organic analyses are listed in Table 8.2-2. Radiological sample bottles are listed in Table 8.2-3. All documentation certifying bottle cleanliness must be maintained in the operation's Quality/Operation files.

8.2.2 Shipping Containers

Shipping containers are defined as the sealed enclosure in which the sample containers are stored during shipment from the sample collection site to the analytical laboratory. Shipping containers must be of sufficient number and size to accommodate the samples in an upright condition. Shipping containers must also meet all Department of Transportation (DOT),

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International Air Transportation Association (IATA), International Civil Aviation Organization (ICAO), United Nations (UN), USEPA, and Nuclear Regulatory Commission (NRC) requirements for the shipment of environmental and/or radioactive samples.

Packaged samples must be shipped to the analytical laboratory in a safe manner that preserves the integrity of the samples. The most common method of sample shipment employs coolers or ice chests that are sealed with custody tape and shipping tape. These coolers must be durable and resistant to crushing during shipment. All coolers must be well maintained and cleaned to prevent cross contamination of the samples. It is the ultimate responsibility of the person collecting and packaging the sample for shipment to ensure that the shipping containers are clean and functional. To help prevent sample breakage during shipment, additional consideration must be given to providing shock absorbency to all samples packaged inside the shipping container. Use of bubble-wrap around each sample container is the best way to provide this protection, followed by foam packing materials and vermiculite which are also commonly used.

8.2.3 Sample Preservatives

Most analytes have a finite holding time in a given sample matrix. Sample preservation is the chemical or physical means by which samples are treated during and/or following sample collection to aid in the stability of the analytes of interest for a given sample matrix. The preservation of samples at the time of sample collection will follow the requirements of the analytical methods used. This preservation includes the addition of reagents to deter chemical degradation and the maintenance of refrigeration during transit and ultimate storage in the laboratory. The required preservatives for the analysis to be performed on each matrix are included in Table 8.2-1 for all inorganic analyses and Table 8.2-2 for all organic analyses. Radiological sample preservatives are listed in Table 8.2-3.

8.2.4 Sample Holding Times

Holding time is defined as the maximum allowable time between sample collection (or laboratory receipt for CLP) and extraction or analysis. ITAS has developed a commitment to meeting sample holding times that extends throughout each ITAS operating unit. Each operation has a system in place to ensure that holding times are monitored by each group within the operating unit. It is the responsibility of each ITAS Associate processing the sample to assure that holding times are met. ITAS laboratories are responsible for meeting all

holding times for samples received within 24 hours of collection.

The holding times for inorganic analyses are listed in Table 8.2-1. The holding times for organic analyses are listed in Table 8.2-2. Radiological sample holding times are listed in Table 8.2-3.

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8.2.5 Turnaround-Time (TAT)

TAT is defined as the maximum number of days from sample collection to the date Certificates of Analysis or other deliverables are received by the client. Sample collection personnel must be aware of the holding time and TAT requirements so that they can determine the best method of sample transport and can communicate that information to the laboratory Project Manager.

8.3 Sample Receipt and Initiation of Testing Program

Each ITAS laboratory has a SOP describing this program in detail. The following sections describe the general program followed by all ITAS operating units.

8.3.1 Sample Receipt

Samples shall be received and logged in at ITAS operations by a designated sample custodian or properly trained designee back-up. Upon sample receipt, the sample custodian shall, as appropriate:

- Wear appropriate personal protective equipment (PPE). At a minimum, this consists of gloves, a lab coat, safety glasses, and in some cases a respirator
- Examine the shipping containers to verify that the custody tape is intact
- Examine all sample containers and determine if the temperature required by the requested testing program (normally 4°C ± 2°C) has been maintained during shipment. Document shipping container temperature on the AR/COC
- Examine all sample containers for damage
- Compare samples received against those listed on the AR/COC
- Verify that sample holding times have not been exceeded
- Examine all sample paperwork for correctness and completeness
- Determine sample pH (if required for the scheduled analysis) and record on the AR/COC
- Sign and date the AR/COC immediately (only after shipment is accepted) and attach the waybill
- Note any problems associated with the samples on the AR/COC, immediately initiate a Condition Upon Receipt Variance Report (CUR), and notify the Project Manager who in turn notifies the client
- Attach appropriate laboratory sample container labels with laboratory ID, test, and preservative information

- Place the samples in proper laboratory storage

8.3.2 Sample Log-in

Sample log-in activities at ITAS operating units are fully documented in operation-specific SOPs. The following is a general description of the log-in process:

- Enter the samples in the laboratory sample log-in book, and/or the sample management computer system (LIMS) which contains the following information at a minimum:
  - Project identification number
  - Sample numbers (both client and laboratory)
  - Type of samples
  - Required tests
  - Date received in laboratory
- Notify the Project Manager and appropriate Group Leader(s) of sample arrival
- Place the completed AR/COCs, waybills, and any additional documentation in the project file

8.3.3 Sample Storage

The primary considerations for sample storage are:

- Maintenance at prescribed temperature, if required, which is typically 4°C ± 2°C
- Processing samples within the prescribed holding time for the parameters of interest
- Maintenance of sample integrity through adequate protection from contamination from outside sources or from cross-contamination of samples. Low-level and high-level samples, when known, must be stored separately. When applicable, samples and standards must be stored in separate refrigerators or freezers.

The requirements listed on Tables 8.2-1, 8.2-2, and 8.2-3 for temperatures and holding times shall be used. Placing of samples in the proper storage environment is the responsibility of sample control personnel who shall notify the Operations Manager and Group Leaders if there are any samples which must be analyzed immediately because of holding time requirements.

8.3.4 Internal Sample Chain-of-Custody

Internal sample custody is tracked and documented in ITAS laboratories as described in operation-specific SOPs. The sample custody documentation shall include, but is not limited to the following:

- Signatures for relinquishing and receiving samples or sample extracts
- Listing of all procedures (sample preparation and analysis) performed on the sample and sample extract

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- Laboratory and project identification
- Sample matrix
- Laboratory sample numbers

8.3.5 Sample Disposal and Return Chain-of-Custody

After the requested analyses on the samples have been completed, any remaining portions of the samples will be maintained by the sample custodian until the samples are disposed of or returned to the client. The disposal of each sample is recorded on the client's Chain-of-Custody (COC) form or referenced in the project file. Sample disposal procedures and documentation are described in operation-specific SOPs.

For NRC or state licensed laboratories, a real time inventory of all radioactive isotopes contained in the laboratory (including radioactive samples), as required by the NRC or state, is maintained by the Radiation Safety Officer (RSO). If the quantities of radioactive materials in-house approach the limits of the laboratory NRC license, appropriate action will be taken to ensure the license is not exceeded. This may involve returning samples to clients immediately.

The original copy of the client's COC form will be maintained in the appropriate laboratory project file unless the entire sample is physically transferred off-site. In that case, the original COC record will be signed off as relinquished by the sample custodian or designee and will accompany the sample in shipment. A copy of the completed COC form will be retained in the laboratory project file. In the case where an aliquot of a sample is shipped from the laboratory, a new COC will be generated by the laboratory and shipped with the sample aliquot and the original COC will be retained in the project file.

8.4 Calibration Procedures and Criteria

8.4.1 Calibration System

All equipment and instruments used at ITAS operations for quantitative measurements are controlled by a formal calibration program. Two types of calibration are discussed in this section. These are operational and periodic calibrations. Operational and periodic calibration procedures are described in operation-specific SOPs. At a minimum, these procedures shall include:

- Equipment to be calibrated
- Reference standards used for calibration
- Calibration technique and sequential actions
- Acceptable performance tolerances
- Frequency of calibration

- Calibration documentation requirements

Whenever possible, recognized procedures, such as those published by ASTM or the USEPA, or procedures provided by manufacturers shall be adopted. If established procedures are not available, a procedure shall be developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured.

8.4.2 Reference Standards

Two types of reference standards are used within ITAS operations for calibration: physical reference standards and chemical reference standards.

8.4.2.1 Physical Reference Standards

Physical reference standards include weights for calibrating balances and certified thermometers for calibrating working thermometers. These are generally associated with periodic calibrations. Whenever possible, physical reference standards shall have known relationships to nationally recognized standards such as the National Institute of Standards Technology (NIST), formerly the National Bureau of Standards (NBS). If national standards do not exist, the basis for the reference standard shall be documented.

- Physical reference standards shall be used only for calibration procedures and shall be stored separately from equipment used for analysis.

8.4.2.2 Chemical Reference Standards

These standards are generally associated with operational calibration. Chemical reference standards include Standard Reference Materials (SRMs) provided by NIST, the USEPA, or other recognized standards agency. This may include vendor-certified materials traceable to NIST or USEPA SRMs. Radioactive reference materials are discussed in Section 4.2.3.

8.4.2.3 Standard Verification

Standard verification is performed at all ITAS laboratories by comparison of a standard with a SRM or second-source standard. For chemical analyses, ITAS operating units shall use purchased standard mixes, when possible, from two different sources. The response factors of the two shall be compared. Neat standards shall be used only when standard mixes are not available. If only one standard source is available, the laboratory shall have two different analysts prepare the stock solution and dilutions of the stock solution. The laboratory shall then compare the response factors of these two separately prepared standards. In the rare cases, such as dioxin standards where costs are significant, new

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standards shall be compared to previous standards for verification. Operation-specific SOPs shall define the specific requirements and process of standard preparation and verification.

8.4.3 Operational Calibration

Operational calibration is routinely performed as part of instrument usage, such as the development of a standard calibration curve. Operational calibration is generally performed for instrument systems.

A summary of the various operational calibrations performed at ITAS operations is shown in Tables 8.4-1 for inorganic method calibrations, and 8.4-2 for organic method calibrations.

8.4.4 Periodic Calibration

Periodic calibration is performed at prescribed intervals. In general, equipment which can be calibrated periodically is a distinct, singular purpose unit and is relatively stable in performance. ITAS operations perform this type of calibration on balances, micropipettors, and thermometers.

Each ITAS operating unit has SOPs in place for the calibration of equipment requiring periodic calibration. Periodic equipment calibrations employed at ITAS operations are listed along with their respective calibration criteria in Table 8.4-3.

8.4.5 Calibration Failure

Equipment that fails calibration or becomes inoperable during use shall be removed from service and segregated to prevent inadvertent use, or shall be tagged to indicate it is out of calibration. Such equipment shall be repaired and recalibrated before reuse.

Recalibration may occur more frequently than scheduled. At any time, if equipment calibration becomes suspect, it shall undergo a calibration check to determine whether the current calibration is still acceptable or if recalibration is required.

8.4.6 Calibration Records

Calibration records shall be prepared for each piece of equipment subject to calibration and shall be maintained according to operation-specific SOPs.

All calibration records (operational and periodic) directly affect data and may not be limited to one project. These records shall be stored in the operating unit Quality/Operations files unless it is required for a project that they be stored in the project file.

8.5 QC Sample Analysis

QC samples are routinely added to the

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normal laboratory sample stream to demonstrate that the laboratory is operating within prescribed requirements for accuracy and precision. Statistical evaluation of QC sample data is discussed in Section 9.2. It is mandatory that all types of QC samples be handled and treated in the field and in all areas of the laboratory in the same manner as actual client samples.

QC levels and types of QC samples are described in the following sections. Laboratory QC samples are also listed per type of analysis in Table 8.5-1 for inorganic analyses and Table 8.5-2 for organic analyses. These tables also list the required frequency, acceptance criteria, and corrective actions. Radiochemistry QC samples are listed in Appendix Section 8 where applicable.

ITAS requires a minimum QC sample analysis frequency of 15%. When QC sample analysis requirements are not specified by a method, the following minimum will be used:

- Method blank
- Laboratory Control Sample
- Matrix Spike sample <u>or</u> Duplicate sample

8.5.1 QC Levels

Following are definitions of the ITAS QC levels:

Level I: ITAS Standard Practice. Use available analytical procedures. Fifteen percent QC samples (blank/spike/duplicate or duplicate spike) for every 20 samples of a given matrix. QC samples may not be performed for a specific project, but as part of compiled sets of samples. QC data are not reported with the analytical results.

Level II: ITAS Standard Practice/Project Specific. Use available analytical procedures. Fifteen percent QC samples minimum (blank/spike/duplicate or duplicate spike) for every 20 samples of a given matrix. QC samples are client or project specific. QC summary report is included with the analytical results. No raw data are included.

Level III: CLP or Equivalent. Use referenced regulatory procedures and/or established/verified procedures using confirmatory techniques. Method blank plus two QC samples minimum per each matrix. QC summary report is supplied with supporting data. Where applicable, this is the USEPA CLP package.

Level IV: Project Specific. QC requirements are defined in a QAPjP, Work Plan, Contract or other specific plan or procedure. Project documentation must be submitted to the laboratory prior to sample submittal.

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8.5.2 Field QC Samples

When field QC sample collection and analysis are required for a project, it is the responsibility of the project sampling supervisor to ensure that this sampling is performed correctly and at the project-required frequencies. Field QC samples may or may not be identified as such to the laboratory and will undergo sample preparation and analysis procedures identical to the actual field samples. Field QC sample results are reported in the Certificate of Analysis or other project-required deliverable. The results are stored in the project file with which they are associated.

Field QC sample types, applicability to organic and inorganic analyses, precision and accuracy applications, and persons they are introduced by are summarized in Table 8.5-3. The following sections provide descriptions of field QC samples.

8.5.2.1 Trip (Travel) Blank (TB)

Volatile organics samples are susceptible to contamination by diffusion of organic contaminants through the Teflon-lined, silicone, rubber septum of the sample vial. Therefore, Trip Blanks, also referred to as Travel Blanks, shall be analyzed to monitor for possible sample contamination during shipment. TBs will be prepared by filling two VOA vials (40 ml) with organic-free water and shipping the blanks with the field kit. TBs accompany the sample bottles during collection and shipment to the laboratory and are stored with the samples.

8.5.2.2 Field Blank (FB)

A FB is a volume of water (or soil) that is provided by the sample collectors to demonstrate the absence of contamination during sampling. Deionized, distilled laboratory water, or previously-prepared solid materials (i.e. lab sand) is placed into sample containers by the sample collection crew, packaged, and shipped with the other field samples.

8.5.2.3 Rinsate Blank

A rinsate blank is a volume of rinse solution (deionized, distilled lab water or organic solvent) used to rinse a sampling tool which contacts multiple samples. The rinse solution is collected after the tool has collected a sample and has been cleaned, to demonstrate that there is no residual contamination remaining on the tool to carry over into the next sample.

8.5.2.4 Field Duplicate (FD)

A FD sample is a duplicate sample which has been introduced as a separate sample by the sample collection personnel. Results of FD samples provide a measure of field precision.

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8.5.2.5 *Field Matrix Spike Analyses*

A field MS sample is created by spiking target analytes into a portion of a sample in the field at the point of sample acquisition. This sample provides information on the target analyte stability after collection and during transport and storage.

8.5.2.6 *Collocated Samples*

Collocated samples are independent samples collected in such a manner that they are equally representative of the variable(s) of interest at a given point in space and time. Examples of collocated samples include: samples from two air quality analyzers sampling from a common sample manifold or two water samples collected at essentially the same time and from the same point in a lake.

Collocated samples processed and analyzed by the <u>same</u> organization provide intralaboratory precision information for the entire measurement system including sample acquisition, handling, shipping, storage, preparation, and analysis. Both samples can be carried through the steps in the measurement process together to provide an estimate of short-term precision for the entire measurement system. Likewise, the two samples, if separated and processed at different times or by different people, and/or analyzed using different instruments, provide an estimate of long-term precision of the entire measurement system.

Collocated samples processed and analyzed by <u>different</u> organizations provide interlaboratory precision information for the entire measurement system.

8.5.2.7 *Replicated Sample Analyses*

A replicated sample is a sample that has been divided into two or more portions at some step in the measurement process. Each portion is then carried through the remaining steps in the measurement process.

8.5.2.8 *Split Sample*

A split sample is a sample divided into two portions. One portion is sent to a different organization or laboratory and subjected to the same environmental conditions and steps in the measurement process as the portion retained.

A split sample can be divided into portions at different points in the sampling and analysis process to obtain precision information on the various components of the measurement system. For example, a field split sample provides precision information about all steps <u>after</u> sample acquisition including the effects of storage, shipment, analysis, and data processing; whereas, information on the intra- and

interlaboratory precision of sample preparation and analysis steps of the measurement system is provided by samples split once they are received in the laboratory.

8.5.3 Laboratory QC Samples

Laboratory QC samples, when successfully analyzed, demonstrate that the functions which are under laboratory control are within acceptable limits. Any laboratory QC sample results that are outside of acceptable limits must be documented on a nonconformance memo. Laboratory QC sample types, applicability to organic and inorganic analyses, precision and accuracy applications, and persons they are introduced by are summarized in Table 8.5-4. In addition, Tables 8.5.1 (inorganic) and 8.5-2 (organic) list laboratory QC samples, acceptance criteria, and corrective actions per analytical method. The following sections provide descriptions of laboratory QC samples.

8.5.3.1 Method Blank (MB)

A MB is a volume of deionized, distilled laboratory water for water samples, or a purified solid matrix for soil/sediment samples carried through the entire analytical procedure. The volume or weight of the blank must be approximately equal to the sample volume or sample weight processed. A MB shall be performed with each group of samples. Analysis of the blank verifies that method interferences caused by contaminants in solvents, reagents, glassware, and other sample processing hardware are known and minimized. Optimally, a MB should contain no greater than the reporting limit for the parameter. Results of MB analyses shall be maintained with or referenced to the corresponding analytical data in the project file.

8.5.3.2 Reagent Blank (RB)

A reagent blank is composed of the materials which will be added to client samples during preparation, and analyzed for specific parameters. It is analyzed to verify that no laboratory contaminants are present at levels which would affect sample results. RBs must be successfully analyzed prior to sample analysis. Records of associated solvent lots and column absorbent test results are stored in Quality/Operation files.

8.5.3.3 Duplicate Sample Analyses

Duplicate analyses are performed to evaluate the precision of an analysis. Results of the duplicate analyses are used to determine relative percent difference. Criteria for evaluating duplicate sample results are provided in Section 9.2.

8.5.3.4 Continuing Calibration Standard (CCS)

Because standards and calibration curves

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are subject to change and can vary from day to day, a midpoint standard or check standard should be analyzed during each time period required by the analytical method. Analysis of this standard is necessary to verify the standard curve and may serve in some cases as sufficient for calibration.

8.5.3.5 Surrogate Standard (SS)

A SS determination should be performed on all samples and blanks for methods requiring surrogate usage. Surrogates should be similar to the target analytes in chemical composition and behavior in the analytical process, but not normally found in environmental samples. All samples and blanks are fortified with surrogate spiking compounds before purging or extraction to monitor preparation and analysis of samples.

8.5.3.6 Laboratory Matrix Spike (MS)

To evaluate the effect of the sample matrix on analytical methodology, a separate aliquot sample should be spiked with the analyte(s) of interest and analyzed with the sample. The percent recovery for the respective compound will then be calculated. If the percent recovery falls outside established QC limits, the data and other associated QC sample results should be evaluated and the sample may require reanalysis if criteria are not met. This type of MS does not necessarily reflect the behavior of the field-collected target analyte, especially if the target analyte is not stable during shipping or storage.

8.5.3.7 Laboratory Matrix Spike Duplicate (MSD)

Similar in concept to the MS sample, a MSD is a separate aliquot sample that is spiked with the analyte(s) of interest and analyzed with the associated sample and sample matrix spike. If the percent recovery falls outside established QC limits, the data and other QC sample results should be evaluated and the sample may require reanalysis if criteria are not met. The comparison of the recoveries of the spiked compounds in the MS and MSD samples is made to determine the relative percent difference (RPD) between the MS/MSD samples.

8.5.3.8 Laboratory Control Sample (LCS), Blank Spike (BS), or QC Check Standard

A LCS is a blank sample spiked with the parameters of interest or is a matrix of known parameter concentrations that is carried through the entire analytical procedure. Analysis of this sample with acceptable recoveries of spiked materials demonstrates that the laboratory techniques for this method are in control. Where required, this sample is analyzed in conjunction with MS/MSD samples. If the

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MS/MSD pair shows poor recoveries due to interferences or matrix effects, yet the LCS is acceptable, this is strong evidence that the method has been performed correctly by the laboratory for these samples, but the sample matrix has affected the results. Results of LCS analyses must be cross-referenced with the corresponding MS/MSD and sample analytical data in the project file. LCSs are control charted to graphically demonstrate laboratory control or monitored through use of control tables. LCSs are described in the ITAS Division SOP No. ITAS-IT-QC-0004, "Use and Purpose of Laboratory Control Samples."

8.5.3.9 Analytical Spike (AS)

An AS sample is created by spiking target analytes into a prepared portion of a sample just prior to analysis. It provides information on matrix effects encountered during analysis such as suppression or enhancement of instrument signal levels. It is most often encountered with elemental analyses involving the various forms of atomic spectroscopy and is often referred to as the "method of standard additions" (MSA).

8.5.3.10 Internal Standard Spike (IS)

An IS is an analyte which has the same characteristics as the surrogate, but is added to a sample just prior to analysis. It provides a short-term indication of instrument performance, but it may also be an integral part of the analytical method in a non-quality control sense, e.g., to normalize data for quantitation purposes.

8.5.4 Matrix QC Samples

Matrix QC samples include MS, MSD, and duplicate samples which are discussed in Section 8.5.3.

8.5.5 Radiological QC Samples

Radiological QC samples are listed in Section 8 of the OS QAMP appendices when applicable. The following is a discussion of QC samples that are specific only to radiochemical analyses.

8.5.5.1 Yield Monitors

Yield monitors are added to the actual samples. There are two types of yield monitors: tracers and carriers. A tracer is a radioisotope usually of the same element, and usually having the same mode of decay as the analyte, that is added to the sample to monitor recovery. A carrier is a non-radioactive solution added to assist in isolating the specific isotope of an element. When standardized, the carrier can also provide recovery information gravimetrically.

8.5.6 Performance Evaluation Samples (PEs)

PE samples may be blind or double-blind and may be internal or external. PE

samples are discussed in detail in section 9.4.1.

8.6 Data Reduction, Verification, and Reporting

Data review procedures, ideally defined as a set of computerized and manual checks applied at various appropriate levels of the measurement process, will be clearly defined for all measurement systems in operation-specific SOPs. Responsibilities for data and report review are defined in the ITAS Division SOP No. ITAS-IT-QC-0003, "ITAS Data and Report Review Responsibilities". Data review begins with the reduction (processing) of data and continues through verification of the data and the reporting of analytical results. Calculations are checked from the raw data to final value prior to reporting results for each group of samples. Data reduction can be performed by the analyst who obtained the data or by another analyst. Data verification starts with the analyst and continues with review by a second level reviewer who verifies that data reduction has been correctly performed and that the reported analytical results correspond to the data acquired and processed. The procedure is outlined in Figure 8.6-1.

8.6.1 Data Reduction

The analyst's responsibilities for data reduction include the following:

- Proper identification of analysis output (charts, chromatograms, mass spectra, etc.)
- Calculation of instrument linearity
- Calculation or verification of QC sample/standard results
- Calculation or verification of sample results
- Use of proper data recording procedures (as described in operation-specific SOPs)
- Documentation of problems encountered
- Reporting of any nonconformances
- Continuation of internal chain-of-custody, if applicable

In general, data will be processed by an analyst in one of the following ways:

- Manual computation of results directly on the data sheet or on calculation pages attached to the data sheets
- Input of raw data for computer processing
- Direct acquisition and processing of raw data by a computer

If data are manually processed by an analyst, all steps in the computation shall be provided including equations used and the source of input parameters such as response factors (RFs), dilution factors, and calibration constants. If calculations are not

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performed directly on the data sheet, they may be attached to the data sheets.

For data that are input by an analyst and processed using a computer, a copy of the input shall be kept and uniquely identified with the project number and other information as needed. The samples analyzed must be clearly defined.

If data are directly acquired from instrumentation and processed, the analyst must verify that the following are correct:

- Project and sample numbers
- Calibration constants and RFs
- Units
- Numerical values used for detection limits (if a value is reported as "less than")

Analysis-specific calculations for methods are provided in operation-specific SOPs. In cases where computers perform the calculations, software must be validated or verified (if industry-standard software is used) in accordance with operation-specific SOPs before it is used to process data. Software validation and verification is discussed in Section 6.0.

The analyst (initial reviewer) is further required to initiate a data review check list for each batch of samples. Data review check lists are described in the ITAS Division SOP No. ITAS-IT-QC-0003, "ITAS Data and Report Review Responsibilities". ITAS data review check lists are shown for the following analyses:

- Metals (Figure 8.6-2)
- General Chemistry (Figure 8.6-3)
- Air (Figure 8.6-4)
- Radiochemistry (Figure 8.6-5)
- GC/MS (Figure 8.6-6)
- GC (Figure 8.6-7)
- HPLC (Figure 8.6-8)
- Dioxins/Dibenzofurans (Figure 8.6-9)

Data review check lists define and document the reviews that are performed on analytical data. The data review check list contains the specific items to be verified for the applicable test method. The items in the check list must be addressed by the initial reviewer (analyst), who must add to the check list any comments that should be relayed to the Project Manager for inclusion in the case narrative. The signature of the reviewer on the check list will serve to document that the initial data verification has been performed.

8.6.2 Data Verification

Following the completion of the initial

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review by the analyst, a systematic second-level review of the data is performed by an experienced peer, technical person, or supervisor. The second level reviewer examines the data using the appropriate check list signed by the analyst. This review includes at least 20% of all items listed and in some cases up to 100% of all items (e.g. if mistakes are found in the 20% review). Any exceptions noted by the analyst must be reviewed. Included in this review is an assessment of the acceptability of produced data with respect to:

- Adherence of procedure used to the requested analytical method or SOP
- Correctness of numerical input when computer programs are used
- Numerical correctness of calculations
- Correct interpretation of chromatograms, mass spectra, etc.
- Acceptability of QA/QC data
- Documentation that instruments were operating according to method specifications (calibrations, performance checks, etc.)
- Documentation of dilution factors, standard concentrations, etc.

This review also serves as verification that the process that the analyst has followed is correct in regard to the following:

- The analytical procedure follows the methods and specific instructions given in the QAS, QAPjP, SOP, and/or project file
- Nonconforming events have been addressed by corrective action as defined in a nonconformance memo
- Relevant comments about sample or analysis problems are clearly stated
- Valid interpretations have been made during the examination of the data and the review comments of the initial reviewer are correct
- The package contains all of the necessary documentation for data review and report production, and results are reported in a manner consistent with the method used for preparation of data reports

The specific items covered in the second-level review may vary according to the analytical method, but this review of the data must be documented on the data review check list with the signature of the person performing the review.

A third-level review is performed by the Project Manager. This review is required before results are submitted to clients. This review serves to verify the completeness of the data report and to ensure that client project requirements are met for the analyses performed. The items to be reviewed are:

- Analysis results are present for every sample in the analytical batch or sample delivery group
- Every parameter or target compound requested is reported with either a concentration of detection limit
- The correct units and correct number of significant figures are given for each sample and each parameter reported
- If specific data reporting forms were requested, all forms are present and are completed correctly
- All nonconformances and data evaluation statements that impact the data quality are accompanied by clearly expressed comments from the laboratory
- The final report is legible, contains all the supporting documentation required by the project, and is in either the standard ITAS format or in the client-required format

A case narrative to accompany the final report will be prepared by project management. This narrative will include relevant comments from the earlier reviews as determined by the Project Manager.

8.6.3 Data Reports

The format and content of data reports are dependent upon client needs such as client or contract requirements and government agency reporting formats. There are three general categories of data reports:

- Certificate of Analysis
- Data Package
- Electronic Data Transfer (EDT)

8.6.3.1 Certificate of Analysis

ITAS laboratories report data in a standard format, unless client or contract requirements take precedence. Figure 8.6-10 shows pages one and two of the standard ITAS Certificate of Analysis.

On page one, client/project information is presented such as:

- Client name and address
- Date
- Job Number
- Purchase Order number
- Project Identification
- Date samples received
- Number and type of samples

After the client/project information, explanatory text begins with an

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Introduction. The Project Manager or designee signs page one after reviewing and approving the report.

Page two continues the explanatory text section with an Analytical Results/Methodology section and a Quality Control section. Following page two is a presentation of the results of the testing program along with QC sample summaries as appropriate.

Data presentation includes:

- Sample identification (both client and laboratory ID)
- Parameter(s) analyzed
- Reported values
- Units of measurement
- Detection limit(s)
- Explanation of abbreviations used, if applicable
- Dates of extractions/digestions and analysis
- QA/QC data (if requested by the client)

8.6.3.2 Data Package

ITAS routinely prepares data packages in accordance with USEPA CLP protocol for samples analyzed according to the CLP Statement of Work. "CLP-like" data packages are also routinely provided for non-CLP analyses. Data packages shall be prepared to meet client and contractual needs. Special data package requests should be addressed with the laboratory prior to sample analysis to assure the proper protocol is followed to generate the needed data package elements.

In general, data packages consist of a case narrative followed by computer-generated data forms, supported by copies of all associated raw data. This may include but not be limited to copies of:

- Chromatograms
- Extraction notes
- Digestion logs
- Strip charts or instrument computer printouts
- Data worksheets
- Standards logs
- Chain-of-Custody records

8.6.3.3 Electronic Data Transfer (EDT)

Upon request, data may be transmitted via computer or diskette. Each operating unit will work with the client to provide a computer format that is consistent with the output of laboratory data and meets contractual needs. Procedures for EDT are documented in operation-specific SOPs.

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8.6.3.4 Verbal Results

Any analytical results communicated verbally or by facsimile should be reviewed and approved prior to the communication. Thus, these results must be of the same quality as the hard copy report.

8.6.3.5 Data Reporting

Sample results are reported per analytical method SOPs or per contract specification. Normally, the laboratory determines a reporting limit at which any analyte of interest detected at or above that level is reported as a positive value and any analyte of interest not detectable or detected below that level is reported as a "less than" value. However, in some cases a situation may occur, due to a contractual requirement, QAPjP, QAPP, client request, etc., that requires the laboratory to report sample results in a specified manner. Some examples are given below:

- The laboratory may be requested to report all analytes of interest that are less than the laboratory's reporting limit but are measurable by the analysis. This data will be flagged with an appropriate qualifier.

- The laboratory may be requested to report any tentatively identified compounds less than or greater than the laboratory's reporting limit. This data will be flagged with an appropriate qualifier.

- The laboratory may be requested to report sample results using a reporting limit that is higher than their normal level. In this case, all analytes of interest not detected or detectable below that level would be reported as "less than" and only the analytes of interest found at or above that level would be reported as positive values. In this case, the laboratory will state the specified reporting level rather than their normal levels.

In these types of cases, the laboratory must include documentation in the project file that supports their reporting procedure.

It is the responsibility of the laboratory to provide for a reporting system that ensures that any problems associated with an analysis are properly documented on a nonconformance memo, communicated to the appropriate ITAS Associates, and addressed appropriately in the data report.

8.7 Data Validation

In ITAS and this OS QAMP, data validation refers to data reviews conducted in accordance with the USEPA CLP "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses" and "Laboratory Data Validation Functional Guidelines for Inorganic Analyses". Data validation performed by ITAS will be done according to ITAS Division SOP No. ITAS-IT-DV-001, "Quality Assurance Plan - Data Validation".

This form of data validation provides an impartial confirmation of the laboratory's results. It is usually performed by a third party. Qualifiers are assigned to data, when required, per the above mentioned documents. The ITAS FAS units routinely perform data validation services.

8.8 Preventive Maintenance

Instruments, equipment, and parts are subject to wear, deterioration, or change in operational characteristics. Within ITAS, preventive maintenance is an organized program of actions taken to maintain proper instrument and equipment performance. The primary purpose of this program is to prevent instrument and equipment failure and minimize down time. A properly implemented preventive maintenance program increases the reliability of a measurement system.

Each instrument or piece of equipment shall be uniquely identified. Each operating unit shall maintain the following:

- Instrument/equipment inventory list
- Instrument/equipment major spare parts list or inventory
- External service contract documents (if applicable)
- Instrument-specific preventive maintenance logbook or file for each functional unit

The record of maintenance shall include at a minimum:

- Actions taken, including parts replaced
- Analyst initials and date maintenance was performed

ITAS documents and describes in detail instrument/equipment preventive maintenance in operation-specific SOPs. SOPs are specific to the type of instrument or equipment being used for sample analysis.

8.8.1 Responsibilities

Within each laboratory, the Operations Manager is responsible for overseeing the preventive maintenance program. Group Leaders and Analysts actually implement and document the program. The QA/QCC shall review implementation to verify compliance.

8.8.2 Frequency of Maintenance

The frequency of maintenance must consider manufacturer's recommendations and previous experience with the instrument or equipment. Schedules of preventive maintenance along with the required frequency are shown in Appendix Section 7.

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9.0 QUALITY ASSESSMENT AND RESPONSE

Each ITAS operating unit shall establish, implement, and document procedures to detect, prevent, and correct quality problems and to ensure quality improvement. Items and processes that do not meet established requirements must be investigated to determine their cause. Improvements must be implemented in the operations which will prevent a recurrence of these quality problems and provide overall quality performance. All phases of laboratory work should be designed with the objective of preventing problems and improving quality on a continuous basis.

9.1 Internal QC

The quality of all data produced at ITAS operations is demonstrated by the analysis of required QC samples in addition to the specified method performance criteria such as calibrations. Operation-specific SOPs include information on all requirements for the type of QC samples, their target frequencies, and target acceptance criteria for each analytical methodology to be used. Additionally, these SOPs describe the appropriate actions to be taken when a QC sample result does not meet target acceptance criteria. This information is listed in Table 8.5.1 for inorganic QC samples and Table 8.5-2 for organic QC samples.

9.2 Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

Section 8.5 of this document describes the QC samples that are employed at ITAS as a routine part of sample analysis. The results of these QC samples will be used to validate the precision and accuracy of the laboratory measurements. QC samples are split into two categories: Laboratory Quality Control Measurements and Matrix Quality Control Measurements. These are described in the following sections:

9.2.1 Laboratory QC Measurements

Laboratory QC samples (discussed in section 8.5.3) demonstrate that the functions which are under laboratory control are within acceptable limits. Table 9.2-1 lists laboratory QC samples and their purpose.

9.2.2 Matrix QC Measurements

Matrix QC samples provide information regarding any influence the sample matrix may exert on the precision and accuracy of the analytical results. As this influence is beyond the control of the laboratory, matrix QC samples outside the acceptance criteria are not always cause for re-analysis of the sample. Matrix QC samples include

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laboratory MS, MSD, and duplicate samples. Matrix QC samples and their purpose are listed in Table 9.2-2.

9.2.3 Precision and Accuracy Limits

Precision and accuracy limits are defined in the applicable methods and will be used to determine the acceptability of the QC sample results. In the case where a method does not specify precision and accuracy limits, internal limits will be determined by the ITAS operating unit and documented in operation-specific SOPs.

Table 9.2-3 shows the precision and accuracy measurements employed by ITAS. MS, MSD, and duplicate sample results are evaluated using method or laboratory limits. Control charts or tables are maintained by the analyst for LCSs on a "real time" basis and are used to assess the level of laboratory control. It is the responsibility of each laboratory analyst to update any other client-required control charts or control tables as a part of routine data reduction.

9.3 Nonconformance, Corrective Action, and Deficiency

9.3.1 Nonconformance

A nonconformance is a deviation or event beyond the limits and criteria established for standard operations, which may lead to a degradation of quality to an unacceptable or indeterminate level. Nonconformances over which the operating unit has control must have the root cause determined so that the possibility of the nonconformance recurring is minimized or eliminated.

Nonconformances may include (but are not limited to) the following:

- Sample holding time exceeded
- Incorrect sample preparation or analysis techniques used
- Invalid instrument calibration used
- QC sample data (blank, spike, duplicate, surrogates, LCS, etc.) are outside acceptance criteria.
- Incorrect data reported to the client
- Sample lost during extraction/analysis; no re-prep or re-analysis possible
- Any other situation that might adversely affect the final data quality

As soon as deviation from accepted laboratory practice is discovered, it is required to be documented. There are two types of documentation within the ITAS system for nonconformances. These are the ITAS Nonconformance Memo (NCM), Figure 9.3-1 (pages 1 and 2) and the ITAS Condition Upon Receipt Variance Report (CUR), Figure 8.3-1.

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9.3.1.1 Nonconformance Memo (NCM)

Information to be documented on the NCM include (but are not limited to) the following:

- Laboratory area affected
- Nonconformance category
- Client notification
- Corrective action (root cause and actions to prevent recurrence should be included, as appropriate)
- QC review (nonconformance or deficiency must be checked off)
- Verification of corrective action if nonconformance (verification is not required for deficiencies)
- Signature by QA/QCC or designee verifying NCM closure
- Routing destination (Quality/Operations files or Project file)

Upon completion, original NCMs are stored in the appropriate project file if project-specific or are stored in the facility Quality/Operations files if non-project specific.

Nonconformances identified through surveillance, or through an internal or external audit require documentation and tracking to verify that the root cause has been determined and that corrective actions have been taken to prevent recurrence. The NCM may be used for this purpose.

9.3.1.2 Condition Upon Receipt Variance Report (CUR)

A CUR is generated by sample control during the log-in process to document nonconformances identified upon receipt of samples in the laboratory. These nonconformances are outside of laboratory control and do not require corrective actions to be taken within the laboratory. The corrective action in this case is client notification. Actions to prevent recurrence should take the form of client education when possible. Nonconformances documented on a CUR may include (but are not limited to) the following:

- Not enough sample received for proper analysis
- Sample received without proper preservative
- Sample received in improper container
- Sample received broken or leaking
- Sample received outside temperature specifications
- Sample received without proper paperwork
- Sample received without or with broken custody tape

- Chain-of-Custody broken (not relinquished by the client)
- Sample information on the container does not match the accompanying paperwork
- All shipping containers (coolers) on waybill not received in the sample shipment

Once the nonconformance is identified and the CUR initiated, the laboratory Project Manager is notified. The Project Manager then notifies the client and requests instructions on how to proceed with the samples. The client contact and the client response to the nonconformance must be documented on the CUR and communicated to sample control so that log-in may proceed. These nonconformances must be resolved prior to sample prep and analysis.

9.3.2 Corrective Action

All nonconformances shall have a corrective action. The process by which corrective action is performed requires a determination of root cause, immediate action, and actions taken to prevent recurrence. The latter two may be the same action. Corrective actions include (but are not limited to) the following:

- Recalibration of instruments, using freshly prepared calibration standards
- Reanalysis of samples
- Replacement of lots of solvent or other reagents that yield unacceptable blank values
- Additional training of laboratory Associates in correct implementation of sample preparation and analytical techniques
- Reassignment of Associates
- Communication with the client to determine appropriate action (e.g. resampling, processing the sample "as is", terminating analysis, etc.)

9.3.3 Deficiency

A deficiency is a deviation from documented procedures, practices, standards, or a defect in an item that is determined *not* to render the quality of an item or service unacceptable or indeterminate. The QA/QCC shall determine whether the deviation is a nonconformance or a deficiency.

9.3.4 Responsibilities

All laboratory Associates are responsible for identifying and reporting any deviation from accepted laboratory practice that might affect the quality of the data. Once a possible nonconformance is identified, a NCM or a CUR is generated and routed to that Associate's supervisor for further review and documentation.

The QA/QCC is responsible for verifying

corrective actions and tracking NCM's until closure. The corrective action must be performed in a timely manner.

The QA/QCC (or designee) is responsible for logging all nonconformances into a master nonconformance log (example shown in Figure 9.3-2).

9.4 QA/QC Audits

ITAS operating units are subject to numerous assessments in the form of audits, both internal (self assessment) and external (independent assessment). Laboratory audits within ITAS can be broken down into four major categories:

- Performance Audits
- Surveillances
- Quality Systems Audits
- Project Audits

Audits of laboratories are performed to determine the degree of adherence to policies, procedures, and standards which include:

- IT and ITAS Quality Assurance Policy
- IT and ITAS Procedures
- Contractual Requirements
- Regulatory Obligations

Audits serve as a useful management tool to evaluate the appropriateness of QA policies. They identify areas for improvement with regard to compliance with policies, procedures, and standards, providing means for correction prior to system failure requiring shut down. In addition, they serve to strengthen the documentation trail assuring known data quality.

9.4.1 Performance Audits

Performance audits are conducted on an ongoing basis within the laboratory by the QA/QCC. These audits are reported to the Operating Unit Director and the Division Director, QA/QC. Performance audits vary with the needs of the operating unit. Performance audits include internal and external performance evaluation (PE) samples. These are discussed in the following sections.

9.4.1.1 Internal Performance Evaluation

The QA/QCC has the responsibility of monitoring the performance of the laboratory by inserting blind QC samples ("true" value(s) unknown to analyst) into the sample stream periodically and analyzing the results. The blind QC samples will be scheduled throughout the year to cover all routine analyses on an annual basis. Internal Performance Audits

are performed on a routine basis and are described in operation-specific SOPs. In addition, they may also be performed along with a project (client requested) or any time the QA/QCC or Operating Unit Director requests the performance audit study. Performance audit samples demonstrate data quality by statistical analysis. The results of these samples may also be used to document the training level of the analyst(s) performing the work. These results are linked to the analyst(s) in the Associate training files.

9.4.1.2 External Performance Evaluation

Each laboratory participates in external PE programs such as the USEPA Water Supply (WS), Water Pollution (WP), and/or Contract Laboratory Program (CLP) quarterly proficiency program for chemical parameters and/or the USEPA Intercomparison Program through the Environmental Monitoring Support Laboratory in Las Vegas (EMSL-LV) for radiochemical parameters. In addition, many state agencies and private contractors provide PE samples to challenge the laboratories and evaluate the effectiveness of the laboratory program. All external PE sample studies and results shall be maintained as quality records in the laboratory Quality/Operations files.

Since participation in these programs and others varies with the type of work performed within each ITAS laboratory, the specifics of participation are described in Appendix Section 6.

9.4.1.3 Double-Blind Performance Evaluation

ITAS employs a "double blind" PE sample program involving semiannual studies. This program applies to all ITAS laboratories. Double-blind PE samples are blind PE samples submitted to the laboratory under the pretense that they are normal client samples. The results of the study are reported to the Vice President, IT Analytical Services, the Division Technical Director, and the Division Director, QA/QC. Recommendations for quality improvement are submitted to the Laboratory Directors, and corrective actions are implemented as necessary.

9.4.2 Surveillances

Surveillances are detailed inspections of specific areas of a laboratory and its QA Program. Surveillances do not require the extensive planning and preparation required for audits and are conducted on a much more informal basis. The QA/QCC shall observe the activity of interest while it is in process and/or review objective evidence. A checklist for the applicable documents and criteria may be used for this review.

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A surveillance is performed each month by the QA/QCC (unless a systems audit or follow-up audit is performed). The scope of the surveillance is determined by the QA/QCC. This allows for a concentrated focus on areas of the laboratory that may be suspect or require additional monitoring to verify compliance with policies, procedures, and standards. The QA/QCC may use the nonconformance/corrective action system to determine trends in a laboratory area that require further investigation. The purpose of a surveillance is to find and correct problems before they become out-of-control situations.

Once the surveillance is complete, the QA/QCC will assign a score and will issue a report to the responsible manager. A copy of the report is sent directly to the Laboratory Director and to the Division Director, QA/QC in the laboratory monthly report to management. The report details the results of the surveillance, and requests a corrective action plan complete with target dates and Associate assignments. The QA/QCC must work with the surveyed group to recommend corrective action and then follow-up after the proposed target date to verify that corrective action was indeed performed. The QA/QCC shall document by memorandum that corrective action was taken. Surveillances are fully described in operation-specific SOPs.

9.4.3 Quality Systems Audits

Four times per year, each laboratory undergoes an internal audit to identify the level of compliance with established, documented, quality assurance systems. Two of these audits are designed and conducted by the QA/QCC. The remaining two are conducted by the Division Director, QA/QC or designee. The Division audits usually consist of a 2-4 day comprehensive review of all quality systems in the laboratory. Six months later, a second or follow-up audit is conducted to assess compliance with the corrective action plan established by the audited laboratory after completion of the first audit. The follow-up can be performed in 1-2 days. The Lead Auditor reserves the right to lengthen the audit or require a complete re-audit in 3 to 6 months depending upon the extent of the problems discovered. Findings which have not been satisfactorily resolved between the two audits shall be specifically reported to the Division Operations Director and Vice President, IT Analytical Services, for resolution.

Systems audits not conducted by the QA/QCC are lead by an ITAS certified Lead Auditor (see System Procedure 8907-QAC-04, "Standard Operating Procedure for Auditors Certification at ITAS Laboratories") under the direction of the Division Director, QA/QC. The Division

Director, QA/QC (or designee) will prepare a schedule of audits to be conducted during the fiscal year and will select appropriate audit teams depending upon the nature and depth of the audit. The source documents for systems audits are the ITAS QAMP, the ITAS Operation-Specific QAMP, and SOPs. The scope of the audit takes into account the expectations of external auditors, contracts, and regulatory requirements. A systems audit check list is prepared for the year and used in all locations audited to provide consistency and objectivity to the audit team.

At the beginning of the audit, the audit team will meet with the Operating Unit Director and the QA/QCC to discuss the goals of the audit. At the close of the audit, the audit team will debrief the Operating Unit Director, QA/QCC, the laboratory Technical Director, Project Managers, and Group Leaders, and will discuss and present the audit findings and observations. Additional laboratory staff may be invited to the debriefing, as deemed necessary by the Lead Auditor. The Lead Auditor can close an audit finding or observation during the debriefing if the laboratory staff can satisfactorily demonstrate that the finding/observation is inappropriate or has been corrected prior to the debriefing. Also during this meeting, recommendations for corrective actions will be discussed. If corrective actions are requested to be taken immediately after audit closure, the actions must be taken.

An audit report will be prepared by the Lead Auditor and will include the following:

- Cover memo summarizing the audit process, any findings, and announcement of the preliminary audit ranking
- Audit Check List
- Finding Report(s)
- Observation Report(s)
- Corrective Action Plan (to be completed by the laboratory)

The audit report shall be completed as soon as possible after completion of the audit, but shall take no longer than 45 days. The original audit report will be addressed to the Operating Unit Director, who is responsible for responding within the designated time frames established by the Lead Auditor. A completed copy of the systems audit report will be sent to the QA/QCC and the Division Director, QA/QC.

Upon receipt of the audit response, the Lead Auditor will evaluate the proposed corrective action plan and will reply stating acceptance or rejection of the plan or its

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elements. Approximately six months later, the Lead Auditor or designee will perform a second audit of the operation and verify completion of the initial audit corrective action plan. The Lead Auditor will then issue a final audit report detailing the results of implementation and will issue a final audit ranking for the year. A positive change in ranking is indicative of improvement in implementation of the QA Program. Quality systems audits are described in a operation-specific SOPs.

9.4.4 Project Audit

Project or data quality audits are designed to address the DQOs (precision, accuracy, representativeness, and completeness) of all data associated with a particular project. These audits also review a project for compliance with contractual requirements set forth in a QAPjP or formal contract. Project audits may be conducted by IT, ITAS, or project QA staff. A project-specific check list is prepared using the QAPjP and/or contract as the source document(s). The audit report is addressed to the Operating Unit Director who is required to respond within the designated time frame stipulated by the Lead Auditor. As with all other audits, a follow-up audit for verification of compliance with the corrective action plan is to be performed.

9.4.5 Findings, Observations, Comments, and Recommendations

Findings represent areas in which the operation or operating unit section as a system is not in compliance with the requirements of the ITAS QA Program. Findings are situations that could directly affect the quality of resulting work. Findings require that a corrective action plan be developed by the Operating Unit Director, who will identifying the root cause of the problem and will schedule action to prevent recurrence.

Observations represent isolated instances of noncompliance or questionable practices. They present situations that could become findings if left unresolved. As with findings, a corrective action plan is required.

Comments or recommendations shall be written by the auditor in an attempt to share information and provide constructive criticism in order to improve performance or documentation in an area. Comments might also indicate areas that may become noncompliant. If attention is not paid to the comment, it is likely to become an observation. Comments and recommendations do not require any formal response by the audited organization, but it is strongly recommended that they be reviewed for appropriate action. Included in

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the comments and observations are those which describe exemplary practices. Audit reports should not focus only on negative aspects of the program and may include a section on exemplary practice.

9.4.6 Audit Ranking

Internal ITAS QA Systems Audits require a preliminary and final ranking to be assessed. Audit check list scores and assessments of open observations and findings (not corrected since the last internal or client audit) are considered in the audit ranking process. Laboratories are ranked as either excellent, acceptable, marginal, or unacceptable. These ranks are described as follows:

- Excellent - Meets or exceeds established requirements for all areas audited.
- Acceptable - Audited work meets all requirements of the ITAS QA Program with only a few minor deviations from established requirements.
- Marginal - Audited work represents a basic QC practice with actions required by the laboratory to improve operations immediately.
- Unacceptable - Audited work indicates that quality practice is not implemented on a regular basis and one or more areas will be shut down for correction.

The Division Director, QA/QC, will issue a memorandum to all QA/QCCs and Operating Unit Directors annually describing the process of determining the audit rank.

While audit ranking allows for comparison of laboratories across the network, caution is advised in using the ranking alone without a detailed review of the situations or conditions observed that caused the Lead Auditor to arrive at that rank.

9.4.7 Client Satisfaction Survey

Each ITAS operating unit has the responsibility to understand client needs, and whether ITAS services are meeting those needs and expectations. At least three client satisfaction surveys should be performed monthly, within each operating unit, to randomly selected clients by the QA/QCC or designee. The IT Corporation Client Satisfaction Survey form (Figure 9.4-1) should be utilized with distribution to the ITAS Project Manager, Operating Unit Director, Division Operations Director, Vice President, IT Analytical Services, Vice President, Quality and Health Services, and Division Director, QA/QC. Any corrective or follow-up action must be documented on the form and implemented by the Project Manager or Operating Unit Director.

9.5 Quality Reports to Management

The QA/QCC and the Division Director, QA/QC shall prepare reports to

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management on a monthly basis indicating the effectiveness of the QA Program. The QA/QCC shall send a quality report to the Division Director, QA/QCC. An example outline for the QA/QCC's report is shown in Figure 9.5-1. The Division Director, QA/QC, shall send a summary of the QA/QCC's reports to the Vice President, IT Analytical Services.

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9.6 Management Review of the Quality Assurance Program

Management at all levels shall assess the QA Program and its performance. Management assessment shall identify barriers that hinder the organization from achieving its objectives in accordance with quality, safety, and environmental requirements. Results of management assessments shall be documented and corrective action taken. The effectiveness of the implementation of corrective actions shall be included in the next management assessment.

An example of the management assessment approach will be to conduct double blind studies on the appropriate laboratories (see Section 9.4.1.3). In such studies, a client contacts the laboratory and submits a sample of known parameters and values for analysis that is totally blind to the laboratory management and the analysts. These studies allow assessment of the total process from initial client contact through final reporting.

Review of the adequacy of the ITAS QA Program is ongoing. At any time, the Division Operations Director, an Operating Unit Director, or the Division Technical Director may present, in writing, recommended changes to the Division Director, QA/QC. During the QA systems audits, the QA Program is discussed with the management of the facility audited. This feedback is valuable and necessary to the progress of the QA Program in meeting the constantly-changing needs of the environmental industry.

In addition to these ongoing reviews, the Vice President, IT Analytical Services shall conduct an annual review of the QA Program considering:

- Results of the QA systems audits. Are undesirable trends occurring?
- Status of QA documents. Are the current documents adequate? Are new documents needed?
- Is the auditing program fulfilling its purpose?

The Vice President will consult with the Division Operations Director, Operating Unit Directors, and the Vice President, Quality and Health Services, as necessary, during the review. To document the review, the Vice President, IT Analytical Services,

will issue a memo to the Division Director, QA/QC, stating the extent of the review and will present recommendations.

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FIGURE 1.2-1
INTERNATIONAL TECHNOLOGY CORPORATION
ANALYTICAL SERVICES
DIVISION OPERATIONS

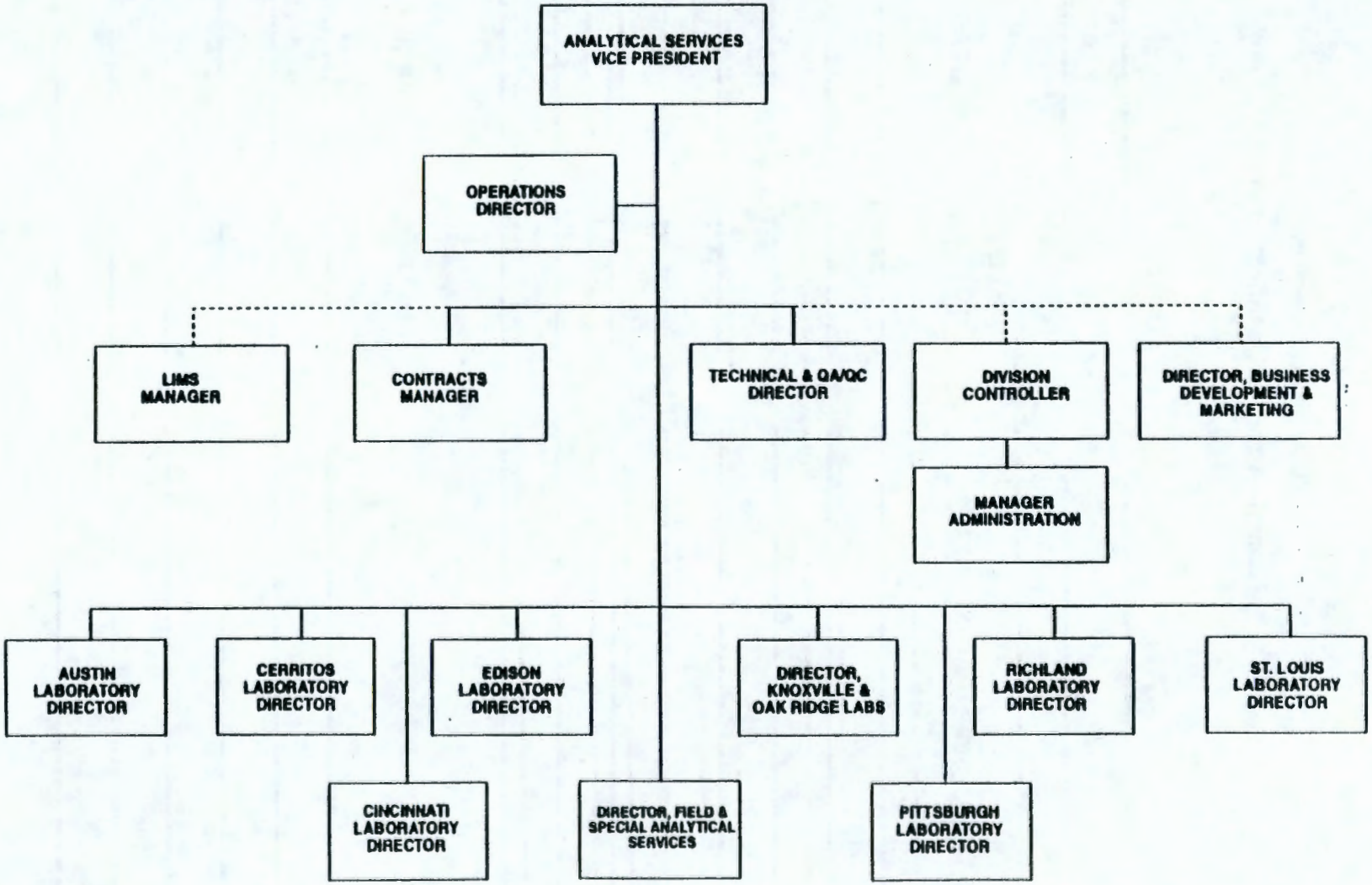

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FIGURE 3.1-1

IT Analytical Services

Example Associate Qualification Form

Name: _____ **Hire Date:** _____

Title: _____ **Supervisor:** _____

PROCEDURE NAME/NUMBER	QUALIFY DATE	APPROVAL SIGNATURE

TRAINING SESSION	DATE	APPROVAL SIGNATURE

FIGURE 3.2-1
Example Individual Training Record

Name: _____ Hire Date: _____

Title: _____ Supervisor: _____

I. ACADEMIC TRAINING/DEGREES

Name of Institution (Including Current Enrollment)	City, State	Curriculum Major	Attendance	Degree(s) Received/Expected	Degree Date

II. SPECIAL SCHOOLING/TRAINING

Date(s)	Course Title	Sponsored By (IT or External)/Location

III. SPECIALIZED EXPERIENCE/ON-THE-JOB TRAINING

Date(s)	Specialized Experience	Reference (Paper or Project)

Associate Signature/Date: _____

QA Concurrence/Date: _____

TRAINREC.FRM\pbc\07-18-93

FIGURE 3.2-2

Example ITAS New Employee Quality Assurance Orientation Form

Name: _____ Date of Hire: _____

Job Title: _____ Report to Work Date: _____

QUALITY ASSURANCE PROGRAM SECTION	REVIEW (X)
Statement of Management Position	
ITAS Quality Assurance Management Plan (QAMP)	
Operation-Specific Quality Assurance Management Plan (OS-QAMP)	
Nonconformance and Corrective Action	
Data Entries and Corrections	
NQA-1	
NRC Regulatory Guide	
Quality-related responsibilities for Job Title (Section and/or Topic):	

I attended the session covering QA sections and/or topics as described above and understood the material presented during the session.

_____ _____

Associate's Signature Date

_____ _____

QA/QC Coordinator's Signature Date

QA Exam Given? _____ Orientation was adequate _____ Further training is needed _____

Follow-up sessions covered:

_____

_____

_____ _____

Associate's Signature/Date QA/QC Coordinator's Signature/Date

THIS DOCUMENT MUST BE RETAINED IN THE ASSOCIATE'S TRAINING FILE

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FIGURE 3.2-3

Example ITAS Lead Auditor Certification Form

NAME	LOCATION	DATE

QUALIFICATION POINT REQUIREMENTS		CREDITS
EDUCATION - University/Degree/Date	4 Credits Max.	
1. Undergraduate Level		
2. Graduate Level		
EXPERIENCE - Company/Dates	9 Credits Max.	
1. Technical (0-5 credits)		
2. Nuclear Industry (0-1 credits) OR		
3. Analytical (Environmental) Industry (0-1 credit) OR		
4. Quality Assurance (0-3 credits) OR		
5. Auditing (0-4 credits)		
PROFESSIONAL ACCOMPLISHMENT - Certificate/Date	2 Credits Max.	
1. Society		
2. Other		
MANAGEMENT - Justification/Evaluator/Date	2 Credits Max.	
Explain:		
Evaluated By: (Name & Title)	Date:	
	Total Credits	0

AUDIT TRAINING/PARTICIPATION				
AUDIT COMMUNICATION SKILLS				
Evaluated By: (Name & Title)				Date:
AUDIT TRAINING COURSES				
Course Topic or Title				
1				
2				
AUDIT PARTICIPATION				
Location	Type of Audit		Date(s)	
1				
2				
3				
4				
5				
6				
7				
EXAMINATION		Passed		Date:
AUDITOR QUALIFIED CERTIFIED BY: (Signature & Date)		**DATE CERTIFIED:**		
ANNUAL EVALUATION				
(Signature & Date)				

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FIGURE 5.0-1

Example Procedural Change Form

ITAS _____ LABORATORY

PROCEDURE/DOCUMENT CHANGE

PROCEDURE/DOCUMENT TITLE AND NUMBER:

PROCEDURE/DOCUMENT SECTION(S) AFFECTED BY CHANGE:

REASON FOR ADDITION OR CHANGE:

CHANGE EFFECTIVE FROM: _____ (DATE) TO: _____ (DATE)

SAMPLES OR PROJECTS AFFECTED:

CHANGE OR ADDITION (SPECIFY SECTION; USE ADDITIONAL SHEETS IF NECESSARY):

SUBMITTED BY: **DATE:**

QA/QC COORDINATOR

LABORATORY DIRECTOR

DIVISION DIRECTOR, QA/QC

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FIGURE 5.4-1
ITAS Standard Administrative SOP Format

1. Purpose, Application and Responsibility

2. References

3. Associated SOPs

4. Definitions

5. Procedure
   - 5.1 Summary
   - 5.2 Safety
   - 5.3 Required Equipment
   - 5.4 Administrative Procedure
   - 5.5 Calculations
   - 5.6 Quality Control

6. Nonconformance and Corrective Action

7. Records Management and Documentation

Note: The inclusion of subsections 5.3 through 5.6 is left up to the discretion of the SOP's author, as appropriate.

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FIGURE 5.4-2
ITAS Standard Technical SOP Format

1. Purpose, Application and Responsibility
   - 1.1 Purpose
   - 1.2 Application
   - 1.3 Responsibilities
2. References
3. Associated SOPs
4. Definitions
5. Procedure
   - 5.1 Summary
   - 5.2 Safety
   - 5.3 Interferences
   - 5.4 Preservation and Holding Time
   - 5.5 Required Equipment
   - 5.6 Reagents/Standards
   - 5.7 Calibration
   - 5.8 Analysis/Operation
   - 5.9 Calculations
   - 5.10 Quality Control
6. Nonconformance and Corrective Action
7. Records Management and Documentation

FIGURE 8.0-1

Data Collection Process Flow Chart

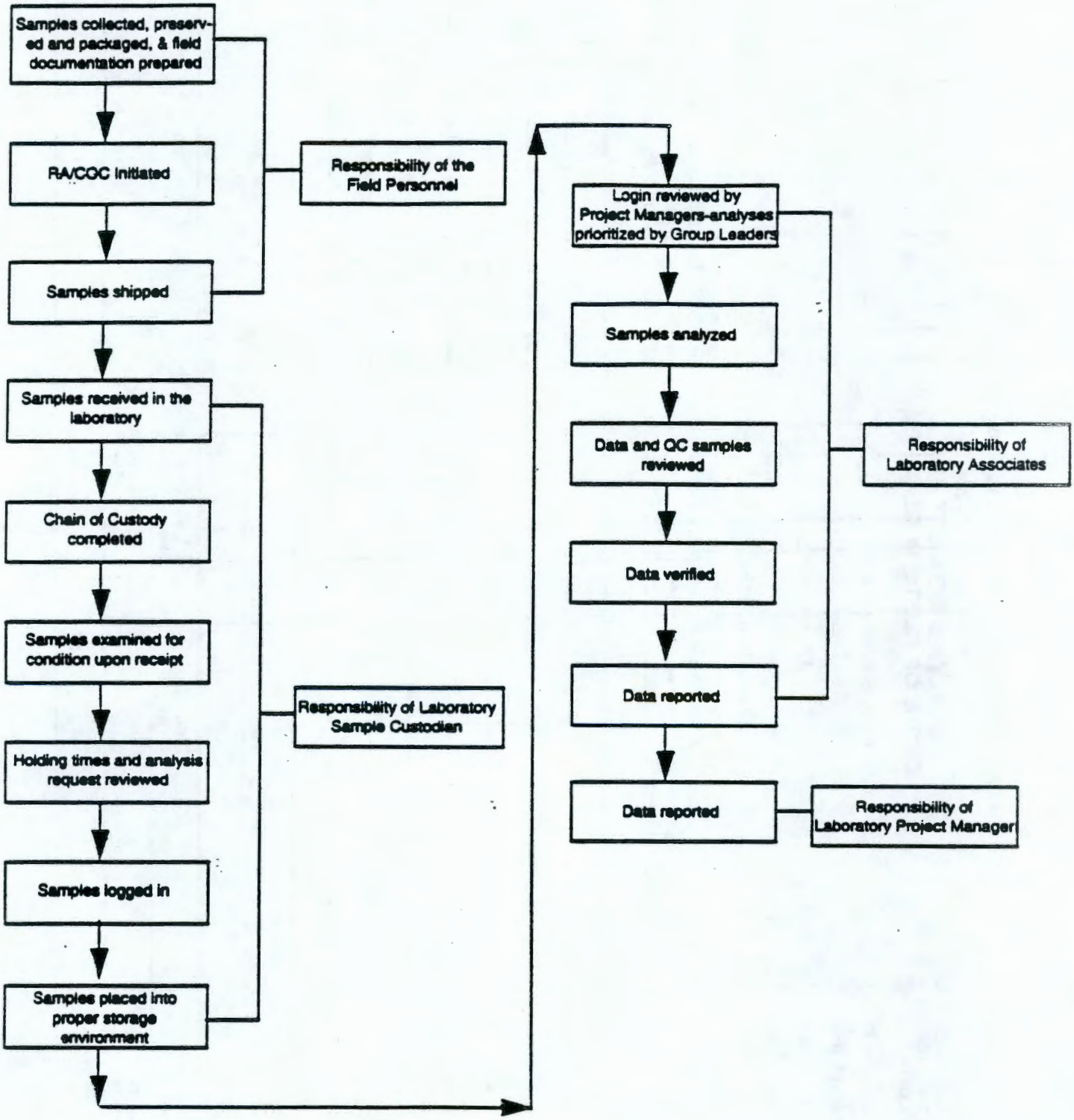

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FIGURE 8.1-1

ITAS Analysis Request/Chain-of-Custody Form

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD*

Reference Document No. 323490
Page 1 of ___

Project Name/No. [1] _____
Sample Team Members [2] _____
Profit Center No. [3] _____
Project Manager [4] _____
Purchase Order No. [6] _____
Required Report Date [11] _____

Samples Shipment Date [7] _____
Lab Destination [8] _____
Lab Contact [9] _____
Project Contact/Phone [12] _____
Carrier/Waybill No. [13] _____

Bill to: [5] _____
Report to: [10] _____

White: To accompany samples
Yellow: Field copy
*See back of form for special instructions

ONE CONTAINER PER LINE

Sample Number [14]	Sample Description/Type [15]	Date/Time Collected [16]	Container Type [17]	Sample Volume [18]	Pre-servative [19]	Requested Testing Program [20]	Condition on Receipt [21]	Disposal Record No. [22]

Special Instructions: [23]

Possible Hazard Identification: [24]
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐

Sample Disposal: [25]
Return to Client ☐ Disposal by Lab ☐ Archive (mos.)

Turnaround Time Required: [26]
Normal ☐ Rush ☐

QC Level: [27]
I. ☐ II. ☐ III. ☐ Project Specific (specify):

1. Relinquished by [28] (Signature/Affiliation)	Date: Time:	1. Received by [28] (Signature/Affiliation)	Date: Time:
2. Relinquished by (Signature/Affiliation)	Date: Time:	2. Received by (Signature/Affiliation)	Date: Time:
3. Relinquished by (Signature/Affiliation)	Date: Time:	3. Received by (Signature/Affiliation)	Date: Time:

Comments: [29]

MCA 3/15/91

FIGURE 8.3-1 Work Order No.:_____

Condition Upon Receipt Variance Report

ITAS - _____ Laboratory

Client:_____ Date:_____

Project No:_____ Initiated by:_____

Analysis Requested:_____ RFA/COC Numbers:_____

Client Sample Numbers Affected:_____

Condition/Variance (Check all that apply):

1. ☐ Not enough sample received for proper analysis.
   Received approximately:_____
2. ☐ Sample received broken/leaking.
3. ☐ Sample received without proper preservative.
   - ☐ Cooler temperature not within 4°C ± 2°C
     Record temperature:_____
   - ☐ pH_____
   - ☐ other:_____
4. ☐ Sample received in improper container.
5. ☐ Sample received without proper paperwork. Explain:
   _____
6. ☐ Paperwork received without sample.
7. ☐ No sample ID on sample container.
8. ☐ Custody tape disturbed/broken/missing.
9. ☐ Sample splits performed by lab.
10. ☐ Volatile sample received with approximately _____ mm headspace.
11. ☐ Sample ID on container does not match sample ID on paperwork. Explain: _____
    _____
    _____
12. ☐ All coolers on airbill not received with shipment.
13. ☐ Other (explain below):
    _____
    _____
    _____

Notes:
_____
_____

Corrective Action:

☐ Client's Name: _____ Informed verbally on: _____ By: _____

☐ Client's Name: _____ Informed in writing on: _____ By: _____

☐ Sample(s) processed "as is". Comments: _____

☐ Sample(s) on hold until: _____ If released, notify: _____

Sample Control Supervisor Review:_____ Date: _____

Project Management Review: _____ Date: _____

SIGNED ORIGINAL MUST BE RETAINED IN THE PROJECT FILE

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FIGURE 8.6-1
Data Review Process

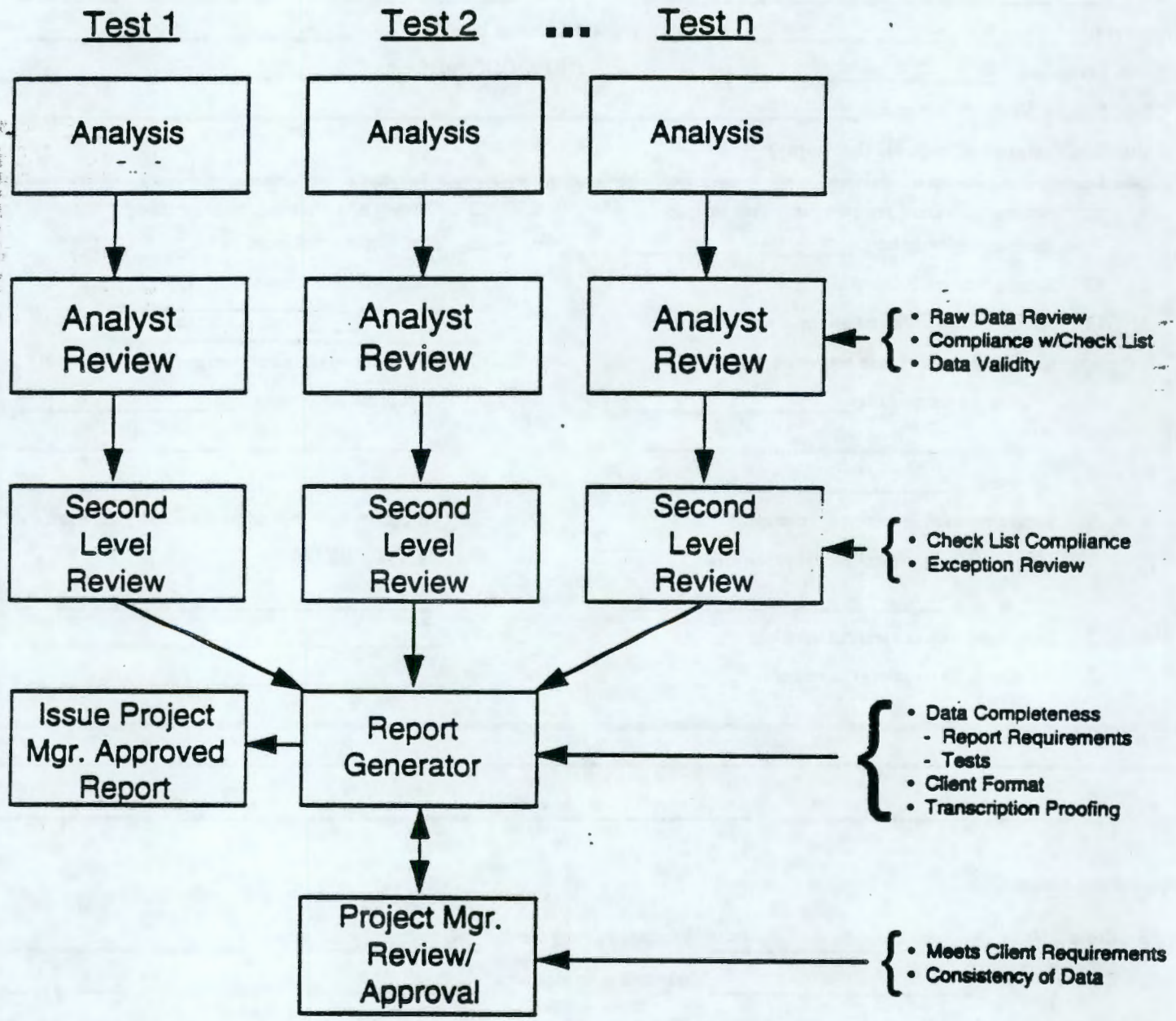

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FIGURE 8.6-2
ITAS Data Review Check List
METALS

Work Order Number(s):
Lab Sample Numbers or SDG:
Method/Test/Parameter:

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Initial Calibration 1. Performed at required frequency with required number of levels?				
2. Correlation coefficient within QC limits?				
3. Initial calibration verification (ICV) analyzed immediately after calibration and results within QC limits?				
4. Initial calibration blank (ICB) analyzed immediately after ICV and concentrations of all parameters ≤ reporting limit?				
B. Continuing Calibration 1. CCV analyzed at required frequency and all parameters within QC limits?				
2. CCB analyzed at required frequency and all results ≤ reporting limit?				
C. Sample Analysis 1. Were any samples with concentrations > the linear range for any parameter diluted and reanalyzed?				
2. Were all sample holding times met?				
D. QC Samples 1. MS or MS/MSD percent recovery within QC limits?				
2. Analytical spikes within QC limits?				
3. LCS recovery within QC limits?				
4. ICP only: One serial dilution performed per SDG?				
5. ICP only: CRDL standard (CRI or CRA) analyzed at required frequency?				
6. ICP only: Interference check samples (ICSA, ICSAB) analyzed at the beginning and end of analytical run or at minimum frequencies and within QC limits?				

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FIGURE 8.6-2
ITAS Data Review Check List
METALS

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
E. Other 1. Are all nonconformances included and noted?				
2. Is the correct date and time of analysis shown?				
3. Did the analyst sign and date the front page of the analytical run?				
4. Correct methodology used?				
5. Transcriptions checked?				
6. Calculations checked at minimum frequency?				
7. Units checked?				

Comments on any "No" response:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Analyst: _____ Date: _____

Second-Level Review: _____ Date: _____

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FIGURE 8.6-3
ITAS Data Review Check List
GENERAL CHEMISTRY

Work Order Number(s):
Lab Sample Numbers or SDG:
Method/Test/Parameter:

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Initial Calibration 1. Does the standard curve consist of a Blank (when required) and the required minimum number of calibration standards?				
2. Is the initial calibration correlation coefficient ≥ 0.995?				
B. Continuing Calibration 1. Is the Continuing Calibration Verification (CCV) percent recovery within QC limits?				
C. Sample Analysis 1. Were all sample holding times met?				
D. QC Samples 1. Is the Method Blank concentration less than the reporting limit?				
2. Is the Laboratory Control Sample (LCS) AND/OR the Matrix Spike (MS) % recovery within QC limits?				
3. When MS/MSD analyzed, is RPD within QC limits?				
4. When duplicate sample analysis performed, is RPD within QC limits (± 20 %)?				
E. Other 1. Are all nonconformances included and noted?				
2. Are all required forms filled out?				
3. Was correct methodology used?				
4. Transcriptions checked?				
5. Were all calculations checked at minimum frequency?				
6. Did the analyst sign and date the front page of the analytical run?				
7. Units checked?				

FIGURE 8.6-3
ITAS Data Review Check List
GENERAL CHEMISTRY

Comments on any "No" response:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Analyst: _____ Date: _____

Second-Level Review: _____ Date: _____

FIGURE 8.6-4
ITAS Data Review Check List
AIR ANALYSIS - METHOD TO-14

Work Order Number(s):
Lab Sample Numbers or SDG:
Method/Test/Parameter:

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Initial Calibration: 1. Was BFB analyzed at beginning of 12-hour period?				
2. Did BFB meet QC limits (all masses met criteria)?				
3. Is the %RSD for all nonpolar analytes <25%? (A maximum of two analytes may be above this but below 40%)				
4. Is the %RSD for all polar analytes <30%? (A maximum of two analytes may be above this but below 45%)				
5. Were a minimum of five calibration points used?				
B. Continuing Calibration 1. Was BFB analyzed at beginning of 12-hour period?				
2. Did BFB meet QC limits (all masses met criteria)?				
3. Was the %D for all CCCs <25% for all nonpolar targets? (A maximum of two are allowed outside this criteria, but must be <40%)				
4. For polar analytes, do all compounds have a %D of 30% or less? (A maximum of two are allowed outside but must be < 45%)				
5. Are all calibration points on the Continuing Calibration present?				
C. Sample Analysis 1. Are internal standard areas within 50-150% of the internal standard areas of the continuing calibration standard analyzed?				
2. Are all sample surrogate values within internal QC limits?				
3. Are all analytes quantitated within the calibrated range of the instrument?				
4. Were a minimum of three RFs checked for each sample to insure the proper RFs are being used for quantitation?				

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FIGURE 8.6-4
ITAS Data Review Check List
AIR ANALYSIS - METHOD TO-14

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
D. QC Samples 1. Are all Blank surrogate values within internal QC limits?				
2. Are all analytes in Blanks < the reporting limit?				
3. Are Reference Standard control values within QC limits for air media?				
4. Are all duplicate RPDs within internal QC limits?				
E. Other 1. Are all nonconformances included and noted?				
2. Are all required forms filled out?				
3. Correct methodology used?				
4. Transcriptions checked?				
5. Were all calculations checked at minimum frequency?				
6. Units checked?				

Comments on any "No" response:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Analyst: _____ Date: _____

Second-Level Review: _____ Date: _____

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FIGURE 8.6-5
ITAS Data Review Check List
RADIOCHEMISTRY

Work Order Number(s):
Lab Sample Numbers or SDG:
Method/Test/Parameter:

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Calibration 1. Is the calibration documentation included where applicable?				
B. Sample Analysis 1. Are the Sample Yields within acceptance criteria?				
2. Were all sample holding times met?				
C. QC Samples 1. Is the Blank Yield within acceptance criteria?				
2. Is the Minimum Detectable Activity for the Blank result ≤ the Contract Detection Limit?				
3. Is the Blank result ≤ the Contract Detection Limit?				
4. Is the Blank result greater than the Contract Detection Limit but the Sample result less than the Contract Detection Limit?				
5. Is the LCS result within acceptance criteria?				
6. Is the LCS yield within acceptance criteria?				
7. Is the LCS Minimum Detectable Activity less than or equal to the Contract Detection Limit ?				
8. MS/MSD results and yield meet acceptance criteria?				
9. Duplicate sample results and yield meet acceptance criteria?				
D. Other 1. Are all nonconformances included and noted?				
2. Are all required forms filled out?				
3. Correct methodology used?				
4. Transcriptions checked?				
5. Were all calculations checked at minimum frequency?				
6. Units checked?				

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FIGURE 8.6-5
ITAS Data Review Check List
RADIOCHEMISTRY

Comments on any "No" response:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Analyst: _____ Date: _____

Second-Level Review: _____ Date: _____

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FIGURE 8.6-6
ITAS Data Review Check List
GC/MS

Work Order Number(s):
Lab Sample Numbers or SDG:
Method/Test/Parameter:

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Tuning 1. BFB/DFTPP tuning criteria met?				
2. Mass list, RIC, and the mass spectrum included?				
3. Correct BFB/DFTPP included with analytical runs?				
B. Initial Calibration 1. RRF and %RSD within acceptance criteria?				
2. Runs checked for saturation?				
3. CLP only: Are surrogates and internal standards labeled on the chromatograms?				
C. Continuing Calibration 1. RRF and % Difference within acceptance criteria?				
D. Sample Analysis After tune, initial calibration, continuing calibration, and method blank criteria have been met: 1. Sample name and other header information correct?				
2. RRT of identified compounds within ±0.06 RRT units of RRT of standard component?				
3. Ions present in the standard spectra with abundance of >10% of the base ion present in sample spectra?				
4. Surrogate recoveries within limits?				
5. Quantified against the appropriate standard?				
6. Run(s) within linear range?				
7. Were all sample holding times met?				
8. TCL match?				

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FIGURE 8.6-6
ITAS Data Review Check List
GC/MS

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
E. QC Samples 1. All Method Blank results ND or hits below reporting limit?				
2. Method Blank analyzed at required frequencies?				
3. Are MS/MSD % recoveries and RPD within QC limits?				
4. Are LCS % recoveries within QC limits?				
5. Second source check standard successfully analyzed?				
F. Other 1. Are all nonconformances included and noted?				
2. Are all required forms filled out?				
3. Correct methodology used?				
4. Transcriptions checked?				
5. Were all calculations checked at minimum frequency?				
6. Were all manual integrations checked by a second reviewer?				
7. Units checked?				

Comments on any "No" response:

_____

_____

_____

_____

_____

_____

_____

Analyst: _____ Date: _____

Second-Level Review: _____ Date: _____

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FIGURE 8.6-7
ITAS Data Review Check List
GC

Work Order Number(s):
Lab Sample Numbers or SDG:
Method/Test/Parameter:

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Initial Calibration 1. Was the maximum %RSD within QC limits?				
2. Were calibration factors updated or were curves drawn for 600 series methods or 8000 series methods?				
3. Are retention time windows established and updated in method?				
4. Did the standards pass the resolution check criteria?				
5. Was the percent breakdown within QC limits?				
B. Continuing Calibration 1. Was the maximum %D within QC limits?				
2. Are compounds within retention time windows?				
3. Was the percent breakdown within QC limits?				
C. Sample Analysis After initial calibration, continuing calibration, and method blank criteria have been met: 1. Are sample name and other header information correct?				
2. Do surrogate % recoveries meet QC criteria?				
3. Were the runs checked for saturation?				
4. Are all hits confirmed if required?				
5. Are all compounds within linear range of calibration curve?				
6. Were all sample holding times met?				
7. Do reported results take into account dilutions, sample weights, and percent moistures?				
D. QC Samples 1. Are all Method Blank hits below the reporting limit?				
2. Are LCS spike % recoveries within QC limits?				
3. Are batch MS/MSD spike % recoveries within QC limits?				

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FIGURE 8.6-7
ITAS Data Review Check List
GC

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
D. QC Samples (continued) 4. Are MS/MSD and/or Duplicates (duplicate sample analyses) RPD within QC limits?				
5. Was second source check standard analyzed successfully?				
E. Other 1. Are all nonconformances included and noted?				
2. Are all required forms filled out?				
3. Correct methodology used?				
4. Transcriptions checked?				
5. Were all calculations checked at minimum frequency?				
6. Were all manual integrations checked by a second reviewer?				
7. Units checked?				

Comments on any "No" response:

_____

_____

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_____

Analyst: _____ Date: _____

Second-Level Review: _____ Date: _____

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FIGURE 8.6-8
ITAS Data Review Check List
HPLC

Work Order Number(s):
Lab Sample Numbers or SDG:
Method/Test/Parameter:

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Initial Calibration 1. Was the maximum %RSD within QC limits or was the correlation coefficient of the curve ≥ 0.995?				
2. Was each run checked for saturation?				
3. Was each run checked for coeluting compounds?				
B. Continuing Calibration 1. Was the maximum %D within QC limits?				
2. Was the run checked for saturation?				
3. Was each run checked for coeluting compounds?				
C. Method Blanks 1. Are all hits below the PQL?				
2. Was a Method Blank analyzed for each set of samples extracted by the same method on the same day?				
3. Do surrogate % recoveries meet QC criteria?				
4. Are peaks quantified against the appropriate standard?				
5. Was the run(s) checked for saturation?				
D. Sample Analysis After initial calibration, continuing calibration, and method blank criteria have been met: 1. Are sample name and other header information correct?				
2. Do surrogate % recoveries meet QC criteria?				
3. Were the runs checked for saturation?				
4. Are all hits confirmed?				
5. Were all sample holding times met?				

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FIGURE 8.6-8
ITAS Data Review Check List
HPLC

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
E. QC Samples 1. Are matrix spike/matrix spike duplicate (MS/MSD) spike % recoveries within QC limits?				
2. Are Laboratory Control Sample (LCS) spike % recoveries within QC limits?				
3. Are MS/MSD and/or Duplicates (duplicate sample analyses) RPD within QC limits?				
F. Other 1. Are all nonconformances included and noted?				
2. Are all required forms filled out?				
3. Correct methodology used?				
4. Transcriptions checked?				
5. Were all calculations checked at minimum frequency?				
6. Were all manual integrations checked by a second reviewer?				
7. Units checked?				

Comments on any "No" response:

_____

_____

_____

_____

_____

_____

_____

_____

Analyst: _____ Date: _____

Second-Level Review: _____ Date: _____

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FIGURE 8.6-9
ITAS Data Review Check List
DIOXINS/DIBENZOFURANS

Work Order Number(s):
Lab Sample Numbers or SDG:
Method/Test/Parameter:

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Initial Calibration 1. Percent RSD within QC limits?				
2. Windowing solution analyzed and retention time windows determined?				
3. Were all signal/noise ratios met?				
4. Were all ion isotopic ratios within specifications?				
5. Was the 2,3,7,8-TCDD resolution met?				
B. Continuing Calibration 1. Continuing calibration standard results within QC limits?				
2. Were all signal/noise ratios met?				
3. Were all ion isotopic ratios within specifications?				
4. Was the window defining solution analyzed at the appropriate frequency?				
5. Were the proper types of continuing calibration check solutions run at the appropriate frequency?				
6. Was the 2,3,7,8-TCDD resolution met?				
C. Sample Analysis 1. Were sample holding times met?				
2. All analyte hits and NDs within set retention time windows?				
3. Are internal standard recoveries within QC limits?				
4. Was a minimum of 20% of the raw data recalculated?				
5. Were signal/noise ratios met for positive results?				
6. Were ion isotopic ratios met for positive results?				

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FIGURE 8.6-9
ITAS Data Review Check List
DIOXINS/DIBENZOFURANS

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
D. QC Sample Analysis 1. All Method Blank results "None Detected"?				
2. Native spike recoveries of batch MS/MSD within QC limits?				
3. Native spike recoveries of batch LCS (or Blank Spike) within QC limits?				
4. Are internal standard recoveries within QC limits?				
5. Is the RPD of batch MS/MSD within QC limits?				
E. Other 1. Are all nonconformances included and noted?				
2. Are all required forms filled out?				
3. Correct methodology used?				
4. Transcriptions checked?				
5. Were all calculations checked at minimum frequency?				
6. Were all manual integrations checked by a second reviewer?				
7. Was % moisture and/or % lipids performed?				
8. Were sample results corrected for % moisture if requested by a client?				
9. Units checked?				

Comments on any "No" response:

_____

_____

_____

_____

_____

Analyst: _____ Date: _____

Second-Level Review: _____ Date: _____

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FIGURE 8.6-10
Example Certificate of Analysis
Page 1 of 2

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Client Name
Client Company
Client Address

Date:

Work Order No.

This is a Certificate of Analysis for the following samples:

Client Project ID:
Date Samples Received:
Number of Samples:

I. Introduction

This section describes general project information. It also includes the date the samples were received and provides a listing of the sample numbers. (Both client and laboratory numbers.)

Reviewed and Approved:

Project Manager

American Council of Independent Laboratories
International Association of Environmental Testing Laboratories
American Association for Laboratory Accreditation

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FIGURE 8.6-10
Example Certificate of Analysis
Page 2 of 2

IT ANALYTICAL SERVICES
304 DIRECTORS DRIVE
KNOXVILLE, TN
(615) 690-3211

Client Project ID ITAS Project No.:

94132B2-0293

II. Analytical Data

This section describes the sample preparation and analytical methodologies used to extract and analyze the samples. It also describes how the sample results are reported. Additionally, any project anomalies, nonconformances, variance, or any other type of unusual occurrences that were noted by the laboratory are documented here.

III. Quality Assurance/Quality Control

This section describes what type or level of QA/QC was followed. QA/QC requirements may be internal or client-specific. Any QA/QC data that exceeded the acceptance criteria will be noted here. Comments may also be included regarding how the QC sample results may have affected the data.

(The sample results follow on additional pages in tabular form.)

FIGURE 9.3-1
ITAS Nonconformance Memo
PAGE 1 of 2

LOG #: __-93-_____ page 1 of 2

ITAS-_____ Laboratory
LABORATORY NONCONFORMANCE MEMO (NCM)

PROJECT ID (Name/Number): _____
NCM INITIATED BY (Name/Date): _____
PARAMETER(S): _____
SAMPLE NUMBER(S) AFFECTED: _____

AREA:
- ☐ SHIP/REC ☐ GC ☐ GEN CHEM ☐ BIOASSAY ☐ IH
- ☐ ORG EXT ☐ HPLC ☐ METALS ☐ RADIOCHEM ☐ DATA VERIF
- ☐ INORG PREP ☐ GCMS ☐ GEO ☐ COUNTING ☐ REPORTING
- ☐ OTHER: ☐ _____ ☐ _____ ☐ _____ ☐ _____

NONCONFORMANCE [check appropriate item(s)]:

1. ☐ Not enough sample received for proper analysis.
2. ☐ Holding time exceeded by _____ days due to:
   - 2.1 ☐ CATEGORY I: Out of Laboratory Control
     - ☐ Holding time expired at receipt.
   - 2.2. ☐ CATEGORY II: Laboratory Dependent
     - ☐ work backlog ☐ instrument failure
     - ☐ communication ☐ other (see #10)
   - 2.3. ☐ CATEGORY III: Laboratory Reruns
     - 2.3.1 ☐ *QA/QC:*
       - ☐ surrogates ☐ internal standards
       - ☐ spike recoveries ☐ blank contamination
     - 2.3.2 ☐ *CONFIRMATION:*
       - ☐ second column ☐ contamination check
       - ☐ other (see #10)
     - 2.3.3 ☐ *DILUTION:*
       - ☐ over calibration ☐ under calibration
       - ☐ other (see #10)
     - 2.3.4 ☐ *OTHER: (see #10)*
3. ☐ Sample lost during extraction/analysis; no re-prep or re-analysis possible.
4. ☐ QC data reported to client outside of:
   - ☐ method limits ☐ internal limits
   - ☐ QAPP limits ☐ contract limits
   - ☐ regulatory limits ☐ blank criteria
5. ☐ Incorrect procedure(s) used. (See #10)
6. ☐ Invalid instrument calibration. (See #10)
7. ☐ Incorrect/incomplete data reported to client. (See #10)
8. ☐ Reported detection limit(s) higher than:
   - ☐ method limits ☐ QAPP limits
   - ☐ contract limits ☐ other (see #10)

   Due to:
   - ☐ sample matrix ☐ insufficient sample
   - ☐ instrumentation ☐ other (see #10)
9. ☐ Other (specify): _____
10. ☐ Comments/Explanation: _____

NOTIFICATION [check appropriate item(s)]:

1. ☐ Client notified by (name and date): _____
   - ☐ in writing ☐ by FAX
   - ☐ by phone ☐ Other (explain)
2. ☐ Client's name _____ and response:
   - ☐ process "as is" ☐ resample
   - ☐ on hold til ____ ☐ Other (explain)

PROJECT MANAGER (signature & date): _____

FURTHER ACTION REQUIRED, SEE PAGE 2 OF 2

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FIGURE 9.3-1
ITAS Nonconformance Memo
Page 2 of 2

INTERNATIONAL TECHNOLOGY CORPORATION LOG #: __-93-_____ page 2 of 2

CORRECTIVE ACTION

☐ ROOT CAUSE: INITIALS/DATE_____

☐ CORRECTIVE ACTION: INITIALS/DATE_____

☐ RESPONSIBILITY FOR PERFORMING CORRECTIVE ACTION ASSIGNED TO:

☐ ACTIONS TO PREVENT RECURRENCE: INITIALS/DATE_____

FIRST LEVEL SUPERVISOR: _____ DATE: _____

RESPONSIBLE MANAGER: _____ DATE: _____

QC REVIEW

☐ NONCONFORMANCE ☐ DEFICIENCY

☐ FURTHER ACTION REQUIRED:

ASSIGNED TO:

QC COORDINATOR: _____ DATE: _____

CORRECTIVE ACTION VERIFICATION

☐ VERIFIED ☐ CANNOT VERIFY (specify reason)

REASON:

NCM CLOSURE

QC COORDINATOR: _____ DATE: _____

SIGNED ORIGINAL MUST BE RETAINED IN FILE: ☐ QUALITY/OPERATIONS FILE ☐ PROJECT FILE

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FIGURE 9.3-2
Example Nonconformance Log

N C M #	DATE INITIATED	PROJECT ID/ WORK ORDER NUMBER	LAB AREA	NO. OF SAMPLES AFFECTED	NC CATEGORY	CORRECTIVE ACTION TARGET DATE	CORRECTIVE ACTION COMPLETION DATE	N OR D *	CORRECTIVE ACTION VERIFICATION DATE/INITIALS
XX- 93- 0001									
XX- 93- 0002									
XX- 93- 0003									
XX- 93- 0004									
XX- 93- 0005									
XX- 93- 0006									
XX- 93- 0007									
XX- 93- 0008									
XX- 93- 0009									
XX- 93- 0010									
XX- 93- 0011									
XX- 93- 0012									
XX- 93- 0013									
XX- 93- 0014									
XX- 93- 0015									
XX- 93- 0016									
XX- 93- 0017									
XX- 93- 0018									
XX- 93- 0019									
XX- 93- 0020									

*N=nonconformance; D=deficiency (NOTE: column 10 need not be completed for a deficiency)

FIGURE 9.4-1
ITAS Client Satisfaction Survey Form
(Page 1 of 2)

IT QUALITY / CLIENT SATISFACTION SURVEY

CLIENT INFORMATION:	PROJECT INFORMATION:
Client Company _____	IT Project Number _____
Client Contact _____ Title _____	Project Name _____
Address _____	Project Size ($000) _____
Phone _____	Work Description _____
IT INFORMATION: Date of Survey _____	
IT ANALYTICAL SERVICES DIVISION	
IT Center Performing Service _____	Project Manager _____
IT Host Center Name / Number _____	
IT Host Center Location _____	

INTRODUCTION

IT is committed to maintaining and continually improving the quality of the services and products we offer. We define quality as meeting client requirements. Therefore, the best measure of our performance is our clients' level of satisfaction.

We would like to ask you to help us by answering a few short questions that rate our performance on a scale of 1 to 5.
A rating of "1" indicates totally unsatisfactory performance, a "3" is acceptable, and a "5" means outstanding.

	Rating (1-5)	Weight	Score
1. On this scale of 1 to 5, how well does IT meet your requirements overall?		2.00	
2. How would you rate the timeliness of our work?		2.00	
3. How well have we met your requirements in adhering to and completing the required scope of work?		2.00	
4. How well did we do in meeting your schedule requirements?		2.00	
5. How do you rate the responsiveness of our staff?		2.00	
6. How do you rate the professional competence of our staff?		2.00	
7. What is your assessment of how well we have communicated with you during the course of our work?		2.00	

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FIGURE 9.4-1
ITAS Client Satisfaction Survey Form
(Page 2 of 2)

IT QUALITY / CLIENT SATISFACTION SURVEY (p.2)

	Rating (1-5)	Weight	Score
8. How well does IT's management of our services meet your requirements?		2.00	
9. How well do our status and progress reports meet your requirements?		2.00	
10. How well do our invoices and billing procedures meet your requirements?		2.00	
11. How do you rate the consistency of our performance?		2.00	
12. How would you score the completeness of our services?		2.00	
13. How do you rate the overall value of the services and products provided to you by IT?		2.00	
TOTAL SCORE:			
AVERAGE SCORE:			
PERCENTAGE: Total Possible:	130		

CLOSING

Thank you very much for your time. We appreciate your willingness to help us. Any concerns you may have raised will be addressed promptly by the IT Project Manager for your project.

There is one final question: What changes would you recommend that IT make to improve its service to you?

Again, Thank you. Survey Conducted by: _____

FOLLOWUP ACTION:	Distribution:
What and How:	Project Manager _____
	Lab/FAS Director _____
	Div. Dir./VP _____
	VP QHS _____
	Div. Dir QA/QC _____
	Regional Director _____
Who: Date:	Other _____
Reviewer _____	_____
Signature Date:	_____

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FIGURE 9.5-1
Example Outline Of QA/QCC Monthly Report to Management

I. Audits
   - A. Internal Surveillances
   - B. External Audits
   - C. Subcontractor Audits

II. Certifications
   - A. Pending
   - B. Received

III. Performance Evaluation Samples
   - A. In-House
   - B. Pending
   - C. Received (score)

IV. Holding Time Violations (HTV)
   - A. Total Holding Time Violations
   - B. Category I - Out of Laboratory Control
   - C. Category II - Laboratory Dependent
   - D. Category III - Laboratory Reruns

V. QAPjPs
   - A. Reviewed
   - B. Received

VI. Training
   - A. In-House
   - B. External

VII. Nonconformance Summary and Resolutions

VIII. QC Data/Control Chart Summary

IX. Standard Operating Procedures

X. Client Satisfaction Surveys

XI. Miscellaneous

TABLE 2.1-1
ITAS QUALITY ASSURANCE MANAGEMENT PLAN REQUIREMENTS MATRIX

ITAS QAMP (Rev.2) & OS QAMP (Rev.0)	ITAS QAM (REV 1)	ANSI/ASQC E4-19xx	QAMS 005/80	NQA-1	5700.6C	ANSI N13.30	ANSI/ASQC Q91-1987 (ISO-9001)
1 Management Commitment and Organization	2 Laboratory Organization	A1 Management Commitment and Organization	5.04 Project Organization and Responsibility	1 Organization	N/A	1.1 Introduction 1.2 Purpose 1.3 Scope	4.1 Management Responsibility
2 Quality Assurance Program Description	1 Introduction 3 Standard Laboratory Practice	A2 Quality Assurance Program Description	5.03 Project Description	2 Quality Assurance Program	1 Program	2.1 Special Word Usage 2.2 Specific Terms 5.1 Quality Assurance 5.2 Quality Control	4.2 Quality System
3 Associate Training and Qualification	16 Training	A3 Personnel Training and Qualification	N/A	2 Quality Assurance Program	2 Personnel Training and Qualification	3.2 Personnel Preparation	4.18 Training
4 Procurement of Items and Services	4 Material Procurement and Control	A5 Procurement of Items and Services	N/A	4 Procurement Document Control 7 Control of Purchased Items and Services	7 Procurement	N/A	4.6 Purchasing

TABLE 2.1-1
ITAS QUALITY ASSURANCE MANAGEMENT PLAN REQUIREMENTS MATRIX

ITAS QAMP (Rev.2) & OS QAMP (Rev.0)	ITAS QAM (REV 1)	ANSI/ASQC E4-19xx	QAMS 005/80	NQA-1	5700.6C	ANSI N13.30	ANSI/ASQC Q91-1987 (ISO-9001)
5 Document Control and Records	1 Introduction 12 Records Management	A6 Document Control and Records	5.01 Title Page 5.02 Table of Contents	6 Document Control 17 Quality Assurance Records	4 Documents and Records	3.6 Direct Bioassay-Record Retention 4.5 Indirect Bioassay-Record Retention	4.5 Document Control 4.16 Quality Records
6 Use of Computer Hardware and Software	10 Data Verification	A7 Use of Computer Hardware and Software	N/A	3 Design Control 11 Test Control	N/A	N/A	ISO 9000-3
7 Work Processes and Operations	9 Analytical Procedures 14 QA/QC Audits	A8 Work Processes and Operations B1 Planning and Scoping B2 Design of Data Collection Operations	N/A	1 Organization 5 Instructions, Procedures, and Drawings 10 Inspection 14 Inspection, Test and Operating Status	5 Work Processes 6 Design 8 Inspection and Acceptance Testing	3.1 Facility Criteria	4.9 Process Control

TABLE 2.1-1
ITAS QUALITY ASSURANCE MANAGEMENT PLAN REQUIREMENTS MATRIX

ITAS QAMP (Rev.2) & OS QAMP (Rev.0)	ITAS QAM (REV 1)	ANSI/ASQC E4-19xx	QAMS 005/80	NQA-1	5700.6C	ANSI N13.30	ANSI/ASQC Q91-1987 (ISO-9001)
8 Data Collection and Production Operations	5 Sample Receipt and Initiation of Testing	B1 Planning and Scoping	5.05 QA Objectives for Measurement Data	2 Quality Assurance Program	1 Program	3.1 Facility Criteria	4.8 Product Identification and Traceability
	6 Calibration Practices	B2 Design of Data Collection Operations	5.06 Sampling Procedures	3 Design Control	6 Design	3.4 Direct Bioassay-Performance Criteria for Service Laboratories	4.11 Inspection, Measuring, and Test Equipment
	7 Preventive Maintenance	B3 Implementation of Planned Operations	5.07 Sample Custody	5 Instructions, Procedures, and Drawings	8 Inspection and Acceptance Testing	3.5 Direct Bioassay-Reporting Results	
	8 Analysis of Quality Control Samples		5.08 Calibration Procedures and Frequency	8 Identification and Control of Items		4.1 Indirect Bioassay-Responsibilities of the Service Laboratory Customer	
	9 Analytical Procedures		5.09 Analytical Procedures	9 Control of Processes		4.2 Indirect Bioassay-Analytical Methodology	
	10 Data Verification		5.11 Internal Quality Control Checks	11 Test Control		4.3 Indirect Bioassay-Performance Criteria for Service Laboratories	
			5.13 Preventive Maintenance	12 Control of Measuring and Test Equipment		5.2 Quality Control	
				13 Handling, Storage, and Shipping			

TABLE 2.1-1
ITAS QUALITY ASSURANCE MANAGEMENT PLAN REQUIREMENTS MATRIX

ITAS QAMP (Rev.2) & OS QAMP (Rev.0)	ITAS QAM (REV 1)	ANSI/ASQC E4-19xx	QAMS 005/80	NQA-1	5700.6C	ANSI N13.30	ANSI/ASQC Q91-1987 (ISO-9001)
9 Quality Assessment and Response	13 Nonconformance and Corrective Action	A4 Management Assessment	5.10 Data Reduction, Validation, and Reporting	2 Quality Assurance Program	3 Quality Improvement	3.3 Direct Bioassay-Interpretation of Measurements	4.10 Inspection and Testing
	14 Quality Assurance/Quality Control Audits	A9 Quality Improvement	5.12 Performance and System Audits	13 Handling, Storage, and Shipping	9 Management Assessment	3.5 Direct Bioassay-Reporting Results	4.13 Control of Nonconforming Products
	15 Quality Reports to Management	B4 Assessment of Data Usability	5.14 Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness	15 Control of Nonconforming Items	10 Independent Assessment	4.4 Indirect Bioassay-Reporting Results	4.14 Corrective Action
		B5 Quality Assessment and Response	5.15 Corrective Action	16 Corrective Action		6.1 Direct Bioassay Measurements	4.17 Internal Quality Audits
			5.16 Quality Assurance Reports to Management	18 Audits		6.2 Indirect Bioassay Measurements	4.20 Statistical Techniques

[1]Quality Management and Quality Assurance Standards, ISO 9000, Part 3, "Guidelines for the application of ISO 9001 to the development, supply and maintenance of software".

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TABLE 2.3-1
ITAS Quality Assurance Documents

Document	Purpose	Required Approval
ITAS Quality Assurance Management Plan (QAMP)	• Provides ITAS Quality Assurance Policy • Is applicable to and provides direction for all ITAS laboratories • Covers administrative and technical aspects of QA/QC • Has precedence over all other ITAS quality related documents	• Chief Executive Officer (CEO), IT Corporation • Vice President, Quality and Health Services, IT Corporation • Vice President, IT Analytical Services • Division Director, Quality Assurance/Quality Control
Operation-Specific Quality Assurance Management Plan (OS QAMP)	• Describes the local implementation of the policies in the ITAS Quality Assurance Management Plan • Meets or exceeds all requirements of the ITAS QAMP • Describes services and quality requirements common to ITAS operations	• Vice President, Analytical Services, IT Corporation • Division Director, Quality Assurance/Quality Control • Vice President, Quality and Health Services • Division Operations Director • Operating Unit Director
OS QAMP Operation-Specific Appendices	• Describes services and quality requirements unique to each ITAS operation	• Laboratory QA/QCC • Technical Specialist • Operating Unit Director • Division Director, QA/QC • Division Technical Director
Manuals of Practice (MOP)	• Provides in-depth technical discussions of a specific topic • May be a collection of standard operating procedures (SOPs).	• Vice President, IT Analytical Services • Division Director, Quality Assurance/Quality Control

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TABLE 2.3-1
ITAS Quality Assurance Documents
(Continued)

Document	Purpose	Required Approval
Division Standard Operating Procedures (SOP) (formerly ITAS Systems Procedures)	• Common to all ITAS operations and standard across the network • Provides detailed instructions describing how to perform a specific operation or task • Defines responsibilities as related to the operation or task • Defines quality requirements as related to the operation or task.	• ITAS Technical Specialist • Division Director, Quality Assurance/Quality Control • Division Director, Health and Safety • ITAS Standardization Committee Member
Laboratory-Specific Standard Operating Procedures (SOP)	• Provides detailed instructions describing how to perform a specific operation or task • Defines responsibilities as related to the operation or task • Defines quality requirements as related to the operation or task.	• Division Director, Quality Assurance/Quality Control • Division Director, Health and Safety • Operating Unit Director • Laboratory Technical Director • Laboratory QA/QCC
Project Specific Manuals, Quality Assurance Project Plans (QAPjPs), or Quality Assurance Program Plans (QAPPs)[1]	• Defines project requirements • Defines the organizational structure for a project and lines of communication between the parties • Defines contractual requirements as pertains to sample analysis • Defines regulatory requirements • Takes precedence over conventional ITAS QA practices for the project	• Operating Unit Director • Laboratory QA/QCC • Laboratory Technical Director • Laboratory Health and Safety Coordinator • Project Manager • Client Representative

TABLE 2.3-1
ITAS Quality Assurance Documents
(Continued)

Document	Purpose	Required Approval
Quality Assurance Summary (QAS) (Operation-specific document)	• Defines specific QA/QC requirements • Defines reporting requirements • Defines any client-specific requirement that varies from normal operation	• Approval varies within the operations

(1) Listed approvals required apply only to these documents when generated by ITAS.

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TABLE 8.2-1
Inorganic Sample Containers, Preservatives, and Holding Times

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Acidity	Water	250 ml plastic or glass, Cool, 4°C, 14 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Alkalinity	Water	250 ml plastic or glass, Cool, 4°C, 14 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ammonia	Water	500 ml plastic or glass, Cool, 4°C H_2SO_4 to pH < 2, 28 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Biochemical Oxygen Demand (BOD)	Water	1000 ml plastic or glass, Cool, 4°C 48 hours	Not Applicable	Not Applicable	200 ml, no preservative required, 48 hours
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Biochemical Oxygen Demand (BOD) (continued)	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Bromide	Water	250 ml plastic or glass, No preservative required, 28 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Chemical Oxygen Demand (COD)	Water	250 ml glass or plastic, Cool, 4°C, H_2SO_4 to pH < 2, 28 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	2 or 4 oz glass, No preservative
Chloride	Water	250 ml plastic or glass, No preservative required, 28 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Residual Chlorine	Water	250 ml plastic or glass, No preservative required, analyze immediately	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not applicable
Chromium (Cr^{+6})	Water	200 ml plastic or glass, Cool, 4°C, 24 hours	250 ml plastic or glass, Cool, 4°C, 24 hours	Not Applicable	Not Applicable
	Liquid	200 ml plastic or glass, Cool, 4°C, 24 hours	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Color	Water	250 ml plastic or glass, Cool, 4°C, 48 hours	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Conductivity	Water	250 ml plastic or glass, Cool, 4°C, 28 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Conductivity (continued)	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Amenable)	Water	1 liter plastic or glass, NaOH to pH > 12 0.6g ascorbic acid[6] Cool, 4°C, 14 days unless sulfide is present. Then maximum holding time is 24 hours	1 liter plastic or glass NaOH to pH > 12 0.6g ascorbic acid[6] Cool, 4°C, 14 days	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	1 liter HDPE[9] NaOH to pH > 12 0.6g ascorbic acid[6] Cool, 4°C
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Free)	Water	Not Applicable	Not Applicable	Not Applicable	1 liter HDPE[9], NaOH to pH > 12 0.6g ascorbic acid[6] Cool, 4°C, 14 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	8 oz or 16 oz glass teflon lined lid, Cool, 4°C, 14 days

Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Cyanide (Total)	Water	1 liter plastic or glass, NaOH to pH > 12, 0.6g ascorbic acid[6] Cool, 4°C, 14 days unless sulfide is present. Then maximum holding time is 24 hours	1 liter plastic or glass, NaOH to pH > 12 0.6g ascorbic acid[6] Cool,4°C, 14 days	1 liter HDPE[5], NaOH to pH > 12 Cool, 4°C, 12 days	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	TCLP Leachate: 14 days Analysis: 14 days from end of TCLP leaching not to exceed 28 days total	Not Applicable	1 liter HDPE[5] NaOH to pH > 12 0.6g ascorbic acid[6] Cool, 4°C
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	8 or 16 oz glass teflon-lined lids, Cool, 4°C, 14 days	8 or 16 oz glass teflon-lined lids, Cool, 4°C, 12 days	Not Applicable
Flashpoint (Ignitability)	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	No requirements: 250 ml amber glass, Cool, 4°C is recommended	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Fluoride	Water	500 ml plastic, No preservation required, 28 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Fluoride (continued)	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Hardness (Total)	Water	250 ml plastic or glass, HNO_3 or H_2SO_4 to pH < 2, 6 months	Not Applicable	Not Applicable	1 liter glass or polyethylene, pH ≤ 2 with HNO_3, 6 months
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Iodide	Water	100 ml plastic or glass, Cool, 4°C, 24 hours	Not Applicable	Not Applicable	100 ml HDPE[5], Cool, 4°C, 24 hours
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Methylene Blue Active Substances (MBAS) (Surfactant)	Water	250 ml plastic or glass, Cool, 4°C, 48 hours	Not Applicable	Not Applicable	250 ml HDPE[5], Cool, 4°C, 48 hours
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Nitrogen, Nitrate-Nitrite	Water	250 ml plastic or glass, Cool, 4°C, H_2SO_4 to pH < 2, Nitrate - 14 days preserved, 48 hours unpreserved, Nitrite - 48 hours, Nitrate + Nitrite - 28 days preserved	Cool, 4°C, plastic or glass, 48 hours	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Odor	Water	200 mL glass only, Cool, 4°C, 24 hours	Not Applicable	Not Applicable	200 mL glass only, Cool, 4°C, 24 hours
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Oil and Grease	Water	1 liter glass, Cool, 4°C HCl or H_2SO_4 to pH < 2, 28 days	1 liter glass, Cool, 4°C H_2SO_4 to pH < 2, 28 days	Not Applicable	1 liter amber glass, Cool, 4°C H_2SO_4 to pH < 2, 28 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	8 oz amber glass with teflon-lined lid, Cool, 4°C, 28 days	Not Applicable	1 liter amber glass, Cool, 4°C H_2SO_4 to pH < 2, 28 days (Not applicable to Sludge, solid, or sediment)

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Oil and Grease (continued)	Soil	Not Applicable	8 oz amber glass with teflon-lined lid, Cool, 4°C, 28 days	Not Applicable	Not Applicable
Ortho-phosphorous	Water	100 ml plastic or glass, Filter on site Cool 4°C, 48 hours	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
pH	Water	100 ml plastic or glass Analyze immediately. This test should be performed in the field	100 ml plastic or glass, Analyze immediately. This test should be performed in the field	Method CLP, Analyze as close to extraction as possible	Not Applicable
	Liquid	Not Applicable	100 ml glass, Cool, 4°C, Analyze immediately. This test should be performed in the field	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	This test is performed in the laboratory	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	4 oz. glass or plastic, Cool, 4°C, Analyze as soon as possible.	Not Applicable	Not Applicable
Phenolics	Water	500 ml glass, Cool, 4°C H_2SO_4 to pH < 2, 28 days	1 liter glass recommended, Cool, 4°C H_2SO_4 to pH < 2, 28 days	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Phenolics (continued)	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Phosphorus (Total)	Water	100 ml plastic or glass, Cool, 4°C H_2SO_4 to pH < 2, 28 days	Not Applicable	Not Applicable	100 ml HDPE[5], Cool, 4°C H_2SO_4 to pH < 2, 28 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Reactivity (Cyanide and Sulfide)	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	10 oz glass amber, Cool, 4°C, no headspace, analyze as soon as possible	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Settleable Solids	Water	1000 ml plastic or glass, Cool, 4°C, 48 hours	Not Applicable	Not Applicable	1 liter HDPE[5], Cool, 4°C, 24 hours
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Silica, Dissolved	Water	Plastic only, 100 mL, Cool, 4°C, 28 days	Not Applicable	Not Applicable	Plastic only, 100 mL, Cool, 4°C, 28 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Silica, Dissolved (continued)	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfate (SO_4)	Water	100 ml plastic or glass, Cool, 4°C, 28 days	100 ml plastic or glass Cool, 4°C, 28 days	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	100 ml plastic or glass Cool, 4°C, 28 days Not applicable to sludge, solid, and sediment.	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfide	Water	500 ml plastic or glass, Cool, 4°C, Add 2 ml zinc acetate plus NaOH to pH > 9, 7 days	500 ml HDPE[8], Cool, 4°C Add 2 ml zinc acetate plus NaOH to pH > 9, 7 days	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Fill the surface of the solid with 2N zinc acetate until moistened. Cool, 4°C, store headspace-free	Not Applicable	Not Applicable
	Soil	Not Applicable	Fill the surface of the solid with 2N zinc acetate until moistened. Cool, 4°C, store headspace-free	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Sulfite (SO_3)	Water	100 ml plastic or glass, No preservative required, analyze immediately	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Temperature	Water	1 liter plastic or glass, analyze immediately in the field	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Dissolved Solids	Water	250 ml plastic or glass, Cool, 4°C, 7 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Kjeldahl Nitrogen (TKN)	Water	500 ml plastic or glass, Cool, 4°C H_2SO_4 to pH < 2, 28 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Total Organic Carbon (TOC)	Water	100 ml plastic or glass, H_2SO_4 or HCl to pH < 2 Cool, 4°C, 28 days	100 ml plastic or glass, H_2SO_4 or HCl to pH < 2 Cool, 4°C, 28 days	Not Applicable	100 ml HDPE[5], H_2SO_4 or HCl to pH < 2, Cool, 4°C, 28 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Organic Halides (TOX)	Water	Not Applicable	500 ml glass amber teflon-lined lid, Cool, 4°C H_2SO_4 to pH < 2, no headspace, 28 days	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
TPH	Water	1 liter glass, H_2SO_4 to pH<2, 28 days	1 liter glass, H_2SO_4 to pH<2, 28 days	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	4 or 8 oz glass widemouth with Teflon-lined lid, Cool, 4°C, 28 days	Not Applicable	Not Applicable
	Soil	Not Applicable	4 or 8 oz glass widemouth with Teflon-lined lid, Cool, 4°C, 28 days	Not Applicable	250 ml glass, no preservative required, 28 days
Total Solids	Water	250 ml plastic or glass, Cool, 4°C, 7 days	Not Applicable	Not Applicable	Not Applicable

Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Total Solids (continued)	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Suspended Solids	Water	250 ml plastic or glass, Cool, 4°C, 7 days	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Volatile Solids	Water	250 ml plastic or glass, Cool, 4°C, 7 days	Not Applicable	Not Applicable	250 ml, HDPE[5], Cool, 4°C, 7 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Turbidity	Water	250 ml plastic or glass, Cool, 4°C, 48 hours	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
ICAP, GFAA, and Flame AA (excludes mercury)	Water	1 liter glass or polyethylene container, HNO_3 to pH ≤ 2, 6 months	1 liter glass or polyethylene container, pH ≤ 2 with HNO_3, 6 months	1 liter glass or polyethylene, Cool, 4°C, pH ≤ 2 with HNO_3, 180 days	Not Applicable
	Liquid	Not Applicable	No preservative required, 6 months	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	1 liter plastic or glass (glass only if organics are to be tested from the same bottle), HNO_3 to pH < 2, TCLP Leaching: 180 days from field collection to TCLP extraction. Analysis: 180 days from extraction to analysis (total elapsed time = 360 days)	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	1 liter glass or polyethylene container, 6 months	8 or 16 oz glass or polyethylene container Cool, 4°C, 6 months	Not Applicable	Not Applicable
	Soil	Not Applicable	8 or 16 oz glass or polyethylene container, Cool, 4°C, 6 months	8 or 16 oz glass or polyethylene container, Cool, 4°C, 180 days	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	Hi-Vols - store in humidity controlled environment, no holding time requirement IH - no holding time requirement
Mercury (CVAA)	Water	1 liter glass or polyethylene container, Cool, 4°C, HNO_3 to pH ≤ 2, 28 days	1 liter glass or polyethylene container, HNO_3 to pH ≤ 2, 13 days plastic, 38 days glass	1 liter glass or polyethylene container, Cool, 4°C, HNO_3 to pH ≤ 2, 26 days	Not Applicable
	Liquid	Not Applicable	No preservative required, 28 days	Not Applicable	Not Applicable

Table 8.2-1
Inorganic Sample Containers, Preservations, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2], [7]	CLP[3],[4]	Other
Mercury (CVAA) (continued)	TCLP Leachate	Not Applicable	1 liter HDPE[5], HNO_3 to pH < 2, TCLP Leaching: 28 days from field collection to TCLP extraction. Analysis: 28 days from extraction to analysis (total elapsed time = 56 days.	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	8 or 16 oz glass or polyethylene container, Cool, 4°C, 28 days	8 or 16 oz glass or polyethylene container, Cool, 4°C, 28 days	1 liter glass or polyethylene container, Cool, 4°C, 26 days	Not Applicable
	Soil	8 or 16 oz glass or polyethylene container, Cool, 4°C, 28 days	8 or 16 oz glass or polyethylene container, Cool, 4°C, 28 days	1 liter glass or polyethylene container, Cool, 4°C, 26 days	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	Hi-Vols - store in humidity controlled environment, no holding time requirement IH - no holding time requirement

(1) National Pollutant Discharge Elimination System
(2) Resource Conservation and Recovery Act (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd edition, Final Update I, July 1992
(3) Contract Laboratory Program
(4) Holding times are calculated from verified time of sample receipt
(5) High density Polyethylene
(6) Should be used only in the presence of chlorine
(7) Holding times are calculated from date of collection

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TABLE 8.2-2
Organic Sample Containers, Preservatives, and Holding Times

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4,5]	Other
Aromatic Volatiles	Water[6a]	40 ml glass VOA vial (in duplicate) with teflon-lined septa without headspace, Cool 4°C, Add sodium thiosulfate if residual chlorine, 7 days with pH > 2 14 days with pH ≤ 2	40 ml glass VOA vial (in duplicate) with teflon-lined septa without headspace, Cool 4°C, Add sodium thiosulfate if residual chlorine, HCl or H_2SO_4 or solid $NaHSO_4$ to pH ≤ 2, 14 days with pH ≤ 2	Not Applicable	40 ml glass VOA vial with teflon-lined septa in duplicate without headspace, Cool 4°C, HCl to pH ≤ 2,
	Liquid	Not Applicable	40 ml glass VOA with teflon-lined lid, Cool 4°C, 14 days	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	4 or 8 oz glass with teflon-lined lid, Cool, 4°C, TCLP Leachate: 14 days, Analysis: 14 days from end of TCLP leaching (not to exceed 28 days total)	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	4 or 8 oz glass with teflon-lined lid, Cool 4°C, 14 days	Not Applicable	Not Applicable
	Soil	Not Applicable	4 or 8 oz glass with teflon-lined lid, Cool, 4°C, 14 days	Not Applicable	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Dioxins/ Dibenzofurans	Water[6a]	1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract, 7 days Analysis, 40 days	1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract, 30 days Analysis, 45 days from date of collection	Not Applicable	Not Applicable
	Liquid	Not Applicable	100 ml glass amber with teflon-lined lid, Cool, 4°C, Extract, 30 days Analysis 45 days from date of collection	Not Applicable	Not Applicable

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Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[a,c]	CLP 88 & 90[a,c]	Other
Dioxins/ Dibenzofurans (continued)	TCLP Leachate	Not Applicable	1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract, 30 days Analysis 45 days from date of collection	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	8 or 16 oz glass amber wide mouth with teflon-lined lid, Cool 4°C, Extract, 30 days Analysis 45 days from date of collection	Not Applicable	Not Applicable
	Soil	Not Applicable	8 or 16 oz glass amber wide mouth with teflon-lined lid, Cool 4°C, Extract, 30 days Analysis 45 days from date of collection	Not Applicable	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Formaldehyde	Water[a,b]	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	Store at 4°C, Analysis, 30 days
Herbicides	Water[a,b]	1 liter glass amber with teflon-lined lid, Sodium thiosulfate of ascorbic acid if residual chlorine present, Cool, 4°C, Extract, 7 days Analysis, 40 days after extraction	1 liter glass amber with teflon-lined lid, Sodium thiosulfate if residual chlorine present, Cool, 4°C, Extract, 7 days Analysis, 40 days after extraction	Not Applicable	1 liter glass Cool, 4°C, Extract, 14 days, Analysis, 28 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times (continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4,5]	Other
Herbicides (continued)	TCLP Leachate	Not Applicable	4 or 8 oz glass widemouth with teflon-lined lid, Cool, 4°C, TCLP Leachate, 14 days, Extract, 7 days from end of TCLP leaching (not to exceed 21 days total), Analysis, 40 days after extraction	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment		4 or 8 oz glass widemouth with teflon-lined lid, Cool, 4°C, Extract, 14 days, Analysis, 40 days after extraction	Not Applicable	Not Applicable
	Soil	Not Applicable	4 or 8 oz glass widemouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days after extraction	Not Applicable	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitroaromatics	Water[6b]	Not Applicable	100 ml glass with teflon-lined cap, Cool, 4°C	Not Applicable	1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract, 7 days Analysis, 40 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	100 ml glass amber with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	4 or 8 oz glass amber widemouth with teflon-lined lid Room temperature or cooler	Not Applicable	8 or 16 oz glass amber wide mouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days

Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times (continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4,5]	Other
Nitroaromatics (continued)	Soil	Not Applicable	4 or 8 oz glass amber widemouth with teflon-lined lid Room temperature or cooler	Not Applicable.	8 or 16 oz glass amber wide mouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days
	Air	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Non-Methane Organic Compounds (NMOC)	Water[11]	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	Summa Cannister, No preservation or holding time required
PAH	Water[11]	1 liter glass amber with teflon-lined lid. Adjust pH to 5-9 if extraction not to be done within 72 hours of sampling. Add sodium thiosulfate if residual chlorine present. Cool, 4°C, Extract, 7 days Analysis, 40 days after extraction	1 liter glass amber with teflon-lined lid. If residual chlorine present, add sodium thiosulfate. Cool, 4°C, Extract, 7 days Analysis, 40 days after extraction	Not Applicable	Not Applicable
	Liquid	Not Applicable	100 ml glass amber with teflon-lined lid, No preservative required, Extract, 14 days Analysis, 40 days after extraction	Not Applicable	Not Applicable

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Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4, 5]	Other
PAH (continued)	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	4 or 8 oz widemouth glass with teflon-lined lid, Cool, 4°C, TCLP Leaching: 14 days from field collection to TCLP extraction, Extract 7 days from the end of TCLP leaching (not to exceed 14 days total), Analysis, 40 days after extraction
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	4 or 8 oz glass widemouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days after extraction	Not Applicable	Not Applicable
	Soil	Not Applicable	4 or 8 oz glass widemouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days after extraction	Not Applicable	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	PUF/XAD-2, Cool, 4°C, Extract within 7 days of collection, Analyze within 40 days from extraction

Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times (continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4,5]	Other
Pesticides/ PCBs	Water[4b]	1 liter glass with teflon-lined lid. Adjust pH to 5-9 if extraction not to be done within 72 hours of sampling. Add sodium thiosulfate if residual chlorine present and aldrin is being determined. Cool, 4°C, Extract, 7 days Analysis, 40 days after extraction	1 liter amber with teflon-lined lid, If residual chlorine present, add sodium thiosulfate. Cool, 4°C, Extract, 7 days Analysis, 40 days after extraction	1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract within 5 days of sample receipt Analysis, 40 days after extraction	1 liter glass (in duplicate) with teflon-lined septa, Cool, 4°C, Extract, 14 days, Analysis, 30 days ——— 1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract, 30 days Analysis, 45 days from date of collection ——— 2 X 40 ml glass amber with teflon-lined lid, Cool, 4°C, Extract 7 days Analyze 14 days from date of collection
	Liquid	Not Applicable	100 ml glass with teflon-lined lid, No preservative required Extract, 14 days Analysis, 40 days after extraction	Not Applicable	100 ml glass amber with teflon-lined lid, Cool, 4°C, Extract, 30 days Analysis, 45 days from date of collection
	TCLP Leachate	Not Applicable	4 or 8 oz widemouth glass with teflon-lined lid, Cool, 4°C, TCLP Leaching: 14 days from field collection to TCLP extraction, Extract 7 days from the end of TCLP leaching (not to exceed 21 days total), Analysis, 40 days after extraction	Not Applicable	1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract, 30 days Analysis, 45 days from date of collection

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Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times (continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4,5]	Other
Pesticides/ PCBs (continued)	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	4 or 8 oz glass widemouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days after extraction	Not Applicable	8 or 16 oz glass amber wide mouth with teflon-lined lid, Cool 4°C, Extract, 30 days Analysis, 45 days from date of collection
	Soil	Not Applicable	4 or 8 oz glass widemouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days after extraction	4 or 8 oz glass widemouth with teflon-lined lid, protect from light, Cool, 4°C, Extract, 10 days of sample receipt, Analysis, 40 days after extraction	8 or 16 oz glass amber wide mouth with teflon-lined lid, Cool 4°C, Extract, 30 days Analysis, 45 days from date of collection
	Air	Not Applicable	Not Applicable	Not Applicable	PUF[8]: Store at 4°C, Extract, 14 days Analysis, 40 days after extraction
Petroleum Hydrocarbons	Water[10]	1 liter glass amber with teflon-lined lid, pH to ≤ 2 with H_2SO_4, Cool, 4°C, 28 days (oil & grease holding time),	Not Applicable	Not Applicable	DRO[7]: 1 liter glass with teflon-lined lid, pH to ≤ 2 with H_2SO_4, Cool, 4°C, Extract 7 days, Analysis 40 days GRO[6]: 40 ml glass VOA vial with teflon-lined septa, in triplicate without headspace. Cool, 4°C. pH ≤ 2 with HCl, 14 days
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times (continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4, 5]	Other
Petroleum Hydrocarbons (continued)	Soil	Not Applicable	Not Applicable	Not Applicable	DRO[7]: 4 or 8 oz glass widemouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days GRO[6]:4 oz widemouth glass jar with teflon-lined lid, with container filled as full as possible, Cool, 4°C, 14 days
	Air	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Purgeable Halocarbons	Water[11]	40 ml glass VOA vial (in duplicate) with teflon-lined septa with no headspace, Cool, 4°C, sodium thiosulfate if residual chlorine, 14 days	40 ml glass VOA vial (in duplicate) with teflon-lined septa with no headspace, Cool, 4°C, HCl or H_2SO_4 or solid $NaHSO_4$ to pH $\leq$ 2, sodium thiosulfate if residual chlorine, 14 days	Not Applicable	Not Applicable
	Liquid	Not Applicable	40 ml glass VOA vial (in duplicate) with teflon-lined septa, Cool, 4°C, 14 days	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	4 or 8 oz glass with teflon-lined lid, Cool, 4°C, TCLP Leachate: 14 days, Analysis: 14 days from end of TCLP leaching (not to exceed 28 days total)	Not Applicable	40 ml glass with teflon-lined septa, Cool 4°C, TCLP Leaching: 14 days Analysis: 14 days from end of TCLP leaching (not to exceed 28 days total)
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	4 or 8 oz glass container with teflon-lined lid, Cool 4°C, 14 days	Not Applicable	Not Applicable
	Soil	Not Applicable	4 or 8 oz glass container with teflon-lined lid, Cool 4°C, 14 days	Not Applicable	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times (continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4,5]	Other
Semivolatiles	Water[6a]	1 liter glass with teflon-lined lid, Cool, 4°C, Extract, 7 days Analysis, 40 days	1 liter amber glass with teflon-lined lid, Cool, 4°C, Extract, 7 days Analysis, 40 days	1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract, 5 days from sample receipt Analysis, 40 days	1 liter glass amber with teflon-lined lid, Cool, 4°C, Extract, 7 days Analysis, 40 days
	Liquid	Not Applicable	100 ml glass with teflon lined lid, No preservative required, Extract, 14 days Analysis, 40 days	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	1 liter glass with teflon-lined lid, Cool, 4°C, TCLP Leaching: 14 days from field collection to TCLP extraction, Extract 7 days from TCLP extraction to preparative extraction, Analysis, 40 days from preparative extraction	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	8 or 16 oz glass wide mouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days after extraction	Not Applicable	Not Applicable
	Soil	Not Applicable	8 or 16 oz glass widemouth with teflon-lined lid, Cool, 4°C, Extract, 14 days Analysis, 40 days after extraction	8 or 16 oz glass amber wide mouth with teflon-lined lid, Cool, 4°C, Extract, 10 days from sample receipt, Analysis, 40 days	Not Applicable
	Air	Not Applicable	Not Applicable	Not Applicable	PUF[6b]/XAD: Store at 4°C, extract, 7 days, Analysis, 40 days

Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times (continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4,5]	Other
Volatiles	Water[6a]	40 ml glass VOA vial (in duplicate) with teflon-lined septa without headspace, Cool, 4°C, HCl to pH ≤ 2, 7 days with pH ≥ 2, Analyze within 14 days of collection with pH ≤ 2	40 ml glass VOA vial (in duplicate) with teflon-lined septa in duplicate without headspace, Cool, 4°C, HCl or H_2SO_4 or $NaHSO_4$ to pH ≤ 2, Sodium thiosulfate if residual chlorine, Analyze within 14 days of collection with pH ≤ 2	40 ml VOA glass vial (in duplicate) with teflon-lined septa, with no headspace, Cool, 4°C, 10 days from sample receipt	40 ml glass with teflon-lined septa, Cool, 4°C, HCl to pH 2, 14 days 40 ml glass with teflon-lined septa, Cool, 4°C, 7 days
	Liquid	Not Applicable	40 ml glass with teflon-lined septa, None required, 14 days	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	40 ml glass with teflon-lined septa, Cool to ≤ 4°C, TCLP Leaching: 14 days from field collection to TCLP extraction, Analysis: 14 days from preparative extraction to determinative analysis, (total lapsed time = 28 days)	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	4 or 8 oz glass with teflon-lined septa, Cool, 4°C, Analyze within 14 days	Applicable only to sediment: 4 or 8 oz glass with teflon-lined septa, Cool, 4°C, 10 days from sample receipt	Not Applicable
	Soil	Not Applicable	4 or 8 oz glass with teflon-lined septa, Cool, 4°C, Analyze within 14 days	4 or 8 oz glass with teflon-lined septa, Cool, 4°C, 10 days from sample receipt	Not Applicable

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Table 8.2-2
Organic Sample Containers, Preservatives, and Holding Times
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES[1]	RCRA (SW846)[2,3]	CLP 88 & 90[4,5]	Other
Volatiles (Continued)	Air	Not Applicable	Not Applicable	Not Applicable	Summa Cannister: Store at ambient temperature, no holding time requirement VOST[10]: Store at < 0°C, 14 days IH[9]: Store at < 0°C, no holding time requirement

(1) National Pollutant Discharge Elimination System
(2) Resource Conservation and Recovery Act (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd edition, Final Update I, July 1992
(3) Holding times are calculated from the date of collection
(4) Contract Laboratory Program
(5) Holding times are calculated from verified time of sample receipt
(6) Gasoline Range Organics
(7) Diesel Range Organics
(8) Polyurethane foam
(9) Industrial Hygiene
(10) Volatile Organic Sampling Train
(11) When a matrix spike (MS) analysis is required for a water sample, it should be sampled in duplicate (two separate sample containers). When a matrix spike/matrix spike duplicate (MS/MSD) analysis is required for a water sample, it should be sampled in triplicate (three separate sample containers).

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TABLE 8.2-3
Radiological Sample Containers, Preservatives, and Holding Times

Analytical Parameters	Matrix	Recommended Containers[1]	Preservative	Maximum Holding Time	Minimum Volume Required for Analysis[2]
Gross Alpha/Beta	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	500 mls
	Soil	P, G	None		50[4] gms
Americium-241	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms
Carbon-14	Water	P, G	Field adjusted to pH > 9 with NaOH[3]	180 days after collection	100 mls
	Soil	P, G	None		50[4] gms
Calcium-45	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	100 mls
Curium-242	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms
Gamma Emitters Actinides, as applicable, Co-60, Cs-137, K-40, Mn-54, and other fission/activation products	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		650[7] gms
Iron-55	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	50 mls
Lead-210	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	500 mls
	Soil	P, G	None		50[4] gms
Neptunium-237	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms

TABLE 8.2-3
Radiological Sample Containers, Preservatives, and Holding Times (Continued)

Analytical Parameters	Matrix	Recommended Containers[1]	Preservative	Maximum Holding Time	Minimum Volume Required for Analysis[2]
Promethium-147	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	250 mls
Plutonium-238,239/240	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms
Radium-226	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms
Radium-228	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms
Strontium-89,90 and Total Strontium	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms
Technetium-99	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	100 mls
	Soil	P, G	None		50 gms
Thorium-227,228,230,232	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms
Total Uranium	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	50 mls
	Soil	P, G	None		50[4] gms
Tritium	Water	P, G[6]	None	180 days after collection	100 mls
	Soil	P, G[6]	None		100 gms

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TABLE 8.2-3
Radiological Sample Containers, Preservatives, and Holding Times (Continued)

Analytical Parameters	Matrix	Recommended Containers[1]	Preservative	Maximum Holding Time	Minimum Volume Required for Analysis[2]
Uranium-233/234,235/236	Water	P, G	Field acidified to pH < 2 with HNO_3	180 days after collection	1000[5] mls
	Soil	P, G	None		50[4] gms
Uranium-238	Soil	P, G	None	180 days after collection	50[4] gms

1 Plastic (polyethylene), Glass
2 Assumes that quality control samples have been assigned in the field. If duplicates, matrix spikes and/or matrix spike duplicates are to be assigned by the laboratory additional multiple sample volumes are required.
Volumes listed are for standard aliquot size. Detection limit requirements may necessitate larger volumes.
3 Assumes that Carbon is in the form of CO_3^-.
4 May be aliquoted or sequentially determined from the same volume.
5 May be aliquoted or sequentially determined from the same volume.
6 Tritium is very volatile. Sample containers must by air tight to eliminate tritium loss.
7 Dry weight.

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TABLE 8.4-1
Summary of Inorganic Method Calibrations

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Acidity	Initial	2 point calibration of pH meter (± 0.05 pH units of true value)	Not Applicable	Not Applicable	2 point calibration of pH meter (± 0.05 pH units of true value)
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Alkalinity	Initial	2 point calibration of pH meter (± 0.05 pH units of true value)	Not Applicable	Not Applicable	2 point calibration of pH meter (± 0.05 pH units of true value)
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ammonia	Initial	7 levels plus blank, "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 level every 10 samples ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 level ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ammonia (TKN)	Initial	7 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 level every 10 samples ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 level ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
BOD	Initial	Winkler calibration	Not Applicable	Not Applicable	Winkler calibration
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Bromide (Titration and Spectro-photometric)	Initial	2 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	8 levels plus blank "r"[4] ≥ 0.995
	Continuing	Single point daily and after every 10 samples ± 15% of true value	Not Applicable	Not Applicable	1 point every 10 samples ± 15% of true value
	Ending	1 level ± 15% of true value	Not Applicable	Not Applicable	1 point every 10 samples ± 15% of true value
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Bromide (IC)	Initial	3 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	Single point daily and after every 20 samples ± 10% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 level ± 10% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cation Exchange Capacity	See ICAP Calibration Procedures, this is an extraction method.				
Chemical Oxygen Demand (COD)	Initial	3 levels plus blank	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 point every 10 samples ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 point ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Chloride (IC)	Initial	3 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	Single point daily and after every 20 samples ± 10% of true value	Not Applicable	Not Applicable	Not Applicable

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Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Chloride (IC) (continued)	Ending	1 level ± 10% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Chloride (LACHAT)	Initial	8 levels plus blank "r"[4] ≥ 0.995	3 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable
	Continuing	1 point every 10 samples ± 15% of true value	1 standard every 15 samples ± 15% of true value	Not Applicable	Not Applicable
	Ending	1 level ± 15% of true value	1 level ± 15% of true value	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Chlorine, Residual	Initial	Standardize titrant	Not Applicable	Not Applicable	Not Applicable
	Continuing		Not Applicable	Not Applicable	Not Applicable
	Ending		Not Applicable	Not Applicable	Not Applicable
	Other		Not Applicable	Not Applicable	Not Applicable
Chromium (Hexavalent) Cr^{+6}	Initial	4 standards plus blank "r"[4] ≥ 0.995	Standard concentration ranging from 0.5 to 5 mg/L Cr(VI)	Not Applicable	7 standards plus blank "r"[4] ≥ 0.995
	Continuing	1 point every 10 samples ± 15% of true value	1 independently-prepared check standard every 15 samples	Not Applicable	1 point every 10 samples ± 15% of true value
	Ending	1 point ± 15% of true value	Not Applicable	Not Applicable	1 point ± 15% of true value
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Color	Initial	3 standards plus blank	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 point every 10 samples	Not Applicable	Not Applicable	Not Applicable
	Ending	1 point	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Conductivity	Initial	Standardize meter with 0.01 M KCl	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 point every 10 samples ± 15% of true value	Not Applicable	Not Applicable	Not Applicable

Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Conductivity (continued)	Ending	1 point ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	1 point ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
Cyanide (Amenable)	Initial	3 levels plus blank "r"[4] ≥ 0.995	6 levels plus blank "r"[4] ≥ 0.995	Not Applicable	8 levels plus blank "r"[4] ≥ 0.995
	Continuing	1 level every 10 samples ± 15% of true value	1 mid-level every 10 samples ± 15 % of true value	Not Applicable	1 level every 10 samples ± 15% of true value
	Ending	1 level ± 15 % of true value	1 level ± 15 % of true value	Not Applicable	1 level ± 15 % of true value
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Free)	Initial	Not Applicable	Not Applicable	Not Applicable	8 levels plus blank "r"[4] ≥ 0.995
	Continuing	Not Applicable	Not Applicable	Not Applicable	1 level every 10 samples ± 15 % of true value
	Ending	Not Applicable	Not Applicable	Not Applicable	1 level ± 15 % of true value
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Total)	Initial	6 levels plus blank "r"[4] ≥ 0.995	6 levels plus blank "r"[4] ≥ 0.995	minimum of 8 levels plus blank "r"[4] ≥ 0.995	8 levels plus blank "r"[4] ≥ 0.995
	Continuing	1 mid-level every 10 samples ± 15 % of true value	1 level every 10 samples ± 15 % of true value	1 level every 10 samples ± 15 % of true value	1 mid-level every 10 samples ± 15 % of true value
	Ending	1 level ± 15 % of true value	1 level ± 15 % of true value	1 level ± 15 % of true value	1 level ± 15 % of true value
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Flashpoint (Ignitability)	Initial	Not Applicable	p-Xylene reference standard must have flashpoint of 27.2°C ± 1.1°C	Not Applicable	Not Applicable
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Fluoride (IC)	Initial	3 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 level every 20 samples ± 10% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 level ± 10% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Fluoride (Ion-Specific Electrode)	Initial	5-8 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 mid-level every 10 samples ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 level ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Hardness	Initial	Standardize titrant	Not Applicable	Not Applicable	Hardness by calculation using ICP results
	Continuing	Not Applicable	Not Applicable	Not Applicable	
	Ending	Not Applicable	Not Applicable	Not Applicable	
	Other	Not Applicable	Not Applicable	Not Applicable	
Iodide (Titration)	Initial	2 points plus blank ± 0.5 N	Not Applicable	Not Applicable	2 points plus blank ± 0.5 N
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Methylene Blue Active Substances (MBAS)	Initial	9 points plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	6 points plus blank "r"[4] ≥ 0.995
	Continuing	Not Applicable	Not Applicable	Not Applicable	1 level every 10 samples ± 15% of true value
	Ending	Not Applicable	Not Applicable	Not Applicable	1 level ± 15% of true value
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitrogen, Nitrate-Nitrite	Initial	8 levels plus blank "r"[4] ≥ 0.995	Nitrate: 6 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable
	Continuing	1 level every 10 samples ± 15% of true value	1 level every 10 samples ± 15% of true value	Not Applicable	Not Applicable
	Ending	1 level ± 15% of true value	1 level ± 15% of true value	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Odor	Initial	No calibration	Not Applicable	Not Applicable	Not Applicable
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Oil and Grease	Initial	This is a gravimetric determination. Calibrate balance before use.	This is a gravimetric determination. Calibrate balance before use.	Not Applicable	3 points plus blank "r"[4] ≥ 0.995
	Continuing			Not Applicable	1 point ± 15% of true value
	Ending			Not Applicable	1 point ± 15% of true value
	Other			Not Applicable	Not Applicable
pH	Initial	2-3 point calibration (± 0.05 pH units of true value)	2 point calibration (± 0.05 pH units of true value)	2 point calibration (± 0.05 pH units of true value)	Not Applicable
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
pH (continued)	Other	Third point check	Third point check	Third point check	Not Applicable
Phenolics (Automated)	Initial	3 levels plus blank "r"[4] ≥ 0.995	3 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable
	Continuing	1 level every 10 samples ± 15% of true value	1 level every 10 samples ± 15% of true value	Not Applicable	Not Applicable
	Ending	1 level ± 15% of true value	1 level ± 15% of true value	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Phenolics (Manual)	Initial	5 levels plus blank "r"[4] ≥ 0.995	5 levels plus blank "r"[4] ≥ 0.995		
	Continuing	1 level every 10 samples ± 15% of true value	1 level every 10 samples ± 15% of true value		
	Ending	1 level ± 15% of true value	1 level ± 15% of true value		
	Other	Not Applicable	Not Applicable		
Phosphorous (Total and Ortho-phosphate) (LACHAT)	Initial	7 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 level every 10 samples ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 level ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Phosphorous (Ortho-phosphate) by IC	Initial	3 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	Single point daily and after every 20 samples ± 10% of true value	Not Applicable	Not Applicable	Not Applicable

94132B2-0342

Table 8.4-1
Summary of Inorganic Method Calibrations (continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Phosphorous (Ortho-phosphate) by IC (continued)	Ending	1 level ± 10% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Particulate/ Air	Initial	Not Applicable	Not Applicable	Not Applicable	Initial balance check with Class S weights
	Continuing	Not Applicable	Not Applicable	Not Applicable	Check balance with Class S weights every 15 filters
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Silica	Initial	6 standards plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	7 standards plus blank "r"[4] ≥ 0.995
	Continuing	1 level ± 15% of true value	Not Applicable	Not Applicable	1 level ± 15% of true value
	Ending	1 level ± 15% of true value	Not Applicable	Not Applicable	1 level ± 15% of true value
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfate (IC)	Initial	3 levels plus blank "r"[4] ≥ 0.995	3 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable
	Continuing	1 level every 20 samples ± 10% of true value	1 level every 15 samples ± 15% of true value	Not Applicable	Not Applicable
	Ending	1 level ± 10% of true value	1 level ± 15% of true value	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfate (LACHAT)	Initial	7 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	Single point daily and after every 10 samples ± 15% of true value	Not Applicable	Not Applicable	Not Applicable

94132B2-0343

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Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Sulfate (LACHAT) (continued)	Ending	1 level ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfate (Turbidimetric)	Initial	6 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 point ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 point ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfide (Titration)	Initial	2 levels plus blank ± 0.5 N	This is a colorimetric titration. Therefore, calibrations are not applicable.	Not Applicable	Not Applicable
	Continuing	1 point every 10 samples ± 15% of true value		Not Applicable	Not Applicable
	Ending	1 level ± 15% of true value		Not Applicable	Not Applicable
	Other	Not Applicable		Not Applicable	Not Applicable
Sulfide	Initial	5 levels "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 point every 10 samples ± 15% of true value	Not Applicable	Not Applicable	Not Applicable
	Ending	1 level ± 10% of true value	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfite	Initial	This is a colorimetric titration. Therefore, calibrations are not applicable.	Not Applicable	Not Applicable	Not Applicable
	Continuing		Not Applicable	Not Applicable	Not Applicable
	Ending		Not Applicable	Not Applicable	Not Applicable
	Other		Not Applicable	Not Applicable	Not Applicable

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Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
Total Organic Carbon (TOC)	Initial	3 levels plus blank "r"[4] ≥ 0.995	3 levels plus blank	Not Applicable	5 levels plus blank
	Continuing	LCS every 20 samples ± 15% of true value	LCS every 20 samples ± 15% of true value	Not Applicable	LCS every 20 samples ± 15% of true value
	Ending	1 level ± 15% of true value	1 level ± 15% of true value	Not Applicable	1 level ± 15% of true value
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Organic Halides (TOX)	Initial	Analyze instrument calibration standard in duplicate plus a blank	Analyze instrument calibration standard in duplicate plus a blank	Not Applicable	Not Applicable
	Continuing	Reanalysis of instrument-calibration standard after each group of 8 pyrolysis determinations	Reanalysis of instrument-calibration standard after each group of 8 pyrolysis determinations	Not Applicable	Not Applicable
	Ending	Not Applicable	1 level ± 15% of true value	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Solids (Dissolved and Volatile)	Initial	This is a gravimetric determination. Calibrate balance before use.	Not Applicable	Not Applicable	Not Applicable
	Continuing		Not Applicable	Not Applicable	Not Applicable
	Ending		Not Applicable	Not Applicable	Not Applicable
	Other		Not Applicable	Not Applicable	Not Applicable
Total Suspended Solids	Initial	This is a gravimetric determination. Calibrate balance before use.	Not Applicable	Not Applicable	Not Applicable
	Continuing		Not Applicable	Not Applicable	Not Applicable
	Ending		Not Applicable	Not Applicable	Not Applicable
	Other		Not Applicable	Not Applicable	Not Applicable
Turbidity	Initial	Minimum of 1 level in each instrument range Follow manufacturer's instructions	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 level	Not Applicable	Not Applicable	Not Applicable
	Ending	1 level	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 8:4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Calibration	Methods			
		NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
GFAA and Flame AA Metals	Initial	3 levels plus blank "r"[4] ≥ 0.995	3 levels plus blank "r"[4] ≥ 0.995	3 levels plus blank (one standard at CRDL) "r"[4] ≥ 0.995	3 levels plus blank "r"[4] ≥ 0.995
	Continuing	1 level every 10 samples ± 10% of true value	1 level every 20 samples ± 20% of true value	Every 10 samples or every 2 hours, which ever is more frequent 1 level ± 10% of true value	1 level every 10 samples ± 10% of true value
	Ending	1 level ± 10% of true value	1 level ± 20% of true value	1 level ± 10% of true value	1 level ± 10% of true value
	Other	Quarterly - Instrument detection limits	Quarterly - Instrument detection limits	Daily - CRDL standards at the beginning of each run Quarterly - Instrument detection limits	Quarterly - Instrument detection limits
Mercury by CVAA	Initial	5 levels plus blank "r"[4] ≥ 0.995	5 levels plus blank "r"[4] ≥ 0.995	4 levels plus blank "r"[4] ≥ 0.995	5 levels plus blank "r"[4] ≥ 0.995
	Continuing	1 level daily or every 10 samples, whichever is more frequent ± 10% of true value	1 level every 10 samples ± 10% of original prepared standard	1 level every 10 samples or every 2 hours, which ever is more frequent ± 20 % of true value	1 level every 10 samples ± 10% of original prepared standard
	Ending	1 level ± 10% of true value	1 level ± 10% of original prepared standard	1 level ± 20 % of true value	1 level ± 10% of original prepared standard
	Other	Quarterly - Instrument detection limits	Quarterly - Instrument detection limits	Daily - CRDL standards at the beginning of each sequence Quarterly - Instrument detection limits	Quarterly - Instrument detection limits
ICP Metals	Initial	1 level and blank	1 level and blank	1 level and blank	1 level and blank
	Continuing	1 level every 10 samples ± 5% of true value	1 level every 10 samples ± 10% of true value	1 level every 10 samples or every 2 hours, whichever is more frequent ± 10% of true value	1 level every 10 samples ± 10% of true value

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Table 8.4-1
Summary of Inorganic Method Calibrations
(continued)

Analysis	Methods				
	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP (88 & 90)[3]	OTHER
ICP Metals (continued)	Ending	1 level ± 5% of true value	± 10% of true value	± 10% of true value	± 10% of true value
	Other	Quarterly - Instrument detection limits Annually - ICP interelement correction factors ICSA, ICSAB: Analyze at beginning and end of every 8 hours	Quarterly - Instrument detection limits Annually - ICP interelement correction factors ICSA, ICSAB: Analyze at beginning and end of every 8 hours	Daily - CRI standards at the beginning and end of each sequence or every 8 hours, whichever is more frequent Quarterly - Instrument detection limits Annually - ICP interelement correction factors Quarterly - Linear Ranges ICSA, ICSAB: Analyze at beginning and end of every 8 hours	Quarterly - Instrument detection limits Annually - ICP interelement correction factors ICSA, ICSAB: Analyze at beginning and every 8 hours

(1) National Pollutant Discharge Elimination System
(2) Resource Conservation and Recovery Act (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd edition, Final Update I, July 1992
(3) Contract Laboratory Program
(4) "r" = correlation coefficient

9413282-0347

TABLE 8.4-2
Summary of Organic Method Calibrations

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Aromatic Volatiles by GC	Initial	Minimum of 3 levels, lowest near but above MDL. If % RSD[4] < 10, assume linearity and average RF[9] used. Otherwise, plot calibration curve.	Minimum of 5 levels, lowest near but above MDL. If % RSD[4] < 20, linearity is assumed and average RF[9] is used. Otherwise, plot calibration curve.	Not Applicable	Not Applicable	5 levels If RSD[4] ≤ 20%, assume linearity. If > 20%, plot calibration curve.
	Continuing	1 or more calibration standards analyzed daily. Compare results to method calibration table.	Mid-level calibration standard analyzed every 10 samples. If not within ± 15 % of predicted response, recalibrate.	Not Applicable	Not Applicable	1 every 10 samples, % D[5] ≤ 15% 1 every 10 samples, % D ≤ 10% (≤ 15% for surrogates)
	Ending	Not Applicable	Retention times in windows for all compounds	Not Applicable	Not Applicable	Not Applicable
	Other	When doubt exists in compound identification, second column confirmation is recommended.	When doubt exists in compound identification, second column confirmation is recommended. Retention time windows established over 72-hour period by injection of each compound three times.	Not Applicable	Not Applicable	Not Applicable
Dioxins/ Dibenzofurans by HRGC/ LRMS[7]	Initial	3 levels If %RSD[4] <10%, use mean RF[9]. If %RSD ≥ 10%, plot calibration curve point to point	5 levels in triplicate % RSD[4] ≤ 15%	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 level each working day. %D[5] must be ≤10%. If not, analyze fresh standard. If still not, recalibrate	1 level every 12 hours after window performance mix. Standard must have RFs[9] with %D[5] ≤ 30% from initial	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Window performance mix	Not Applicable	Not Applicable	Not Applicable

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Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Dioxins/ Dibenzofurans by HRGC/ LRMS[7] (continued)	Other	Not Applicable	Window mix to set congener windows every 12 hours at beginning of sequence. Isotope ratios in standard must meet criteria in method. Valley between 2,3,7,8-TCDD[6] and 1,2,3,4-TCDD must be ≤ 25% of the 2,3,7,8-TCDD peak height.	Not Applicable	Not Applicable	Not Applicable
Dioxins/ Dibenzofurans by HRGC/ HRMS[8]	Initial	Not Applicable	5 levels plus window defining solution. %RSD[4] for natives ≤20% for RFs[9]; %RSD, for labelled compounds ≤30% for RFs.	Not Applicable	Not Applicable	Not Applicable
	Continuing	Not Applicable	1 level every 12 hours after window defining solution. RFs[9] with %D[5] ≤20% for natives; %D ≤30% for labelled compounds from initial	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	1 level: RFs[9] with %D ≤20% for natives; %D[5] ≤30% for labelled compounds from initial	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Isotope ratios in standard must meed criteria in method. Valley between 2,3,7,8-TCDD[6] and all other TCDDs must be ≤25% of the 2,3,7,8-TCDD height	Not Applicable	Not Applicable	Not Applicable
Formaldehyde	Initial	Not Applicable	Not Applicable	Not Applicable	Not Applicable	5 point calibration RSD[4] ≤ 20% Recalibrate if criteria not met

94132B2-0349

Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Formaldehyde (continued)	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable	1 per 10 samples %D[5] ≤ 15% Reanalyze and recalibrate if criteria not met
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable	At end of run %D[5] ≤ 15% Reanalyze and recalibrate if criteria not met
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Herbicides by GC	Initial	Minimum of 3 levels, lowest near but above MDL. If % RSD[4] ≤ 10 %, use avg. RF[9]. Otherwise, plot calibration curve	Minimum of 5 levels, lowest near but above MDL. If % RSD[4] ≤ 20%, use avg. RF[9]. Otherwise, plot calibration curve	Not Applicable	Not Applicable	Minimum 3 levels, %RSD[4] ≤20% (use mean RF[9]) 1 level calibration standard at beginning and end of each day (must be different levels) %D[5] must be ± 20% of initial or recalibrate
	Continuing	1 or more calibration standards analyzed daily. If not within ± 10% of predicted response, recalibrate	Mid-level calibration standard run every 10 samples. If not within ± 15 % of predicted response, recalibrate Retention times in windows for all continuing standards	Not Applicable	Not Applicable	%D[5] must be ≤20% or recalibrate 2 levels every 24 hours. One at beginning and one at the end
	Ending	Not Applicable	Retention times in windows for all compounds.	Not Applicable	Not Applicable	%D[5] ≤ 20%

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Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Herbicides by GC (continued)	Other	When doubt exists in compound identification, second column confirmation should be used	When doubt exists in compound identification, second column confirmation should be used Retention time windows established over 72 hour period by injection of each compound three times	Not Applicable	Not Applicable	Not Applicable
Nitroaromatics by HPLC	Initial	Not Applicable	Analyze standards in triplicate. Curve should be linear with zero intercept.	Not Applicable	Not Applicable	Minimum of 5 levels ≤ 20% RSD[4] avg to be used. Otherwise point to point calculations if curve ≤ 30% RSD
	Continuing	Not Applicable	Midpoint calibration standard after the midpoint of sample run. Must agree within 20% of initial values, otherwise reinject all solutions in triplicate and recalculate calibration curve.	Not Applicable	Not Applicable	Single point for each analyte at the beginning of each sequence or each 24 hours. ≤ 15% D[5] from initial for each analyte. Every single component after every 10 or less sample injections ≤ 15% D[5] from initial for each analyte. Retention times in windows for in all continuing standards

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Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Nitroaromatics by HPLC (continued)	Ending	Not Applicable	Midpoint calibration standard after the end of sample run. Must agree within 20% of initial values, otherwise reinject all solutions in triplicate and recalculate calibration curve.	Not Applicable	Not Applicable	≤ 15% D[5] from initial for each analyte.
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Retention time windows established over 72 hour period by injection of each compound three times
Non-Methane Organic Compounds (NMOC)	Initial	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Minimum of 3 levels %RSD[4] must be ≤ 25 %
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Mid-level standard every 24 hours % D[5] must be ≤ 20 % from initial or recalibration required
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
PAHs by HPLC	Initial	Minimum of 3 levels, lowest near but above MDL. If %RSD[4] <10, assume linearity and average RF is used. Otherwise, plot calibration curve.	Minimum of 5 levels, lowest near but above MDL. If %RSD[4] <20, assume linearity and average RF is used. Otherwise, plot calibration curve.	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 or more calibration standards analyzed daily. If not within ± 15% of predicted response, recalibrate.	Mid-level calibration standard analyzed every 10 samples. If not within ± 15% of predicted response, recalibrate.	Not Applicable	Not Applicable	Not Applicable

Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
PAHs by HPLC (continued)	Ending	Not Applicable	Retention times in windows for all compounds.	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Retention time windows established over 72-hour period by injection of each compound three times.	Not Applicable	Not Applicable	Not Applicable
PCBs by HRMS	Initial	Not Applicable	Not Applicable	Not Applicable	Not Applicable	5 Levels %RSD ≤ 30% for RFs
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable	1 Level every 12 hours. RFs[9] ≤ 30% for natives after window defining solution
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Pesticides/ PCBs	Initial	Minimum of 3 levels, lowest near but above MDL. If % RSD[4] ≤ 10% use avg. RF[9]. Otherwise plot calibration curve	Minimum of 5 levels, lowest near but above MDL. If % RSD[4] ≤ 20 use average RF[9]. Otherwise plot calibration curve. Check for DDT[11] and endrin degradation. % breakdown must be < 20.	3 levels each time a new column is used. Beginning of 72-hour sequence: Evaluation Mixes: Linearity ≤ 10% Degradation ≤ 20%. Individual Standard Mixes to establish RTs[21] and CFs[12]	3 levels (except multi-components at one level), the lowest at the CRQL[16]. The RSD[4] must be ≤ 20 %, however, 2 compounds may be > 20 % but must be < 30 %. Analyze Resolution Check Mixture and PEM[13] prior to initial calibration.	Method 505: Minimum of 3 standards: % RSD[4] ≤ 20% Method 508A: Minimum of 5 standards: The RSD[4] of RF[9] must be < 6% for the 7 injections at 0.1 ng/uL level

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Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Pesticides/ PCBs (continued)	Continuing	1 or more calibration standards analyzed daily. If not within ± 10 % of predicted response, recalibrate.	Mid-level calibration standard analyzed every 10 samples; must agree within ± 15 % of predicted response or recalibrate	Evaluation Mix B and Individual Standard Mixes (A or B) run alternately between every 5 samples Individual Standard Mixes: CFs ≤ 15% D[5] for quantitation, ≤ 20% D[5] for confirmation, retention times in windows Evaluation Mix: Degradation ≤ 20 %	Instrument Blank and midpoint calibration or PEM[13] standard are run once per 12 hour period. Standard must be within ± 25 % of predicted response. Check for DDT[11] and endrin degradation every 12 hours. % breakdown must be ≤ 20.	Method 505: 1 or more levels every 24 hours. %D[5] ± 20% or less: if not, recalibrate with fresh standards Method 508A: 1 standard at 0.1 ng/uL must be analyzed at least once after each 8 hours of operation. %D[5] must be ± 20%
	Ending	Not Applicable	Retention times in windows for all compounds	72-hour sequence must end with Individual Standards A and B.	Samples must be bracketed by acceptable Instrument Blank, PEM[13], and both Individual Standard Mixtures A and B.	Not Applicable
	Other	When doubt exists in compound identification, second column confirmation should be used.	When doubt exists in compound identification, second column confirmation should be used. Retention time windows established over 72 hour period by injection of each compound three times	Retention time windows established over 72 hour period by injection of each compound three times	Second column confirmation is mandatory.	Not Applicable
Petroleum Hydrocarbons, Total Recoverable, by IR	Initial	Minimum of 3 levels plus blank "r"[4] ≥ 0.995	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Continuing	1 level Expected response should be within ± 15%	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Petroleum Hydrocarbons, Total Recoverable, by IR (continued)	Ending	1 level Expected response should be within ± 15%	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Petroleum Hydrocarbons, Total, by GC	Initial	Not Applicable	Not Applicable	Not Applicable	Not Applicable	GRO[15] & DRO[14] Methods: Minimum of 5 levels, lowest near but above MDL. If % RSD[4] ≤ 25 use mean RF. Otherwise, plot calibration curve. Minimum of 3 levels RSD[4] ≤ 20% use mean CF. Otherwise, if RSD ≤ 30% plot calibration curve
	Continuing	Not Applicable	Not Applicable	Not Applicable	Not Applicable	GRO[15] & DRO[14]: Mid-point QC check standard analyzed each working day. If not within ± 25% of predicted response, recalibrate. Single point for each analyte at the beginning of each sequence or 24 hours ≤ 15% D[5] from initial for each analyte ≤ 10% D[5] for California LUFT
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Run to confirm system in control

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Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Petroleum Hydrocarbons, Total, by GC (continued)	Other	Not Applicable	Not Applicable	Not Applicable	Not Applicable	TN GRO[13] & DRO[14]: Retention time windows established over 72 hour period by injection of each method component three times. ——— Retention time windows established over 72 hour period by injection of method standard 3 times.
Purgeable Halocarbons by GC	Initial	Minimum of 3 levels, lowest near but above MDL. If % RSD[4] < 10, assume linearity and average RF is used. Otherwise, plot calibration curve.	Minimum of 5 levels, lowest near but above MDL. If % RSD[4] < 20, linearity is assumed and average RF is used. Otherwise, plot calibration curve.	Not Applicable	Not Applicable	5 levels If RSD[4] ≤ 20%, assume linearity. If > 20%, plot calibration curve.
	Continuing	1 or more calibration standards analyzed daily. Compare results to method calibration tables.	Mid-level calibration standard analyzed every 10 samples. If not within ± 15 % of predicted response, recalibrate.	Not Applicable	Not Applicable	1 every 10 samples, % D[5] ≤ 15% ——— 1 every 10 samples, % D[5] ≤ 10% (≤ 15% for surrogates)
	Ending	Not Applicable	Retention times in windows for all compounds	Not Applicable	Not Applicable	Not Applicable
	Other	When doubt exists in compound identification, second column confirmation is recommended.	When doubt exists in compound identification, second column confirmation is recommended. Retention time windows established over 72-hour period by injection of each compound three times.	Not Applicable	Not Applicable	Not Applicable

Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Semivolatiles by GC/MS	Initial	Minimum of 3 levels, lowest near but above MDL If % RSD[4] ≤ 35%, can use mean RF[9]	Minimum of 5 levels, lowest near but above MDL. ≤ 30% RSD[4] for CCCs[18] SPCCs[17]: RF[9] ≥ 0.050	5 levels plus blank ≤ 30% RSD[4] for CCCs[18] SPCCs: RF_{avg}[9] or RF_{daily} ≥ 0.050	5 levels (except 8 compounds which require 4 levels) ≤ 20.5 % RSD[4] of method Minimum RRF[10] of method	Not Applicable
	Continuing	1 level every 24 hours If not within ± 20% of predicted response, recalibrate	Mid-level standard every 12 hours after tuning < 30% RSD[4] for CCCs[18] SPCCs[17]: RF[9] ≥ 0.050	1 level every 12 hours after tuning ≤ 25% D[5] for CCCs[18] SPCCs[17]: RF_{avg}[9] or RF_{daily} ≥ 0.050	1 mid-level standard every 12 hours after tuning ≤ 25 % D[5] of method Minimum RRF[10] and maximum RSD[4] of method	Not Applicable
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Other	DFTPP[19] tuning every 24 hours before standard or sample runs. Check column performance daily with benzidine and pentachlorophenol	DFTPP[19] tuning at the beginning of every 12 hour shift.	DFTPP[19] tuning at the beginning of every 12 hour shift. SPCCs[17]: RF_{avg}[9] or RF_{daily} ≥ 0.050	DFTPP[19] tuning at the beginning of every 12 hour shift for RT[21] and EICP area of internal standards evaluated against latest continuing calibration	Not Applicable
Semivolatiles by GC	Initial	Minimum of 3 levels, lowest near but above MDL. If % RSD[4] ≤ 10% use avg. RF. Otherwise plot calibration curve	Minimum of 5 levels, lowest near but above MDL. If % RSD[4] < 20 use average RF. Otherwise plot calibration curve.	Not Applicable	Not Applicable	Not Applicable

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Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Semivolatiles by GC (continued)	Continuing	1 or more calibration standards analyzed daily. If not within ± 10 % of predicted response, recalibrate.	Mid-level calibration standard run every 10 samples. If not within ± 15% of predicted response, recalibrate	Not Applicable	Not Applicable	Not Applicable
	Ending	Not Applicable	Retention times in windows for all compounds	Not Applicable	Not Applicable	Not Applicable
	Other	When doubt exists in compound identification, second column confirmation should be used.	When doubt exists in compound identification, second column confirmation should be used. Retention time windows established over 72 hour period by injection of each compound three times	Not Applicable	Not Applicable	Not Applicable
Volatiles by GC/MS	Initial	Minimum of 3 levels, lowest near but above MDL If % RSD[4] ≤ 35% can use mean RF[9]	Minimum of 5 levels, lowest near but above MDL % RSD[4] for CCCs[18] ≤ 30 SPCCs[17]: RF[9] ≥ 0.300 (0.250 for bromoform)	5 levels ≤ 30% RSD[4] of CCCs[18] SPCCs RF ≥ 0.300 (0.250 for Bromoform)	5 levels ≤ 20.5 % RSD[4] of method Minimum RRF[10] and maximum RSD must meet method criteria	Method 524.2: 5 levels plus blank ≤ 20% RSD[4] for all compounds ——— See operation-specific SOPs for air analysis
	Continuing	1 level every 24 hours after tune check standard Recoveries must meet limits given in method	Mid-level every 12 hours after tune check standard RF[9] of CCCs[18] ≤ 25% D[5] SPCCs[17]: RF[9] ≥ 0.300 (0.250 for bromoform)	1 level every 12 hours after tune check standard ≤ 25% D[5] for CCCs[18] SPCCs RF ≥ 0.300 (0.250 for Bromoform)	Mid-level every 12 hours after tune check standard %D[5] must be ≤ 25 from initial calibration Minimum RRF[10] must be met.	Method 524.2: 1 level every 8 hours after tune check standard ≤ 30% RSD[4] for all compounds ——— See operation-specific SOPs for air analysis
	Ending	Not Applicable	Not Applicable	Not Applicable	Not Applicable	See operation-specific SOPs for air analysis

Table 8.4-2
Summary of Organic Method Calibrations
(continued)

Analysis	Calibration	NPDES[1]	RCRA(SW846)[2]	CLP 88[3]	CLP 90[3]	OTHER
Volatiles by GC/MS (continued)	Other	BFB[20] tuning at the beginning of every 24 hour shift.	BFB[20] tuning at the beginning of every 12 hour shift.	BFB[20] tuning at the beginning of every 12 hour shift. SPCCs[17]: RF_{avg} or $RF^{(9)}_{daily}$ ≥ 0.300 (0.250 for bromoform)	BFB[20] tuning at the beginning of every 12 hour shift for RT[21] and EICP area of internal standards evaluated against latest continuing calibration	Method 524.2: BFB[20] tuning at beginning of every 8 hour shift ——— See operation-specific SOPs for air analysis
Volatiles by GC (Detectors in series)	Initial	Not Applicable	Minimum of 5 levels, lowest near but above MDL. If % RSD[4] ≤ 20, linearity assumed and average RF used. Otherwise, plot calibration curve.	Not Applicable	Not Applicable	Minimum of 3 levels, lowest near but above MDL. If % RSD[4] ≤ 10, linearity assumed and average RF[9] used.
	Continuing	Not Applicable	Mid-level calibration standard run every 10 samples. If not within ± 15% of predicted response, recalibrate. Retention times in windows for all continuing standards.	Not Applicable	Not Applicable	1 level every 10 samples % D[5] ± 15% from initial calibration
	Ending	Not Applicable	Retention times in windows for all compounds.	Not Applicable	Not Applicable	Not Applicable
	Other	Not Applicable	When doubt exists in compound identification, second column confirmation is recommended. Retention time windows established over 72 hour period by injection of each compound three times	Not Applicable	Not Applicable	When doubt exists in compound identification, second column confirmation is recommended. Retention time windows established over 72 hour period by injection of each compound three times

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Table 8.4-2
Summary of Organic Method Calibrations
(continued)

(1) National Pollutant Discharge Elimination System
(2) Resource Conservation and Recovery Act (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd edition, Final Update I, July 1992
(3) Contract Laboratory Program
(4) RSD - Relative Standard Deviation
(5) % D - Percent Difference
(6) TCDD - 2,3,7,8-Tetrachlorodibenzo-p-dioxin
(7) HRGC/LRMS - High Resolution Gas Chromatography/Low Resolution Mass Spectrometry
(8) HRGC/HRMS - High Resolution Gas Chromatography/High Resolution Mass Spectrometry
(9) RF - Response Factor
(10) RRF - Relative Response Factor
(11) DDT - Dichloro-diphenyl-trichloro-ethane
(12) CF - Calibration Factor
(13) PEM - Performance Evaluation Mixture
(14) DRO - Diesel Range Organics. DRO corresponds to alkane range of C_{10} - C_{24}.
(15) GRO - Gasoline Range Organics. GRO corresponds to an alkane range of C_6 - C_{10}.
(16) CRQL - Contract Required Quantitation Limit
(17) SPCC - System Performance Check Compound
(18) CCC - Continuing Calibration Compounds
(19) DFTPP - Decafluorotriphenylphosphine
(20) BFB - Bromofluorobenzene
(21) RT - Retention Time

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TABLE 8.4-3
Periodic Equipment Calibrations

Type of Calibration	Calibration Requirements
Balance Calibration	• Must be serviced and calibrated annually by a manufacturer's representative • Calibration must be checked daily before use by analyst with weight(s) classified as Class "S" (or Class "S" traceable) by NIST per operation-specific SOPs. • Quarterly calibrations must cycle through the range of weights applicable to a balance as described in operation-specific SOPs. • All Class "S" weights must be certified by an outside agency every three years. • Class "S" traceable weights used for daily balance calibration checks must be checked against a Class "S" weight monthly.
Thermometer Calibration	• Working thermometers must be calibrated against a certified NIST thermometer at least annually as described in operation-specific SOPs. • The NIST thermometer must be re-certified every three years.
Micropipettors	• Calibrations are checked gravimetrically as required by the operation-specific SOP. • Must be calibrated at the frequency (normally quarterly) required by the manufacturer at a minimum.
Syringes, Volumetric Glassware and Graduated Glassware	• All syringes and volumetric glassware are purchased as Class A items. • Class A items are certified by the manufacturer to be within ± 1% of the measured volume, therefore, calibration of these items by ITAS-laboratories is not required. • All analysts are trained in the proper use and maintenance of measuring devices to ensure the measurement of standards, reagents and sample volumes are within method tolerances.

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Acidity	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Alkalinity	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Alkalinity (continued)	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Ammonia	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Ammonia (continued)	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within laboratory control chart limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: ≤ 20 % RPD[4] limit Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Ammonia (TKN)	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Ammonia (TKN) (continued)	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
BOD	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable		

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Bromide	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples (or 1 per 10 samples by IC) Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples (or 1 per samples 10 by IC) Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.
Cation Exchange Capacity	See ICAP Procedures, this is an extraction method.				

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Chemical Oxygen Demand (COD)	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Chloride	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Chloride (continued)	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples (or 1 per 10 samples by IC) Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Frequency: 1 per batch of ≤ 10 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples (or 1 per 10 samples for IC) Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Frequency: 1 per batch of ≤ 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable
Chlorine, Residual	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Chlorine, Residual (continued)	Matrix Spike Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Water	Not Applicable	Not Applicable
Chromium (Hexavalent) Cr^{+6}	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples prepped Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Frequency: 1 per batch of ≤ 20 samples prepped Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of ≤ 20 samples prepped Criteria: percent recovery of analyte must be within laboratory control chart limits Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Chromium (Hexavalent) Cr^{+6} (continued)	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within laboratory-established QC limits Corrective Action: Flag data outside of limit	Frequency: 1 per analytical batch of 20 samples Criteria: Advisory limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Must be within laboratory-established QC limits Corrective Action: Flag data outside of limit
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Frequency: 1 per analytical batch of 20 samples Criteria: ≤ 20 %RPD[4] limit Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.	Not Applicable	Frequency: 1 per analytical batch of 20 samples Criteria: ≤ 20 %RPD[4] limit Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.
Color	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Color (continued)	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Conductivity	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable

94132820 37

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Cyanide (Amenable)	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Frequency: 1 per analytical batch of 20 samples Criteria:Advisory limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of 20 samples Criteria:Advisory limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable

94132B2-0372

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Cyanide (Amenable) (continued)	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Cyanide (Free)	Method Blank	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples prepped Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples prepped Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per analytical batch of 20 samples Criteria: Limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

9413282.0373

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Cyanide (Free) (continued)	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per analytical batch of 20 samples Criteria: Limits are ≤ 20% RPD[4] Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable duplicate sample
Cyanide (Total)	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of ≤ 20 samples Criteria: % recovery must be within ± 20% Corrective Action: Rerun all samples associated with unacceptable LCS	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery of analyte must be within 80% - 120% Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Frequency: 1 per analytical batch of 20 samples Criteria: Advisory limit is 75% - 125% recovery Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Advisory limits are 75% - 125% recovery Corrective Action: Flag data associated data. Post digestion spike if sample result ≥ 4 times the spike level.	Not Applicable

94113282-0374

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Cyanide (Total) (continued)	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Limit is 75% - 125% recovery Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Advisory limits are ≤ 20% RPD[4] Corrective Action: Flag data associated with unacceptable duplicate sample	Not Applicable
Flashpoint (Ignitability)	Method Blank	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Frequency: 1 per batch of ≤20 samples Criteria: RPD[4] must be ≤ 20% Corrective Action: Flag data associated with unacceptable duplicate sample	Not Applicable	Not Applicable

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9413282.0376

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Fluoride	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of ≤ 20 samples (or 1 per 10 samples by IC) Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples (or 1 per 10 samples by IC) Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Hardness	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable

9413282.0377

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Hardness (continued)	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Iodide	Method Blank	Frequency: 1 per batch of 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Iodide (continued)	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Methylene Blue Active Substances (MBAS)	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

94 3282.0378

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Methylene Blue Active Substances (MBAS) (continued)	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.
Nitrogen, Nitrate-Nitrite	Method Blank	Frequency: 1 per batch of 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Nitrate only: Frequency: 1 per batch of 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples (or 1 per 10 samples for IC) Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples (or 1 per 10 samples for IC) Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable

94132B2.0379

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Odor	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Oil and Grease	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery of analyte must be between 80 - 120 % Corrective Action: Rerun all samples associated with unacceptable LCS

9413282.0380

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Oil and Grease (continued)	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample (Requires that two samples be sent by client)	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Advisory limits are ≤ 20% RPD[4] Corrective Action: Flag data associated with unacceptable duplicate sample	Not Applicable	Frequency: 1 per analytical batch of 20 samples Criteria: Advisory limits are ≤ 20% RPD[4] Corrective Action: Flag data associated with unacceptable duplicate sample
pH	Method Blank	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: ≤ 20 % RPD[4] limit Corrective Action: Flag data outside of limit.	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Advisory limits are ≤ 20% RPD[4] Corrective Action: Flag data associated with unacceptable duplicate sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Advisory limits are ≤ 20% RPD[4] Corrective Action: Flag data associated with unacceptable duplicate sample	Not Applicable

9413282.0381

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Phenolics	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Frequency: 1 per analytical batch of 20 samples Criteria:Advisory limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable

94H3282-0382

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Phosphorus (Total and Ortho-phosphate)	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples (or 1 per 10 samples for IC) Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples (or 1 per 10 samples for IC ortho-phosphate determination only) Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable

94132B2.0383

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Silica	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.
Solids	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable

94A3282.0384

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Solids (continued)	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Sulfate	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: Rerun all samples associated with unacceptable LCS (ICV)	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: Rerun all samples associated with unacceptable LCS (ICV)

9413282.0385

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Sulfate (continued)	Matrix Spike Sample	Frequency: 1 per batch of ≤ 20 samples (or 1 per 10 samples by IC) Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Frequency: 1 per batch of 20 samples Criteria: Limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples (or 1 per 10 samples by IC Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Frequency: 1 per analytical batch of 20 samples Criteria: ≤ 20 %RPD[4] limit Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.	Not Applicable	Frequency: 1 per analytical batch of 20 samples Criteria: ≤ 20 %RPD[4] limit Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.
Sulfide	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable

94N3282-0386

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Sulfide (continued)	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Sulfite	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

94132B2-0387

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Sulfite (continued)	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable
Total Organic Carbon (TOC)	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Must be within QC limits Corrective Action: Flag data outside of limit	Frequency: 1 per batch of 20 samples Criteria: Limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Not Applicable	Frequency: 1 per batch of 20 samples Criteria: Must be within laboratory control chart limits Corrective Action: Flag data outside of limit
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

94113282.0388

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Total Organic Carbon (TOC) (continued)	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Frequency: 1 per analytical batch of 20 samples Criteria: ≤ 20 %RPD[4] limit Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: ≤ 20 % RPD[4] limit Corrective Action: Flag data outside of limit.
Total Organic Halides (TOX)	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples prepped Criteria: percent recovery of analyte must be within ± 20% Corrective Action: Rerun all samples associated with unacceptable LCS	Frequency: 1 per batch of ≤ 20 samples prepped Criteria: percent recovery of analyte must be within ± 20% Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Frequency: 1 per batch of 20 samples Criteria: Limits are 75% - 125% recovery Corrective Action: Reanalyze if sample remaining. If not, flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

94132B2.0389

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples (Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Total Organic Halides (TOX) (continued)	Duplicate Sample	Frequency: 1 per analytical batch of 20 samples Criteria: ≤ 20 %RPD[4] limit Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.	Frequency: 1 per analytical batch of 20 samples Criteria: ≤ 20 %RPD[4] limit Corrective Action: Reanalyze if sample remaining. If not, flag data outside of limit.	Not Applicable	Not Applicable
Turbidity	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration must be less than the reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples Criteria: Percent recovery must be within laboratory control chart limits Corrective Action: If not within laboratory control chart limits, rerun all associated samples	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: ≤ 20 % RPD[4] Corrective Action: Flag data outside of limit.	Not Applicable	Not Applicable	Not Applicable

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
GFAA and Flame AA Metals, Mercury by CVAA	Method Blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples Criteria: Concentration ≤ CRDL[4]. If not, all samples between the CRDL and 10 X the blank values must be redigested. See CLP method for details. Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS	Frequency: 1 per batch of ≤20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS	Frequency: 1 per batch of ≤20 samples Criteria: percent recovery of analyte must be between 80-120% (or supplier's established range for solid) Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of 20 samples Criteria: Limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable MS. (See SOP for detailed corrective action procedure and for other QC procedures.)	Frequency: 1 per batch of 20 samples Criteria: Limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable MS. (See SOP for detailed corrective action procedure and for other QC procedures.)	Frequency: 1 per batch of ≤20 samples Criteria: Limits for percent recovery are 75 - 125% unless sample conc. is > 4X the true value of the matrix spike Corrective Action: Flag data associated with unacceptable MS unless sample conc. is > 4X the true value of the matrix spike	Not Applicable

94132B2.0391

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
GFAA and Flame AA Metals, Mercury by CVAA (continued)	Matrix Spike Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: Limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable MSD	Frequency: 1 per batch of 20 samples Criteria: Limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable MSD Post digestion spike if sample result ≥ 4X the spike level. Serial dilution at 5X, %D[5] < 10	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Frequency: 1 per analytical batch of ≤20 samples Criteria: Advisory limits of ≤20% RPD[4] Corrective Action: Flag data outside of range	Not Applicable
ICP Metals	Method Blank	Frequency: 1 per batch of ≤20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤20 samples Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank	Frequency: 1 per batch of ≤20 samples Criteria: Concentration ≤ CRDL[6]. If not, all samples between the CRDL and 10 X the blank values must be redigested. See CLP method for details. Corrective Action: Rerun all samples associated with unacceptable blank	Not Applicable

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TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
ICP Metals (continued)	Laboratory Control Sample	Frequency: 1 per batch of ≤20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS	Frequency: 1 per batch of ≤20 samples Criteria: percent recovery of analyte must be within ± 20 % Corrective Action: Rerun all samples associated with unacceptable LCS	Frequency: 1 per batch of ≤20 samples Criteria: percent recovery of analyte must be between 80 - 120% except for Ag and Sb (or supplier's established range for solid) Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable
	Matrix Spike Sample	Frequency: 1 per batch of ≤20 samples Criteria: Limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per batch of ≤20 samples Criteria: Limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable matrix spike sample Post digestion spike if sample result ≥ 4X the spike level. Serial dilution at 4X, %D[5] < 10	Frequency: 1 per batch of ≤20 samples Criteria: Advisory limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable matrix spike sample Post-digestion spike if sample result ≤ 4X the spike level	Not Applicable
	Matrix Spike Duplicate Sample	Frequency: 1 per batch of 20 samples Criteria: Limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per batch of 20 samples Criteria: Limits for percent recovery are 75 - 125% Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable

94132B2-0393

TABLE 8.5-1
Inorganic Laboratory Quality Control Samples
(Continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
ICP Metals (continued)	Duplicate Sample	Not Applicable	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Limit is ≤ 20% RPD[4] Corrective Action: Flag data outside of range	Not Applicable

(1) National Pollutant Discharge Elimination System
(2) Resource Conservation and Recovery Act (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd edition, Final Update I, July 1992
(3) Contract Laboratory Program
(4) RPD - Relative Percent Difference
(5) % D - Percent Difference
(6) CRDL - Contract Required Detection Limit

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TABLE 8.5-2
Organic Laboratory Quality Control Samples

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Aromatic Volatiles by GC	Method Blank	Frequency: 1 per day Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is more frequent Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Not Applicable	1 per 10 samples
	Laboratory Control Sample	Frequency: 1 with each batch of samples or when new reagents are used Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Frequency: 1 per 20 samples or each batch of samples, whichever is more frequent Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	1 with MS/MSD (≤20 samples)
	Matrix Spike Sample	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	1 per batch (≤20 samples
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	1 per batch of ≤ 20 samples

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Aromatic Volatiles by GC (continued)	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Re-extract samples or flag sample data not meeting surrogate criteria	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: samples which have any surrogate outside of lab established control limits will be flagged as estimated. Upon client request will be reanalyzed once and both sets of data reported.	Not Applicable	All samples, standards, and blanks
	Internal Standards	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.	Not Applicable	Not Applicable
Dioxins/ Dibenzofurans	Method Blank	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all positive samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all positive samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	Not Applicable

TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Dioxins/ Dibenzofurans (continued)	Matrix Spike Sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike duplicate sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike duplicate sample	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Internal Standards	Internal standards are added to all samples (QC samples included). Internal standard recovery should be between 40 % to 120 %	Internal standards are added to all samples (QC samples included). Internal standard recovery should be between 40 % - 120 % for Method 8280 and between 40 % - 135 % for Method 8290. Use limits in laboratory SOP.	Not Applicable	Not Applicable
Formaldehyde	Method Blank	Not Applicable	Not Applicable	Not Applicable	1 per 10 samples ≤ reporting limit
	Laboratory Control Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Formaldehyde (continued)	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Internal Standards	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Herbicides	Method Blank	Frequency: 1 with each batch of samples	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank. Re-extract if still unacceptable.	Not Applicable	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank. Re-extract if still unacceptable.
	Laboratory Control Sample	Frequency: One with each batch of samples extracted or when new reagents used Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS	Not Applicable	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Herbicides (continued)	Matrix Spike Sample	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory-established control limits. Corrective Action: Flag data associated with unacceptable matrix spike sample
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory-established control limits. Corrective Action: Flag data associated with unacceptable duplicate sample

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Herbicides (continued)	Surrogates	Recommended	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must fall within laboratory established control limits before sample analysis may proceed. Sample Criteria: samples which have any surrogate outside of control limits will be flagged.	Not Applicable	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: Surrogate control limit is 70 - 130 % recovery. If Blank fails, re-extract and reanalyze. If sample fails, reanalyze and report best result. If best result not within limits, report both results Sample Criteria: Samples which have any surrogate outside of control limits will be flagged.
	Internal Standards	Optional	Optional	Not Applicable	Not Applicable
Nitro-aromatics by HPLC	Method Blank	Not Applicable	Frequency: 1 per ≤ 20 samples or each extraction batch of samples, whichever is greater. Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Not Applicable	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: Concentration less than reporting limit Corrective Action: Rerun all samples associated with unacceptable blank
	Laboratory Control Sample	Not Applicable	Frequency: 1 per ≤20 samples or each extraction batch, whichever is greater Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Rerun all samples associated with unacceptable LCS

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Nitro-aromatics by HPLC (continued)	Matrix Spike Sample	Not Applicable	Frequency: 1 per batch of ≤ 20 samples received within a one month period Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: None. Matrix spike results will be submitted in final report when requested by client.
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples received within a one month period Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: None. Matrix spike duplicate results will be submitted in final report when requested by client.
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Internal Standards	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Non-Methane Organic Compounds (NMOC)	Method Blank	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per day Criteria: All target analytes must be < reporting limit Corrective Action: Reanalyze, obtain acceptable blank before proceeding
	Laboratory Control Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Non-Methane Organic Compounds (NMOC) (continued)	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per 20 samples Criteria: %D must be ≤ 30% Corrective Action: Flag data associated with unacceptable duplicate sample
	Surrogates	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Internal Standards	Not Applicable	Not Applicable	Not Applicable	Not Applicable
PAHs by HPLC	Method Blank	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is more frequent Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Frequency: 1 per ≤ 20 samples or each extraction batch of samples, whichever is more frequent Criteria: Percent recovery must be within laboratory derived acceptance limits Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
PAHs by HPLC (continued)	Matrix Spike Sample	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples received within a one month period Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples received within a one month period Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Not specified in method	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: Results must fall within laboratory established control limits Sample Criteria: Samples which have any surrogate outside of control limits will be flagged.	Not Applicable	Not Applicable
	Internal Standards	Optional	Optional	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
PCBs by HRGC/ HRMS	Method Blank	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per 20 or fewer samples Criteria: No detects above lower calibration range Corrective Action: Discuss with client, track down potential sources of contamination
	Laboratory Control Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per 20 or fewer samples Criteria: Percent recovery should be within 40 - 160 % Corrective Action: Verify calculations, track down potential sources of error, discuss with client
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per 20 or fewer samples Criteria: Percent recovery should be within 40 - 160 % Corrective Action: Verify calculations, track down potential sources of error, discuss with client
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per 20 or fewer samples Criteria: Percent recovery should be within 40 - 160 %, % Difference should be within ± 50 % Corrective Action: Verify calculations, track down potential sources of error, discuss with client
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
PCBs by HRGC/ HRMS (continued)	Surrogates	Not Applicable	Not Applicable	Not Applicable	Surrogates spiked into method blank and all samples (QC included) Criteria: Percent recovery should be within 25 - 150 % Corrective Action: Verify calculations, track down potential sources of error, discuss with client
	Internal Standards	Not Applicable	Not Applicable	Not Applicable	Internal standards spiked into method blank and all samples (QC included) Criteria: Percent recovery should be within 25 - 150 % Corrective Action: Verify calculations, track down potential sources of error, discuss with client
Pesticides/ PCBs by GC	Method Blank	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is more frequent Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per case, 1 per 20 samples, or 1 per sample extraction batch, whichever is greater Criteria: All compounds < CRQL[4] Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per case, 1 per 20 samples, or 1 per sample extraction batch, whichever is greater Criteria: Conc. < reporting limit Corrective Action: Rerun all samples associated with unacceptable blank

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Pesticides/ PCBs by GC (continued)	Laboratory Control Sample	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: Percent recovery must be within laboratory derived acceptance limits Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: percent recovery must be within laboratory-established control limits Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS
	Matrix Spike Sample	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 MS/MSD per sample delivery group or 1 per 20 samples, whichever is greater Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory-established control limits Corrective Action: Flag data associated with unacceptable matrix spike sample
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 MS/MSD per sample delivery group or 1 per 20 samples, whichever is greater Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Pesticides/ PCBs[7] (continued)	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample
	Surrogates	Not specified in method	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: Results must fall within laboratory established control limits Sample Criteria: Samples which have any surrogate outside of control limits will be flagged.	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: percent recovery for surrogates should be within the advisory limits 60-150 % Sample Criteria: samples which have any surrogate outside of control limits will be flagged.	Not Applicable
	Internal Standards	Optional	Optional	Not Required	Not Applicable
Petroleum Hydrocarbons Total by IR	Method Blank	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Not Applicable	Not Applicable	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Petroleum Hydrocarbons Total by IR (continued)	Laboratory Control Sample	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: percent recovery must be within laboratory established acceptance limits Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	Not Applicable	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: percent recovery must be within laboratory established acceptance limits Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS
	Matrix Spike Sample	Frequency: 1 per 20 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery must be within laboratory established acceptance limits Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory established acceptance limits Corrective Action: Flag data associated with unacceptable matrix spike sample
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within laboratory established acceptance limits Corrective Action: Flag data associated with unacceptable matrix spike sample
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Internal Standards	Not Applicable	Not Applicable	Not Applicable	Not Applicable

94113282.0408

TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Petroleum Hydrocarbons (Total) by GC	Method Blank	Not Applicable	Not Applicable	Not Applicable	DRO[5] and GRO[6] Methods: Frequency: 1 per ≤20 samples or each extraction batch of samples, whichever is greater Criteria: Concentration less than reporting limit Corrective Action: Re-extract all samples associated with unacceptable blank
	Laboratory Control Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per 20 samples Criteria: Percent recovery must be within control chart limits Corrective Action: Re-extract all samples associated with unacceptable LCS
	Matrix Spike Sample	Not Applicable	Not Applicable	Not Applicable	Recommended for specific sampling programs
	Matrix Spike Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Recommended for specific sampling programs

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Petroleum Hydrocarbons (Total) by GC (continued)	Surrogates	Not Applicable	Not Applicable	Not Applicable	Surrogates spiked into Method Blank and all samples (QC samples included) Method Blank and LCS Criteria: Recovery of surrogates should be within 50% - 150% Sample Criteria: Samples which have any surrogate outside of control limits will be flagged
	Internal Standards	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Purgeable Halocarbons by GC	Method Blank	Frequency: 1 per day Criteria: Concentration less than reporting limit Corrective Action: Reanalyze all samples associated with unacceptable blank	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is more frequent Criteria: Concentration less than reporting limit Corrective Action: Reanalyze all samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 with each batch of samples Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Reanalyze all samples associated with unacceptable LCS	Frequency: 1 per 20 samples Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Reanalyze all samples associated with unacceptable LCS	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Purgeable Halocarbons by GC (continued)	Matrix Spike Sample	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: Percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: Percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: Reanalyze samples or flag sample data not meeting surrogate criteria	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: samples which have any surrogate outside of lab established control limits will be flagged as estimated. Upon client request will be reanalyzed once and both sets of data reported.	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Purgeable Halocarbons by GC (continued)	Internal Standards	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.	Not Applicable	Not Applicable
Semi-volatiles by GC/MS[7]	Method Blank	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	Frequency: 1 per batch of ≤ 20 samples extracted Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS
	Matrix Spike Sample	Frequency: 1 per 20 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is more frequent. Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Semi-volatiles by GC/MS[7] (continued)	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples received within a 14 day period Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Surrogates spiked into method blank and all samples (QC included) Method Blank and LCS Criteria: All surrogates must be in control before sample analysis may proceed. Sample Criteria: Re-extract samples or flag sample data not meeting surrogate criteria	Surrogates spiked into method blank and all samples (QC included) Method Blank and LCS Criteria: All surrogates must be in control before sample analysis may proceed. Sample Criteria: Re-extract samples or flag sample data not meeting surrogate criteria	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria: All surrogates must be in control before sample analysis may proceed. Sample Criteria: Samples are allowed one acid and/or one base/neutral surrogate outside of control limits. If two or more acid or base/neutral surrogates are out of control limits or any one surrogate is less than 10% recovery the sample will be re-extracted and reanalyzed.	Not Applicable
	Internal Standards	Optional, may be used for quantitation.	Internal Standards are added to all samples (QC samples included). Internal standard area of daily standard must be within -50 % to +100 % from the last daily calibration check standard. Otherwise, sample is reanalyzed.	Internal Standards are added to the method blank and all samples (QC samples included). Internal standard areas must be within -50 % to +100 % from the last daily calibration check standard. Otherwise, sample is re-analyzed	Internal Standards are added to the method blank and all samples (QC samples included). Internal standard areas must be within -50 % to +100 % from the last daily calibration check standard. Otherwise, sample is re-analyzed[4]

TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Semivolatiles by GC	Method Blank	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is more frequent Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Frequency: 1 with each batch of samples extracted or when new reagents used Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is greater Criteria: Percent recovery must be within laboratory derived acceptance limits Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	Not Applicable
	Matrix Spike Sample	Frequency: 1 per 10 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples received within a one month period Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per analytical batch of ≤ 20 samples received within a one month period Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Semivolatiles by GC (continued)	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Not specified in method	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: Results must fall within laboratory established control limits Sample Criteria: Samples which have any surrogate outside of control limits will be flagged.	Not Applicable	Not Applicable
	Internal Standards	Optional	Optional	Not Required	Not Applicable
Volatiles by GC/MS[7]	Method Blank	Frequency: 1 per day Criteria: Concentration less than reporting limit Corrective Action: Reanalyze all samples associated with unacceptable blank	Frequency: 1 per ≤ 20 samples Criteria: Concentration less than reporting limit Corrective Action: Reanalyze all samples associated with unacceptable blank	Frequency: 1 per 12 hours Criteria: Concentration less than reporting limit, except methylene chloride, acetone, 2-butanone must be ≤5X CRQL Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Frequency: 1 per 8 hours Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank
	Laboratory Control Sample	Frequency: Analyzed if MS results fall outside advisory limits Criteria: percent recovery for each analyte must be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Frequency: 1 per 8 hours containing all analytes of concern Criteria: percent recovery must be within acceptable control chart limits Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Volatiles by GC/MS[7] (continued)	Matrix Spike Sample	Frequency: 1 per ≤ 20 samples from each site or 1 per month, whichever is more frequent Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per 20 samples Criteria: No criteria specified in method
	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Frequency: 1 per analytical batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Frequency: 1 per 20 samples Criteria: % Difference within laboratory limits
	Surrogates	Surrogates spiked into Method Blank and all samples (QC included) Method Blank Criteria: All surrogates must be in control before sample analysis may proceed. Sample Criteria: Reanalyze samples, then flag sample data not meeting surrogate criteria	Surrogates spiked into Method Blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be in control before sample analysis may proceed. Sample Criteria: Reanalyze samples, then flag sample data not meeting surrogate criteria	Surrogates spiked into Method Blank and all samples (QC included) Method Blank Criteria: All surrogates must be in control before sample analysis may proceed. Sample Criteria: CLP guidelines will be followed.	Surrogates spiked into Method Blank and all samples. Method Blank Criteria: All surrogates must be in control before sample analysis may proceed. Sample Criteria: If surrogates not in control, sample will be reanalyzed to prove/disprove matrix interference.

9413282.0446

TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Volatiles by GC/MS[7] (continued)	Internal Standards	Internal standards may be used for quantitation (optional).	Internal Standards are added to all samples (QC samples included). Internal standard area of daily standard must be within -50 % to +100 % from the last daily calibration check standard. Otherwise, sample is reanalyzed.	Internal Standards are added to the method blank and all samples (QC samples included). Internal standard areas must be within -50 % to +100 % from the last daily calibration check standard. Otherwise, sample is re-analyzed	Internal Standard added to all samples and QC samples
Volatiles by GC (Detectors in series)	Method Blank	Not Applicable	Frequency: 1 per 20 samples Criteria: Concentration less than reporting limit Corrective Action: Re-extract and reanalyze all samples associated with unacceptable blank	Not Applicable	Not Applicable
	Laboratory Control Sample	Not Applicable	Frequency: 1 per 20 samples or each extraction batch of samples, whichever is more frequent Criteria: percent recovery must be within acceptance limits given in method for each analyte Corrective Action: Re-extract and reanalyze all samples associated with unacceptable LCS	Not Applicable	Not Applicable
	Matrix Spike Sample	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable

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TABLE 8.5-2
Organic Laboratory Quality Control Samples
(continued)

Analysis	QC Sample	NPDES[1]	RCRA(SW846)[2]	CLP[3] (88 and 90)	OTHER
Volatiles by GC (continued)	Matrix Spike Duplicate Sample	Not Applicable	Frequency: 1 per batch of ≤ 20 samples Criteria: percent recovery for each analyte should be within advisory limits given in method Corrective Action: Flag data associated with unacceptable matrix spike sample	Not Applicable	Not Applicable
	Duplicate Sample	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Surrogates	Not Applicable	Surrogates spiked into method blank and all samples (QC included) Method Blank Criteria and LCS: All surrogates must be within laboratory established control limits before sample analysis may proceed. Sample Criteria: samples which have any surrogate outside of lab established control limits will be flagged as estimated. Upon client request will be reanalyzed once and both sets of data reported.	Not Applicable	Not Applicable
	Internal Standards	Not Applicable	Optional: Internal standards are added to the method blank and all samples (QC included). If used, same compounds as used for surrogates may be appropriate.	Not Applicable	Not Applicable

(1) National Pollutant Discharge Elimination System
(2) Resource Conservation and Recovery Act (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd edition, Final Update I, July 1992
(3) Contract Laboratory Program
(4) CRQL - Contract Required Quantitation Limits
(5) DRO - Diesel Range Organics. DRO corresponds to alkane range of C_{10} - C_{24}.
(6) GRO - Gasoline Range Organics. GRO corresponds to an alkane range of C_6 - C_{10}.
(7) See operation-specific SOP for air analysis

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Table 8.5-3
Field Quality Control Samples

Type	Applicability		Accuracy and Precision Application	Introduced By
	Inorganic	Organic		
Trip Blank (volatiles)		✓	Accuracy	Supplier of Containers
Field Blank	✓	✓	Accuracy	Field Sampler
Rinsate Blank	✓	✓	Accuracy	Field Sampler
Collocated Sample	✓	✓	Precision	Field Sampler
Replicated Sample	✓	✓	Precision	Field Sampler
Split Sample	✓	✓	Precision	Field Sampler
Field Duplicate	✓	✓	Precision	Field Sampler
Field Matrix Spike	✓	✓	Accuracy	Field Sampler

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Table 8.5-4
Laboratory Quality Control Samples

Type	Frequency	Applicability		Accuracy and Precision Application	Introduced By
		Inorganic/ Radiochemical	Organic		
Reagent Blank	Can be done as part of method blank, determine separately with each new batch of reagent/solvents.	✓	✓	Accuracy	Analyst
Duplicate	1 out of 20 or at least 1/month/run	✓	✓	Precision	Analyst/ Prep
Continuing Calibration Standard	With each group of samples	✓	✓	Accuracy	Analyst/ Prep
Surrogate Standard	All standards, method blanks, and samples		✓ Method Dependent	Accuracy	Analyst/ Prep
Matrix Spikes	1 out of 20 or at least 1/month/run	✓	✓	Accuracy	Analyst/ Prep
Matrix Spike Duplicates	1 out of 20 or at least 1/batch	✓	✓	Both	Analyst/ Prep
Blank Spike (Laboratory Control Sample)	1 out of 20 or at least 1/batch with MS/MSD pair	✓	✓	Accuracy	Analyst/ Prep
Analytical Spike	As specified in methods, or as needed	✓		Accuracy	Analyst/ Prep
Internal Standards	Each sample and standard	✓	✓	Both	Analyst/ Prep
Method Blank	With each group of samples, or beginning and end of each run. For GC/MS, method is spiked with surrogates 1 out of 10	✓	✓	Accuracy	Analyst/ Prep
Yield Monitors	Operation-specific	✓		Accuracy	Prep

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TABLE 9.2-1
Laboratory Quality Control Samples/Measurements

Sample/Measurement	Purpose
Initial Calibration	Ensures the calculated concentration is within the limits of error as defined by the initial calibration conformance requirements. (For example by using an average calibration factor with a conformance limit of ≤ 20% relative standard deviation, all samples calculated will be within 20% of the true value.)
Continuing and Ending Calibration	Ensure that the calculated concentration is within the limits of error defined by the continuing calibration conformance criteria (*e.g.* all values are within 15% of the true concentration).
Solvent Blanks	Demonstrates that the solvent used to prepare standards and dilutions is free of interferences as regards a specific analysis.
Method Blanks	Demonstrate the laboratory systems (*e.g.* glassware cleaning procedures) and laboratory reagents used for the preparation and analysis of samples have not contributed to a false positive or negative measurement.
Reagent Blanks	Demonstrate that the reagents purchased by the laboratory are free of interferences as regards an analysis and do not contribute to false positive or false negative results.
Volatile Holding Blanks	Demonstrate that the volatile organic samples are not cross contaminated during storage at the laboratory.
Laboratory Control Sample	Demonstrates the laboratory's ability to perform an analysis within the conformance requirements of the method.

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TABLE 9.2-2
Matrix Quality Control Samples

Quality Control Sample	Purpose
Duplicate samples	Estimates the ability of the laboratory to obtain precise measurements on a sample. This measure is dependent on the homogeneity of the sample being duplicated. Solid samples often portray poor sample homogeneity and therefore often have poor duplication as regards to the sample result.
Matrix Spike Sample	Estimates the ability of the laboratory to obtain accurate measurements on a sample. The measure is dependent on the bias a sample matrix may cause regarding a given analyte.
Matrix Spike Duplicate Sample	In addition to verifying the accuracy of the matrix spike sample,the matrix spike duplicate can be used with the matrix spike sample as a measure of precision by calculating the relative percent difference (RPD).

94H3282.0423

TABLE 9.2-3
Precision and Accuracy Measurements

Measurement	Definition
Accuracy	The degree of agreement of a measurement with an accepted reference or true value. The only true or known values in the laboratory are spiked samples. Expressed as laboratory control sample percent recovery (LCS %R). $$LCS\ \%\ R = \frac{Found}{True} x 100$$ Found = the concentration of an analyte determined from sample analysis. True = the concentration of the analyte spiked into the sample.
Precision	The measure of analytical reproducibility of two values. Expressed as the relative percent difference (RPD) of two values. $$RPD = \left[\frac{\lvert x_1 - x_2 \rvert}{\left(x_1 + \frac{x_2}{2}\right)}\right] x\ 100$$ where: x_1 = first value x_2 = second value
Arithmetic mean $(\bar{x})$	The average of a set of values. $$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$ where: $\bar{x}$ = the mean x_i = the ith data value n = number of data values

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TABLE 9.2-3
Precision and Accuracy Measurements
(Continued)

Measurement	Definition
Sample Standard Deviation (s)	A measure of the random (probable) error associated with a single measurement within a data set. $$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$ where: s = sample standard deviation; $\bar{x}$ = the mean; x_i = the ith data value; n = number of data values
Quality Control Chart	A graphical representation of analytical accuracy. Displays the arithmetic mean of a data set, the upper and lower warning limits and the upper and lower control limits.
Upper Control Limit (UCL)	$UCL = \bar{x} + 3s$
Upper Warning Limit (UWL)	$UWL = \bar{x} + 2s$
Lower Warning Limit (LWL)	$LWL = \bar{x} - 2s$
Lower Control Limit (LCL)	$LCL = \bar{x} - 3s$

9413282.0425

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INDEX

Page

Accuracy (See Precision and Accuracy Measurements)

Assessment

Client Satisfaction Surveys 82, 118
Data Accuracy 73
Data Completeness 73
Data Precision 73
Internal QC 73
Management Review 83
Quality Reports to Management 82, 120
Work Processes 50

Audits

Comments 81
Findings 81
Observations 81
Performance Audits 77
Project Audits 81
QA/QC Audits 77
Quality Systems Audits 79
Ranking 82
Recommendations 81
Surveillance 78

Calibrations

Failure 58
Inorganic (Method Calibrations)
Acidity 157
Alkalinity 157
Ammonia 157
Ammonia (TKN) 157
BOD 157
Bromide (Titration and Spectrophotometric) 158
Bromide (IC) 158
Cation Exchange Capacity 158
Chemical Oxygen Demand (COD) 158
Chloride (IC) 158
Chloride (LACHAT) 159

9413282.0426

INDEX (continued)

Page

Calibrations - Inorganic Method Calibrations (continued)

Chlorine, Residual 159
Chromium (Hexavalent) CR^{+6} 159
Color 159
Conductivity 159
Cyanide (Amenable) 160
Cyanide (Free) 160
Cyanide (Total) 160
Flashpoint (Ignitability) 161
Fluoride (IC) 161
Fluoride (Ion-Specific Electrode) 161
Hardness 161
Iodide (Titration) 161
Methylene Blue Active Substances (MBAS) 162
Metals
- Flame AA 167
- Graphite Furnace AA 167
- ICAP 167
- Mercury (CVAA) 167

Nitrogen, Nitrate-Nitrite 162
Odor 162
Oil and Grease 162
Particulate/Air 164
pH 162
Phenolics (Automated) 163
Phenolics (Manual) 163
Phosphorous (Total and Ortho-phosphate) - LACHAT 163
Phosphorous (Ortho-phosphate) by IC 163
Silica 164
Sulfate (IC) 164
Sulfate (LACHAT) 164
Sulfide 165
Sulfide (Titration) 165
Sulfate (Turbidimetric) 165
Sulfite 165
Total Organic Carbon (TOC) 166
Total Organic Halides (TOX) 166
Total Solids (Dissolved and Volatile) 166
Total Suspended Solids 166
Turbidity 166

94U3282-0427

INDEX (continued)

Page

Calibrations (continued)
- Operational 58
- Organic (Method Calibrations)
  - Aromatic Volatiles by GC 169
  - Dioxins/Dibenzofurans by HRGC/LRMS 169
  - Dioxins/Dibenzofurans by HRGC/HRMS 170
  - Formaldehyde 170
  - Herbicides by GC 171
  - Nitroaromatics by HPLC 172
  - Non-Methane Organic Compounds (NMOC) 173
  - Polynuclear Aromatic Hydrocarbons (PAHs) by HPLC 173
  - Polychlorinated Biphenyls (PCBs) by HRMS 174
  - Pesticides/PCBs 174
  - Petroleum Hydrocarbons, Total Recoverable, by IR 175
  - Petroleum Hydrocarbons, Total, by GC 176
  - Purgeable Halocarbons by GC 177
  - Semivolatiles by GC/MS 178
  - Semivolatiles by GC 178
  - Volatiles by GC/MS 179
  - Volatiles by GC (Detectors in series) 180
- Periodic Equipment 58, 182
  - Balance Calibrations 182
  - Graduated Glassware 182
  - Micropipettors 182
  - Syringes 182
  - Thermometer Calibration 182
  - Volumetric Glassware 37, 182
- Procedures 56
- Records 58
- System 56

Certificate of Analysis 68, 113

Certification
- Lead Auditor 34, 89
- Sample Containers 52

94H3282-0428

INDEX (continued)

Page

Chain-of-Custody
- Internal 55
- ITAS Request for Analysis/Chain-of-Custody Form 52, 54, 55, 94
- Return Chain-of-Custody 56

Computer
- Hardware 45
- Security 45
- Software 46
- Software Changes 47
- Software Reverification 47
- Software Review 47
- Software Validation 48
- Software Verification 48
- Viruses 48

Control Charts 64, 74, 245

Data
- Accuracy 73
- Collection 51, 93
- Completeness 73
- Data Review Checklist
  - Air 101
  - Dioxins/Dibenzofurans 111
  - GC 107
  - GC/MS 105
  - General Chemistry 99
  - HPLC 109
  - Metals 97
  - Radiochemistry 103
- Electronic Data Transfer (EDT) 69
- Package 69
- Precision 73
- Reduction 65
- Reporting 65, 68, 70
- Review 65, 96
- Validation 70
- Verbal Results 70
- Verification 65, 66

94113282.0429

INDEX (continued)

Page

Detection Limits 49

Documents
- Standard Operating Procedures (SOP) 42, 49, 91, 92, 125, 126
- ITAS Quality Assurance Management Plan (QAMP) 41, 125
- Manuals of Practice (MOP) 41, 125
- Operation-Specific Quality Assurance Management Plan (OS QAMP) 41, 125
- Operation-Specific Quality Assurance Management Plan (OS QAMP) Appendices 41, 125
- Project Specific Manuals, Quality Assurance Project Plans (QAPjPs), or Quality Assurance Program Plans (QAPPs) 42, 126
- Quality Assurance Summary (QAS) 127
- Quality Assurance Documents 29, 125

Equipment 18

Holding Times (See Sample Containers, Preservatives, and Holding Times)

Internal QC Requirements
- Air (Compressed) 38
- Gases (Compressed) 38
- Glassware 37, 39
- Water 38

Methods
- Analytical 49
- Variance 50

Nonconformance 74
- Condition Upon Receipt Variance Report (CUR) 75, 95
- Corrective Action 76
- Deficiency 76
- Nonconformance Log 77, 117
- Nonconformance Memo (NCM) 75, 115
- Responsibilities 76

Organization Charts 18, 85

94A 3282 04 30

INDEX (continued)

Page

Orientation
- Health and Safety 33
- Laboratory Staff 32
- Quality Assurance 32, 88

Performance Evaluation
- Double-Blind Performance Evaluation 78
- External Performance Evaluation 78
- Internal Performance Evaluation 77
- Performance Evaluation (PE) Samples 64
- Quality Systems Audits 79
- Surveillance 78

Precision and Accuracy Measurements
- Accuracy 74, 244
- Arithmetic Mean 244
- Laboratory QC Measurements 73
- Limits 74
- Lower Control Limit (LCL) 245
- Lower Warning Limit (LWL) 245
- Matrix QC Measurements 73
- Precision 74, 244
- Quality Control Chart 245
- Standard Deviation(s) 245
- Upper Warning Limit (UWL) 245
- Upper Control Limit (UCL) 245

Preservatives (See Sample Containers, Preservatives, and Holding Times)

Preventive Maintenance 71
- Frequency 71
- Responsibilities 71

Procedures
- Change (Procedural) 90
- Standard Operating Procedures (SOPs) 42, 49, 91, 92, 125, 126

9413282.0431

INDEX (continued)

Page

Procurement
- Procedures 36
- Quality Related Items 35
- Services 37

Program
- Quality Assurance Program 27
- Quality Assurance Program Objectives 28
- Quality Assurance Program Matrix 121

Purchasing
- Role of ITAS Division 36

Qualifications (Associate) 31, 86

Quality Control Levels (ITAS) 59

Quality Control Samples
- Analysis 59
- Field
  - Collocated Sample 61, 240
  - Field Blank 60, 240
  - Field Duplicate 60, 240
  - Field Matrix Spike 61, 240
  - Replicated Samples 61, 240
  - Rinsate Blank 60, 240
  - Split Sample 61, 240
  - Trip Blank 60, 240
- Inorganic
  - Acidity 183
  - Alkalinity 183
  - Ammonia 184
  - Ammonia (TKN) 185
  - BOD 186
  - Bromide 187
  - Cation Exchange Capacity 187
  - Chemical Oxygen Demand (COD) 188
  - Chloride 188
  - Chlorine, Residual 189

9413282.0432

INDEX (continued)

Page

Quality Control Samples - Inorganic (continued)
- Chromium (Hexavalent) CR^{+6} 190
- Color 191
- Conductivity 192
- Cyanide (Amenable) 193
- Cyanide (Free) 194
- Cyanide (Total) 195
- Flashpoint (Ignitability) 196
- Fluoride 197
- Hardness 197
- Iodide 198
- Methylene Blue Active Substances (MBAS) 199
- Metals
  - Flame AA 212
  - Graphite Furnace AA 212
  - ICP 213
  - Mercury (CVAA) 212
- Nitrogen, Nitrate-Nitrite 200
- Odor 201
- Oil and Grease 201
- pH 202
- Phenolics 203
- Phosphorus (Total and Ortho-phosphate) 204
- Silica 205
- Solids 205
- Sulfate 206
- Sulfide 207
- Sulfite 208
- Total Organic Carbon (TOC) 209
- Total Organic Halides (TOX) 210
- Turbidity 211

Laboratory
- Analytical Spike 64, 241
- Blank Spike 63, 241
- Continuing Calibration Standard 62, 241
- Duplicate 62, 241
- Internal Standards 64, 241
- Laboratory Control Sample 63, 241, 242
- Matrix Spikes 63, 241
- Matrix Spike Duplicate 63, 241

94113282.0433

INDEX (continued)

Page

Quality Control Samples - Laboratory (continued)

Method Blank 62, 241, 242
Reagent Blank 62, 241, 242
Solvent Blank 242
Surrogate Standard 63, 241
Volatile Holding Blank 242

Matrix

Duplicate Samples 243
Matrix Spike Sample 243
Matrix Spike Duplicate Sample 243

Measurements

Calibration (Initial, Continuing, and Ending) 242
Laboratory Control Sample 242
Method Blanks 242
Reagent Blanks 242
Solvent Blanks 242
Volatile Holding Blanks 242

Organic

Aromatic Volatiles by GC 216
Dioxins/Dibenzofurans 217
Formaldehyde 218
Herbicides 219
Nitro-aromatics by HPLC 221
Non-Methane Organic Compounds (NMOC) 222
Polynuclear Aromatic Hydrocarbons (PAHs) by HPLC 223
Polychlorinated Biphenyls (PCBs) by HRGC/HRMS 225
Pesticides/PCBs by GC 226
Petroleum Hydrocarbons (Total) by GC 230
Petroleum Hydrocarbons (Total) by IR 228
Purgeable Halocarbons by GC 231
Semivolatiles by GC/MS 233
Semivolatiles by GC 235
Volatiles by GC/MS 236
Volatiles by GC 238

Radiological 64
Yield Monitors 64, 241

9413282.0434

INDEX (continued)

Page

Records

Project 43
Quality/Operations 44
Validation 44

Reference Materials

Chemical Reference Standards 57
Physical Reference Standards 57
Radioactive 37, 57

Sample Containers, Preservations, and Holding Times

Inorganic

Acidity 128
Alkalinity 128
Ammonia 128
Biochemical Oxygen Demand (BOD) 128
Bromide 129
Chemical Oxygen Demand (COD) 129
Chloride 129
Residual Chlorine 130
Chromium (Cr^{+6}) 130
Color 130
Conductivity 130
Cyanide (Amenable) 131
Cyanide (Free) 131
Cyanide (Total) 132
Flashpoint (Ignitability) 132
Fluoride 132
Hardness (Total) 133
Iodide 133
Methylene Blue Active Substances (MBAS) (Surfactant) 133

Metals

GFAA 141
Furnace AA 141
ICAP 141
Mercury 141

Nitrogen, Nitrate-Nitrite 134
Odor 134
Oil and Grease 134
Ortho-phosphorous 135

9413282.0435

INDEX (continued)

Page

Sample Containers, Preservations, and Holding Times - Inorganic (continued)

pH 135
Phenolics 135
Phosphorus (Total) 136
Reactivity (Cyanide and Sulfide) 136
Settleable Solids 136
Silica, Dissolved 136
Sulfate (SO_4) 137
Sulfide 137
Sulfite (SO_3) 138
Temperature 138
Total Dissolved Solids 138
Total Kjeldahl Nitrogen (TKN) 138
Total Organic Carbon (TOC) 139
Total Organic Halides (TOX) 139
TPH 139
Total Solids 139
Total Suspended Solids 140
Total Volatile Solids 140
Turbidity 140

Organic

Aromatic Volatiles 143
Dioxins/Dibenzofurans 143
Formaldehyde 144
Herbicides 144
Nitroaromatics 145
Non-Methane Organic Compounds (NMOC) 146
Polynuclear Aromatic Hydrocarbons (PAH) 146
Polychlorinated Biphenyls (PCB) 148
Pesticides 148
Petroleum Hydrocarbons 149
Purgeable Halocarbons 150
Semivolatiles 151
Volatiles 152

Radiological

Alpha/Beta (Gross) 154
Americium-241 154
Carbon-14 154

9413282.0436

INDEX (continued)

Page

Sample Containers, Preservations, and Holding Times - Radiological (continued)

Calcium-45 154
Curium-242 154
Gamma Emitters 154
Iron-55 154
Lead-210 154
Neptunium-237 154
Promethium-147 155
Plutonium-238, 239/240 155
Radium-226 155
Radium-228 155
Strontium-89, 90 and Total Strontium 155
Technetium-99 155
Thorium-227, 228, 230, 232 155
Total Uranium 155
Tritium 155
Uranium-233/234, 235/236 156
Uranium-238 156

Samples

Chain-of-Custody (Internal) 55
Chain-of-Custody (Return) 56
Disposal 56
Field Collection 51
Containers (Sample) 52, 128, 143, 154
Containers (Shipping) 52
Holding Times 53, 128, 143, 154
Initiation of Testing 54
Log-in 55
Preservatives 53, 128, 143, 154
Receipt 54
Shipment 51
Storage 55
Turnaround Time (TAT) 54

9413282.0437

INDEX (continued)

Page

Standards
- Chemical Reference Standards 57
- Physical Reference Standards 57
- Preparation 58
- Reference 57
- Verification 57

Security
- Computer 45
- Facility 18

Surveillance 78

Training
- QA/QCC 34
- Quality Assurance 33, 87
- Records 34

Vendors
- Selection of Vendors 35

9413282.0438

9413282.0439

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Operation-Specific
QUALITY ASSURANCE MANAGEMENT PLAN
IT ANALYTICAL SERVICES DIVISION

RICHLAND LABORATORY
APPENDIX

9413282.0440

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APPENDIX

RICHLAND-0

LIST OF APPENDIX SECTIONS, TABLES, AND FIGURES

LIST OF APPENDIX SECTIONS

SECTION NO.	CONTENTS	COVER PAGE
Richland - 0	Lists of Appendix Sections, Tables, and Figures	3
Richland - 1	Organizational Chart	5
Richland - 2	Instrument List	7
Richland - 3	Standard Operating Procedure List	9
Richland - 4	Analytical Methods	19
Richland - 5	Minimum Detectable Activity	25
Richland - 6	Performance Evaluation Studies	29
Richland - 7	Preventive Maintenance Schedules	31
Richland - 8	Additional Operation-Specific Information	33

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
RD-1-1	Organizational Chart	6
RD-5-1	Radiochemical Mimimum Detectable Concentration	26

LIST OF TABLES

TABLE NO.	TITLE	PAGE
RD-2-1	Instrument List	8
RD-3-1	Standard Operating Procedure (SOP) List	10
RD-4-1	Radiological Methods	20
RD-6-1	Performance Evaluation Studies	30
RD-7-1	Maintenance Schedule for Radiological Analysis Equipment	32

9413282.0444

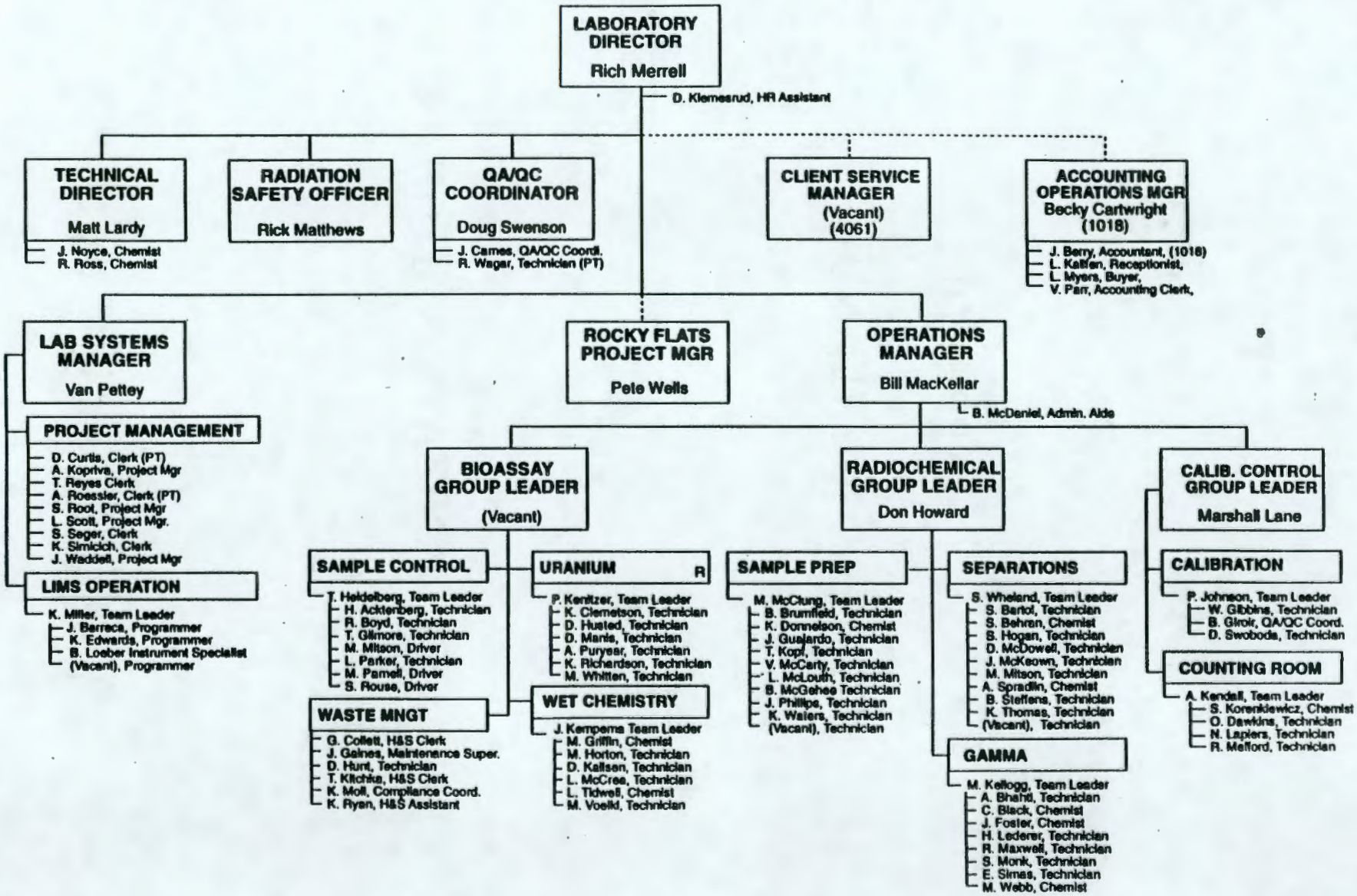
APPENDIX

RICHLAND-1

ORGANIZATIONAL CHART

FIGURE RD-1-1

INTERNATIONAL TECHNOLOGY CORPORATION
ANALYTICAL SERVICES
RICHLAND/4632



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APPENDIX

RICHLAND-2

INSTRUMENT LIST

TABLE RD-2-1
ITAS-RICHLAND LABORATORY
Instrument List
September, 1993

Instrument Type	Manufacturer	Model	Age
Alpha Proportional	UST-RD	Hex 1	11
	NMC	PC-5	4
	NMC	PCC 11TC	4
Beta Proportional			
Low Beta	Beckman	UST-RD	27
Quad Beta 1"	UST-RD	QB 1	8
Quad Beta 1.5"	UST-RD	QB 1.5	7
Low Alpha/Beta Proportional Automatic Changer	Tennelec	LB5100	6
Liquid Scintillation	Packard	460CD	12
	Packard	4530	9
	Packard	2000 CA/LL	7
	Packard	1550	5
Gamma Spectroscopy NaI 3" Dia.	Harshaw	N/A	12
NaI 9" Dia.	Harshaw	N/A	28
Germanium	Ortec, PGT, Canberra	Coaxial, Planar	5-10
Alpha Spectroscopy Surface Barrier, 300 mm^2	Ortec	596	4-12
Alpha Scintillation Lucas cell counters	Randam	SC-5	4-11
	Ludlum	2000/182	4-11
Fluorometer	Oak Ridge & UST-RD	FL 1	28
Laser Phosphorimeter	UST-RD	LIP1, LIP2	8 and 5

9413282-0447

9413282.0448

APPENDIX

RICHLAND-3

STANDARD OPERATING PROCEDURE LIST

TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	TITLE
RD0801	PREPARATION OF QC VIALS
RD0802	RECEIPT TO PREPARATION OF LIQUID RADIOACTIVE STANDARDS
RD0803	PREPARATION AND STANDARDIZATION OF BARIUM CARRIERS
RD0804	PREPARATION AND STANDARDIZATION OF IODINE CARRIERS
RD0805	PREPARATION AND STANDARDIZATION OF STRONTIUM CARRIERS
RD0806	PREPARATION OF STRONTIUM CARRIERS
RD0807	PREPARATION AND STANDARDIZATION OF YTTRIUM CARRIERS.
RD0808	PREPARATION OF MIXED FISSION PRODUCT CARRIER
RD0810	PREPARATION OF ALPHA AND/OR BETA AIR FILTER CALIBRATION STANDARDS
RD0811	PREPARATION OF GAMMA DETECTOR CALIBRATION STANDARDS
RD0812	PREPARATION OF CALIBRATION STANDARDS FOR ALPHA AND/OR BETA GAS PROPORTIONAL COUNTERS
RD0813	PREPARING BETA AND/OR ALPHA WATER-RESIDUE CALIBRATION STANDARDS
RD1600	DETERMINATION OF PROPORTIONAL COUNTERS EFFICIENCY
RD1602	CALIBRATION FOR ALPHA SPECTROMETRY SYSTEMS
RD1603	LIQUID SCINTILLATION COUNTER CALIBRATION
RD1800	ANNUAL CALIBRATION OF THERMOMETERS
RD1801	BALANCE CALIBRATION
RD1802	PIPET CALIBRATION CHECK
RD2203	ENVIRONMENTAL RADIOCHEMISTRY DATA REVIEW
RD2800	CHAIN OF CUSTODY FOR EACH SAMPLE
RD2801	RADIOLOGICAL SCREENING AND CLASSIFICATION OF SAMPLES
RD2802	METHOD FOR ALPHA/BETA SCREENING
RD2803	SAMPLE RECEIVING AND ROUTING
RD2804	SAMPLE LOGIN AND TRACKING USING THE SAM SYSTEM
RD2806	GENERATION OF SAMPLE DELIVERY GROUP CODES
RD3800	HANDLING EPA CROSS-CHECK SAMPLES
RD5800	SOFTWARE QUALITY ASSURANCE

9413282.0449

TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List
(Continued)

SOP NO.	TITLE
RD5801	RADIOCHEMICAL SAMPLE DATA PACKAGE ASSEMBLY
RD6001	LOGBOOK MAINTENANCE AND REVIEW
RD6400	BIOASSAY DATA REVIEW
RD6800	RADIOCHEMISTRY CONTROL CHARTING
RD6801	GUIDELINES AND CODES FOR RADIOCHEMISTRY
RD7200	QUALITY TESTING OF DIBUTYL N,N-DIETHYLCARBAMYLPHOPHONATE (DDCP)
RD7802	EXTERNAL AUDIT
RD7803	INTERNAL AUDIT
RD7804	TRAINING
RD7805	NONCONFORMANCE
RD7806	SURVEILLANCE
RD7807	10 CFR 21 COMPLIANCE
RD7808	ISSUING BLIND SAMPLES/STANDARDS
RD7809	WRITING A QUALITY ASSURANCE PROJECT PLAN
RD7810	FINAL PRODUCT QUALITY REVIEW
RD7811	ASSESSMENT OF THE QUALITY ASSURANCE PROGRAM
RD8801	MAINTENANCE OF QUALITY AND OPERATION FILES
RD8802	CONTROL OF PROCEDURES AND FORMS
RD8803	RECORDS STORAGE
RD8804	PROJECT RECORDS MANAGEMENT
RD9012	PREVENTIVE MAINTENANCE FOR ION SELECTIVE ELECTRODE ANALYSES
RD9200	RADON-222 ALPHA SCINTILLATION COUNTER PREVENTIVE MAINTENANCE
RD9400	FLUOROMETER PREVENTIVE MAINTENANCE
RD9600	PREVENTIVE MAINTENANCE FOR ALPHA SPECTROMETER VACUUM PUMP
RD9601	LIQUID SCINTILLATION COUNTER PREVENTIVE MAINTENANCE
RD9602	ALPHA, BETA AND GAMMA PROPORTIONAL, ALPHA SPECTROMETER & TENNELEC PM
RD9603	LASER INDUCED PHOSPHORESCENCE ANALYZER PREVENTIVE MAINTENANCE

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TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List
(Continued)

SOP NO.	TITLE
RD9800	PREVENTIVE MAINTENANCE FOR ALL LABORATORY BALANCES
RD10002	CHEMICAL/REAGENT TRACKING
RD10800	REAGENT WATER QUALITY MONITORING
RD10802	PROCUREMENT OF QUALITY MATERIALS
RD10804	USE OF BALANCES
RD10805	CHECKING THE PORTABLE SURVEY METERS
RD10806	DECONTAMINATION OF LABORATORY GLASSWARE AND ELECTRODEPOSITION EQUIPMENT
RD10807	FACILITY SECURITY
RD11001	OUT OF SPECIFICATION REPORTING FOR EG & G ROF CONTRACT BA44377PB
RD11004	BIOASSAY DELIVERY AND RETRIEVAL
RD12800	ACCUMULATION AND COLLECTION OF ALL WASTE GENERATED
RD12801	COLLECTION OF LIQUID DRUM SAMPLES
RD12802	HAZARDOUS WASTE DESIGNATION
RD12803	DISPOSAL OF RADIOACTIVE STANDARDS
RD12804	WASTE SHIPPING AND MANIFESTING
RD12805	GUIDELINES FOR RADIATION AND CONTAMINATION SURVEYS
RD3200	COPRECIPITATION OF SOME ACTINIDES ON NEODYMIUM FLUORIDE FOR ALPHA-PARTICLE SPECTROMETRY
RD3201	POLONIUM-210 IN URINE
RD3202	TRITIUM IN AIR DETERMINATION
RD3203	RADIUM-226 AND 228 IN WATER, SOIL AND SEDIMENT, URINE AND FECES - ADAPTED FROM EPA 903.1 AND 904.0
RD3205	TRITIUM DETERMINATION IN WATER AND AQUEOUS COMPONENT OF WINE
RD3206	ISOTOPIC AMERICIUM/CURIUM DETERMINATION
RD3209	ISOTOPIC PLUTONIUM DETERMINATION, ALL MATRICES
RD3214	GROSS ALPHA AND GROSS BETA IN WATER SAMPLES FROM METHOD 9310
RD3219	GAMMA ANALYSIS SAMPLE PREPARATION - ALL MATRICES
RD-RA-3321	PREPARATION AND DISSOLUTION OF SEDIMENTS AND SOIL BY MICROWAVE BOMB DIGESTION

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TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List
(Continued)

SOP NO.	TITLE
RD3234	URANIUM PURIFICATION FOR ISOTOPIC AND/OR FLUOROMETRIC DETERMINATION BY ION EXCHANGE
RD3238	STRONTIUM DETERMINATION IN DRINKING WATER
RD3244	THORIUM DETERMINATION IN FECAL AND URINE SAMPLES
RD3246	ACTINIDE ELECTRODEPOSITION
RD3255	IODINE DETERMINATION IN DRINKING WATER
RD3256	TOTAL STRONTIUM DETERMINATION IN URINE
RD3302	DETERMINATION OF PLUTONIUM AND/OR AMERICIUM IN SMALL SOIL AND FRESH WATER SEDIMENT SAMPLES
20-AM-01	AMERICIUM IN SOIL - ALPHA/GAMMA COINCIDENCE COUNTING
20-AM-03	RADIOCHEMICAL ANALYSIS FOR AMERICIUM IN SOIL
20-AM/CM-01	RAPID DETERMINATION OF ISOTOPIC AMERICIUM/CURIUM
20-C-01	DETERMINATION OF CARBON-14 IN WATER
20-C-02	DETERMINATION OF CARBON-14 IN URINE
20-C-03	DETERMINATION OF C-14 BENZENE SYNTHESIS
20-C-04	DETERMINATION OF CARBON-14 IN GRAPHITE
20-C-05	DETERMINATION OF CARBON-14 IN WATER DIRECT COUNTING METHOD
20-C-06	DETERMINATION OF CARBON-14 IN FECES, DIRECT COUNTING METHOD FOR RAPID AND EXPEDITE
20-Ce-01	DETERMINATION OF CERIUM-144 IN URINE AND FECAL SAMPLES
20-Cf-01	RAPID ISOTOPIC DETERMINATION OF CALIFORNIUM
30-Eu-01	DETERMINATION OF EUROPIUM-152, -154 AND -155 IN URINE AND FECAL SAMPLES
20-Fe-01	PROCEDURE FOR DETERMINATION OF IRON-55 AND IRON-59 IN WATER SAMPLES
20-H-01	DETERMINATION OF TRITIUM, CARBON-14 OR PHOSPHORUS-32 IN URINE
20-H-04	DETERMINATION OF TRITIUM IN MILK SAMPLES
20-H-05	TRITIUM BY CRYOGENIC DISTILLATION
20-H-EE	DETERMINATION OF LOW-LEVEL TRITIUM IN WATER
20-I-01	DETERMINATION OF IODINE-131 IN MILK BY BATCH ION EXCHANGE METHOD

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TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List
(Continued)

SOP NO.	TITLE
20-I-02	DETERMINATION OF IODINE-131 AND 129 IN WATER BY SOLVENT EXTRACTION METHOD
20-Ni-01	DETERMINATION OF NICKEL-63 IN SOIL
20-Ni-02	DETERMINATION OF Ni-63 IN ALL ENVIRONMENTAL MATRICES, EXCEPT SOIL
20-Np-03	DETERMINATION OF NEPTUNIUM-237 BY LIQUID-LIQUID EXTRACTION
20-P-01	DETERMINATION OF PHOSPHORUS-32 IN WATER
20-Pb	DETERMINATION OF LEAD-210 BY SOLVENT EXTRACTION
20-PbR-01	RAPID DETERMINATION OF Pb-210 IN URINE AND FECES
20-Pm-01	DETERMINATION OF PROMETHIUM-147
20-Po-02	POLONIUM-210 DETERMINATION WATER AND URINE MATRICES
20-Pu-02	PLUTONIUM - ALPHA ISOTOPIC RAPID PROCEDURE FOR FECES
20-Pu/Am/CmR	SEQUENTIAL PLUTONIUM - AMERICIUM - CURIUM, ALPHA ISOTOPIC RAPID PROCEDURE FOR URINE
20-PuR	PLUTONIUM - ALPHA ISOTOPIC RAPID PROCEDURE FOR URINE
20-Pu/SrR-01	SEQUENTIAL DETERMINATION OF PLUTONIUM AND TOTAL STRONTIUM RAPID PROCEDURE FOR FECES
20-Ra-02	DETECTION OF TOTAL ALPHA RADIUM IN WATER AND SOIL
20-RaRP	RADIUM-224 AND 226 IN URINE AND FECES RAPID, EXPEDITE AND PRIORITY
20-Ru-01	DETERMINATION OF RUTHENIUM-103 AND -106 IN URINE, FECAL AND WATER SAMPLES
20-S-02	DETERMINATION OF SULFUR-35 IN URINE
20-Sr-02	STRONTIUM DETERMINATION FECAL MATRICES
20-Sr-03	STRONTIUM DETERMINATION FOR ENVIRONMENTAL MATRICES
20-SrR-01	TOTAL STRONTIUM - RAPID PROCEDURE FOR FECES
20-Tc-01	EMERGENCY DETERMINATION OF Tc-99 IN BIOASSAY MATRICES
20-Tc-02	DETERMINATION OF Tc-99 IN BIOASSAY MATRICES
20-Tc-03	DETERMINATION OF Tc-99 IN ENVIRONMENTAL MATRICES
20-Th/Pb	THORIUM ISOTOPIC AND LEAD-210 ANALYSIS OF WATER, SEDIMENTS, AND SOIL
20-TSr-01	TOTAL STRONTIUM - RAPID ANALYSIS FOR URINE

9413282.0453

TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List
(Continued)

SOP NO.	TITLE
20-U-02	PURIFICATION OF URANIUM BY IMBK EXTRACTION AND RADIOMETRIC DETERMINATION OF URANIUM
20-U-03	FLUOROMETRIC DETERMINATION OF URANIUM FOLLOWING PURIFICATION
20-U-04	DIRECT FLUOROMETRIC ANALYSIS OF URANIUM IN URINE ROUTINE AND RUSH METHOD
20-U-05	DETERMINATION OF URANIUM BY PHOSPHORESCENCE ANALYSIS
20-U-06	URANIUM SEPARATION FOR URINE SAMPLES
20-UIR	URANIUM ISOTOPIC - RAPID ANALYSIS
20- U/Po	URANIUM ISOTOPIC AND POLONIUM-210 ANALYSIS OF WATER, SEDIMENTS, AND SOIL
30-01	DETERMINATION OF MIXED FISSION PRODUCTS IN URINE AND FECAL SAMPLES
30-03	DETERMINATION OF GROSS ALPHA & BETA ACTIVITY IN WATER
30-04	DETERMINATION OF GROSS ALPHA AND BETA ACTIVITY SOLVENT EXTRACTION PROCEDURE
30-05	DETERMINATION OF TOTAL ALPHA AND BETA ACTIVITY IN AIRBORNE PARTICULATES
30-06	DETERMINATION OF TOTAL ALPHA AND BETA ACTIVITY IN FOOD AND VEGETATION
30-07	DETERMINATION OF TOTAL ALPHA AND BETA ACTIVITY IN SOIL, BOTTOM SEDIMENT AND SHORELINE SOIL
30-08	DETERMINATION OF GROSS BETA ACTIVITY IN URINE - RAPID AND NORMAL ANALYSIS
30-10	DETERMINATION OF GROSS ALPHA ACTIVITY IN WATER BY CO-PRECIPITATION
30-11	SAMPLE PREPARATION FOR DISSOLVED URANIUM BY DIRECT MEASUREMENT OF LASER-INDUCED PHOSPHORESCENCE
30-12	URANIUM SEPARATION FOR URANIUM DETERMINATION BY LASER-INDUCED PHOSPHORESCENCE
30-13	GROSS RADIUM ALPHA SCREENING PROCEDURE FOR DRINKING WATER
30-19	DETERMINATION OF SOLUBILITY OF RADIOACTIVE PARTICLE CONSTITUENTS
30-20	PARTICLE SIZE ANALYSIS OF AEROSOL-INCIDENT SAMPLES
30-BA-LP	PREPARATION FOR BIOASSAY EMERGENCY ANALYSIS
30-BA-SP	URINE AND FECAL SAMPLE PREPARATION

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TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List
(Continued)

SOP NO.	TITLE
30-CARDS	EXAMPLES OF RADIOCHEMISTRY ANALYTICAL WORK CARDS AND FORMS
30-CR-01	CREATININE II PROCEDURE - ENDPOINT METHOD
30-DISS	COMPLETE DISSOLUTION OF SMALL SOIL AND SEDIMENT SAMPLES BY MIXED ACIDS IN TEFLON BEAKERS
30-ED-02	ELECTRODEPOSITION PROCEDURE FOR THE ACTINIDES
30-ENV-SP	SAMPLE PREPARATION PROCEDURE FOR ENVIRONMENTAL MATRICES
30-EP	DIRECTIONS FOR ANALYSIS OF EPA INTERLABORATORY COMPARISON SAMPLES
30-GA	DETERMINATION OF GROSS ALPHA ACTIVITY IN URINE - DIRECT MEASUREMENT METHOD
30-IL-SP-01	INTERMEDIATE LABORATORY SOIL SAMPLE PREPARATION - UNC TRENCH SOILS
30-IX	ION EXCHANGE COLUMN PREPARATION
30-PR	PROTEIN IN URINE
30-QC	QUALITY CONTROL INSTRUCTIONS
30-RFSP	RESIN AND FILTER SAMPLE PREPARATION PROCEDURE
30-SG	SPECIFIC GRAVITY OF URINE
30-SOIL	SOIL AND SEDIMENT PREPARATION PROCEDURE
30-SUP-01	SYNTHETIC URINE PREPARATION
RD4600	OPERATION OF LIQUID SCINTILLATION COUNTER
RD4601	USE OF HEX ALPHA
RD4602	USE OF QUAD BETA COUNTERS
RD4606	USE OF BETA 12 & 13 COUNTERS
RD4607	USE OF BETA PROPORTIONAL 41-46
RD4608	USE OF 9" DETECTOR FOR GAMMA COUNTING
RD4609	USE OF GERMANIUM/GAMMA DETECTORS
RD4610	USE OF ALPHA SPECTROMETERS
RD4611	USE OF DECAY CALCULATION FOR CHECK SOURCE ACTIVITY
RD4612	USE OF TENNELEC LB5100
RDCRC	CONTROL OF RADIATION COUNTERS
60-ERA-00	ERA DATA HANDLING

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TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List
(Continued)

SOP NO.	TITLE
60-ERA-01	SAMPLE RECEIPT
60-ERA-02	SAMPLE LOGIN
60-ERA-03	PRELIMINARY DATA EVALUATION
60-ERA-04	DATA ENTRY AND CALCULATIONS
60-ERA-05	TRITIUM IN WATER (DIRECT COUNTING)
60-ERA-06	TRITIUM IN WATER (ELECTROLYTIC ENRICHMENT)
60-ERA-07	TRITIUM IN AIR
60-ERA-08	CARBON 14 IN AIR (SODA LIME)
60-ERA-09	GROSS ALPHA IN ALL MEDIA
60-ERA-10	GROSS BETA IN ALL MEDIA
60-ERA-11	CALCULATION OF P-32, I-131 AND TOTAL RADIUM
60-ERA-12	TECHNETIUM-99 IN ENVIRONMENTAL MEDIA
60-ERA-13	Sr-90 OR Sr-89 & -90 IN ENVIRONMENTAL MEDIA
60-ERA-14	ALPHA SPECTROSCOPY CALCULATIONS
60-ERA-15	CALCULATION OF URANIUM FLUOROMETRIC DATA
60-ERA-16	CALCULATION FOR RADIUM-226 BY DEEMANATION
60-ERA-17	RADON-222 IN WATER
60-ERA-18	GAMMA SPECTROMETRY
60-ERA-19	REPORTING
60-ERA-SP	SAMPLE REPARATION PROCEDURE FOR ENVIRONMENTAL MATRICES
61-BA-00	BA DATA HANDLING
61-BA-05	GENERAL PROCEDURE INSTRUCTIONS
61-BA-06	PLUTONIUM
61-BA-07	Sr-90 AND TOTAL STRONTIUM
61-BA-08	QUS
61-BA-09	URANIUM WITH YIELD CORRECTION
61-BA-10	H-3 AND C-14
61-BA-11	Pu/Sr SEQUENTIAL ANALYSIS (IPS & IPSR)

TABLE RD-3-1
ITAS-RICHLAND LABORATORY
Standard Operating Procedure (SOP) List
(Continued)

SOP NO.	TITLE
61-BA-12	Pu/Am/Cm & Pu/Sr/Am SEQUENTIAL ANALYSIS (ITPAC &IPSA)
61-BA-13	Pu/Am SEQUENTIAL & Am ANALYSIS (IPA & Am)
61-BA-14	Pu ALPHA AND Pu BETA & Am SEQUENTIAL & Pu-241 ANALYSIS
61-BA-15	Pu/U SEQUENTIAL ANALYSIS
61-BA-16	GAMMA SPECTROSCOPY/LEPS ANALYSIS
61-BA-17	GROSS BETA IN URINE AND FECES
61-BA-18	LOW ALPHA IN URINE
61-BA-19	ISOTOPIC URANIUM
61-BA-20	QUALITY CONTROL
61-BA-21	EMERGENCY AND EXPEDITE PROCESSING
61-BA-24	SAMPLE RESULTS DUE TO BE REPORTED (SAMPLE STATUS)

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9413282.0458

APPENDIX

RICHLAND-4

ANALYTICAL METHODS

TABLE RD-4-1
ITAS-RICHLAND LABORATORY
Radiological Methods

Analytical Parameters	Matrix	Method
Gross Alpha/Beta	Water	SW846 Method 9310 Solvent Extraction and Determination by Gas Flow Proportional Alpha/Beta Counting
	Soil	Direct Determination by Gas Flow Proportional Alpha/Beta Counting
	Filter	Direct Determination by Gas Flow Proportional Alpha/Beta Counting
	Other Matrices	Sample Digestion and Determination by Gas Flow Proportional Alpha/Beta Counting
Americium-241	Water	Separation by Ion Exchange and Determination by Alpha Spectrometry
	Soil	Sample Digestion, Separation by Ion Exchange and Determination by Alpha Spectrometry
	Other Matrices	Sample Digestion, Separation by Ion Exchange and Determination by Alpha Spectrometry
Carbon-14	Water	Direct Determination by Liquid Scintillation Counting Sample Distillation and Determination by Liquid Scintillation Counting
	Soil	Combustion of Sample, Collection of CO_2 and Determination by Liquid Scintillation Counting
	Urine	Direct Determination by Liquid Scintillation Counting
	Other Matrices	Combustion of Sample, Collection of CO_2 and Determination by Liquid Scintillation Counting
Calcium-45	Water	Sample Separation and Determination by Gas Flow Proportional Counting
Curium-242	Water	Separation by Ion Exchange and Determination by Alpha Spectrometry
	Soil	Sample Digestion, Separation by Anion Exchange and Determination by alpha Spectrometry
	Other Matrices	Sample Digestion, Separation by Anion Exchange and Determination by Alpha Spectrometry

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TABLE RD-4-1
ITAS-RICHLAND LABORATORY
Radiological Methods
(Continued)

Analytical Parameters	Matrix	Method
Gamma Isotopic	Water	Direct Determination by Gamma Spectroscopy
	Soil	Direct Determination by Gamma Spectroscopy
	Air Filter	Direct Determination by Gamma Spectroscopy
	Urine/Feces	Direct Determination by Gamma Spectroscopy
	Other Matrices	Direct Determination by Gamma Spectroscopy
Iodine-129	Water	Solvent Extraction and Determination by Liquid Scintillation Counting Direct Determination by Gamma Spectroscopy
	Other Matrices	Direct Determination by Gamma Spectroscopy
Iodine-131	Drinking Water	Sample Separation and Determination by Gas Flow Proportional Counting
	Milk	Sample Separation by Ion Exchange and Determination by Gas Flow Proportional Counting
	Water	Direct Determination by Gamma Spectroscopy
	Air Filter	Direct Determination by Gamma Spectroscopy
Lead-210	Water	Separation by Ion Exchange and Determination by Gas Flow Proportional Counting
	Air Filter	Sample Digestion, Separation by Ion Exchange and Determination by Gas Flow Proportional Counting
	Soil	Direct Determination by Gamma Spectroscopy
	Other Matrices	Direct Determination by Gamma Spectroscopy
Nickel-63	Water	Direct Determination by Liquid Scintillation Counting
	Environmental Matrices	Sample Digestion, Separation and Determination by Liquid Scintillation Counting
Neptunium-237	Water	Separation by Liquid-Liquid Extraction and Determination by Alpha Spectrometry
	Soil	Separation by Liquid-Liquid Extraction and Determination by Alpha Spectrometry
	Other Matrices	Separation by Liquid-Liquid Extraction and Determination by Alpha Spectrometry

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TABLE RD-4-1
ITAS-RICHLAND LABORATORY
Radiological Methods
(Continued)

Analytical Parameters	Matrix	Method
Polonium-210	Water	Separation by Ion Exchange and Determination by Alpha Spectrometry
	Urine	Separation by Ion Exchange and Determination by Alpha Spectrometry
	Vegetation, Soil or Sediment	Sample Digestion, Separation by Ion Exchange and Determination by Alpha Spectrometry Direct Determination by Gamma Spectrometry
	Air Filter	Sample Digestion, Separation by Ion Exchange and Determination by Alpha Spectrometry
Plutonium Isotopic	Water	Separation by Ion Exchange and Determination by Alpha Spectrometry
	Air Filter	Sample Digestion, Separation by Ion Exchange and Determination by Alpha Spectrometry
	Vegetation, Soil or Sediment	Sample Digestion, Separation by Ion Exchange and Determination by Alpha Spectrometry
	Urine	Separation by Ion Exchange and Determination by Alpha Spectrometry
	Feces	Sample Digestion, Separation by Ion Exchange and Determination by Alpha Spectrometry
	Animal Tissue or Bone	Sample Digestion, Separation by Ion Exchange and Determination by Alpha Spectrometry
Radium - Total Alpha	Water	Coprecipitation and Determination by Gas Flow Proportional Counting or Alpha Scintillation Counting
	Soil	Sample Digestion, Coprecipitation and Determination by Gas Flow Proportional Counting or Alpha Scintillation Counting
Radium-226 & 228	Water, Soil & Sediment, Urine and Feces	Adapted from EPA Procedures 903.1 and 904.0
Strontium-89, 90 and Total Strontium	Water	Precipitation and Determination by Gas Flow Proportional Beta Counting
	Vegetation, Soil or Sediment	Sample Digestion, Precipitation and Determination by Gas Flow Proportional Beta Counting

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TABLE RD-4-1
ITAS-RICHLAND LABORATORY
Radiological Methods
(Continued)

Analytical Parameters	Matrix	Method
Strontium-89, 90 and Total Strontium (Continued)	Air Filter	Sample Digestion, Precipitation and Determination by Gas Flow Proportional Beta Counting
	Urine	Precipitation and Determination by Gas Flow Proportional Beta Counting
	Feces	Sample Digestion, Precipitation and Determination by Gas Flow Proportional Beta Counting
	Animal Tissue or Bone	Sample Digestion, Precipitation and Determination by Gas Flow Proportional Beta Counting
Technetium-99	Water	Sample Separation and Liquid Scintillation Counting
	Urine or Feces	Sample Separation and Liquid Scintillation Counting
	Vegetation, Soil, Sediment, Animal Tissue or Bone	Sample Digestion, Separation and Liquid Scintillation Counting
Thorium Isotopic	Water	Separation by Anion Exchange and Determination by Alpha Spectrometry
	Soil, Air Filter, Vegetation, Sediment, Animal Tissue or Bone	Sample Digestion, Separation by Anion Exchange and Determination by Alpha Spectrometry
	Urine or Feces	Separation by Anion Exchange and Determination by Alpha Spectrometry
Tritium	Water	Direct Determination by Liquid Scintillation Counting Sample Distillation and Determination by Liquid Scintillation Counting Electrolytic Enrichment and Determination by Liquid Scintillation Counting
	Wine	Sample Distillation and Determination by Liquid Scintillation Counting

TABLE RD-4-1
ITAS-RICHLAND LABORATORY
Radiological Methods
(Continued)

Analytical Parameters	Matrix	Method
Tritium (Continued)	Silica, Vegetation, Soil or Sediment	Sample Distillation and Determination by Liquid Scintillation Counting
	Urine	Direct Determination by Liquid Scintillation Counting Sample Distillation and Determination by Liquid Scintillation Counting
Uranium Total	Water	Sample Separation and Determination by Laser Phosphorimetry
	Soil or Sediment	Sample Digestion, Sample Separation and Determination by Laser Phosphorimetry Direct Determination by Gamma Spectrometry
	Air Filter, Vegetation, Animal Tissue or Bone	Sample Digestion, Sample Separation and Determination by Laser Phosphorimetry
	Urine	Sample Separation and Determination by Laser Phosphorimetry
Uranium Isotopic	Water	Separation by Anion Exchange and Determination by Alpha Spectrometry
	Air Filter, Vegetation, Soil, Sediment, Animal Tissue or Bone	Sample Digestion, Separation by Anion Exchange and Determination by Alpha Spectrometry
	Urine or Feces	Separation by Anion Exchange and Determination by Alpha Spectrometry

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APPENDIX

RICHLAND-5

MINIMUM DETECTABLE ACTIVITY

FIGURE RD-5-1
ITAS-RICHLAND LABORATORY
Radiochemical Minimum Detectable Concentration

Detection Limits

For radiochemistry measurements, ITAS/RD uses for guidance "Performance Criteria for Radiobioassay", Draft Standard P/N13.30 ANSI/Health Physics Society Standard, "Upgrading Environmental Radiation Data", EPA 520/1-80-012, and "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements", Nureg/CR-4007, or as requested by the client.

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Minimum Detectable Concentration Equation

$$MDC = \frac{3 + (4.65 * \sqrt{R_b * t_b})}{2.22 * E * t_a * V_a * Y}$$

Terms in Equations

E = counting efficiency for the analyte of interest.

MDC = minimum detectable activity in pCi per sample unit.

R_b =background counts per minute (cpm) in the ROI or analyte of interest.

R_g = gross cpm of sample aliquant.

t_a = count length of sample aliquant, in minutes.

t_b = count length of background, in minutes.

TPU = total propagated uncertainty.

$$U_\Sigma = (U_E^2 + U_S^2 + U_V^2 + U_Y^2)$$

U_E = relative fractional random uncertainty associated with the counting efficiency E, typically 0.03.

U_R = counting uncertainty in pCi per sample unit.

U_S = relative fractional systematic uncertainty of the procedure, typically 0.03.

FIGURE RD-5-1
ITAS-RICHLAND LABORATORY
Radiochemical Minimum Detectable Concentration
(Continued)

U_V = relative fractional random uncertainty associated with the volume measurement, typically 0.015. Substitute U_M for solid samples, typically 0.01.

U_Y = relative fractional random uncertainty associated with yield Y, typically 0.05 for procedures with radiochemical separations.

V_a = volume or mass of sample aliquant analyzed, typically in liters. Substitute M_a for solid samples, typically in grams.

Y = chemical yield, as determined from processing matrix spikes. Y = dpm recovered/dpm added.

2 = for two sigma uncertainty.

2.22 = conversion of dpm to pCi.

3, 4.65 = constants in the MDC equation.

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APPENDIX

RICHLAND-6

PERFORMANCE EVALUATION STUDIES

TABLE RD-6-1
ITAS-RICHLAND Laboratory
Performance Evaluation Studies

PE Sample Program Description	Analysis Performed	Frequency of Participation
Environmental Radioactivity Laboratory Intercomparison Studies Program (EMSL)	Gamma, Iodine, Gross Alpha, Gross Beta, Tritium, Radium-226, Radium-228, Plutonium, Strontium-89, Strontium-90, Natural Uranium	Monthly
Environmental Measurements Laboratory Quality Assessment Program (QAP)	Gamma, Tritium, Plutonium, Strontium, Uranium, Americium	Semi-Annually

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APPENDIX

RICHLAND-7

PREVENTIVE MAINTENANCE SCHEDULES

TABLE RD-7-1
ITAS-RICHLAND LABORATORY
Maintenance Schedule
Radiological Analysis Equipment

Instrument	Items Checked/Service	Minimum Frequency
Alpha Proportional	Check gas flow Clean sample tray Check bubbler oil level	Daily Weekly Monthly
Beta Proportional	Check gas flow Clean sample holders	Daily Weekly
Liquid Scintillation	Clean sample changer Check condensate trays Check air filters	Weekly Weekly Monthly
Quad αß Proportional	Check gas flow Clean sample holders	Daily Weekly
Gamma Spectroscopy	Check LN_2 level Replace plastic liner	Bi-weekly Weekly
Alpha Spectroscopy	Clean sample holder Change vacuum pump oil	As needed Every six months
LIPA	Clean sample changer Check laser dye performance	Weekly Weekly
Benzene Synthesizer	Check gas tubes Clean instrument	Weekly Monthly
Electrolytic Enrichment	Check electrical leads Clean system	Monthly Monthly
Fluorometer	Clean sample holder	Weekly

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APPENDIX

RICHLAND-8

ADDITIONAL OPERATION-SPECIFIC INFORMATION

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Operation-Specific
QUALITY ASSURANCE MANAGEMENT PLAN
IT ANALYTICAL SERVICES DIVISION

SPECIAL ANALYSIS LABORATORY
APPENDIX

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APPENDIX

SPECIAL ANALYSIS - 0

LISTS OF APPENDIX SECTIONS, TABLES, AND FIGURES

LIST OF APPENDIX SECTIONS

SECTION NO.	CONTENTS	COVER PAGE
SAL - 0	Lists of Appendix Sections, Tables, and Figures	3
SAL - 1	Organizational Chart	5
SAL - 2	Instrument List	7
SAL - 3	Standard Operating Procedure List	9
SAL - 4	Analytical Methods	13
SAL - 5	Practical Quantitation Limits	17
SAL - 6	Performance Evaluation Sample Studies	25
SAL - 7	Preventive Maintenance Schedule	27
SAL - 8	Additional Operation-Specific Information	29

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LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
SA-1-1	Organizational Chart	6
SA-7-1	Example GC/MS Preventive Maintenance Schedule	28

LIST OF TABLES

TABLE NO.	TITLE	PAGE
SA-2-1	Instrument Inventory	8
SA-3-1	Standard Operating Procedure (SOP) List	10
SA-4-1	Organic Sample Preparation Methods	14
SA-4-2	Organic Analysis Methods	15
SA-5-1	Dioxin/Furans by HRGC/LRMS Method 8280 - PQLs	18
SA-5-2	Dioxin/Furans by HRGC/HRMS Method 8290 - PQLs	20
SA-5-3	PCBs by HRGC/HRMS - PQLs	22
SA-5-4	2,3,7,8-TCDD by HRGC/HRMS Method 1613 - PQL	23
SA-6-1	Performance Evaluation Sample Program	26

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APPENDIX

SPECIAL ANALYSIS - 1

ORGANIZATIONAL CHART

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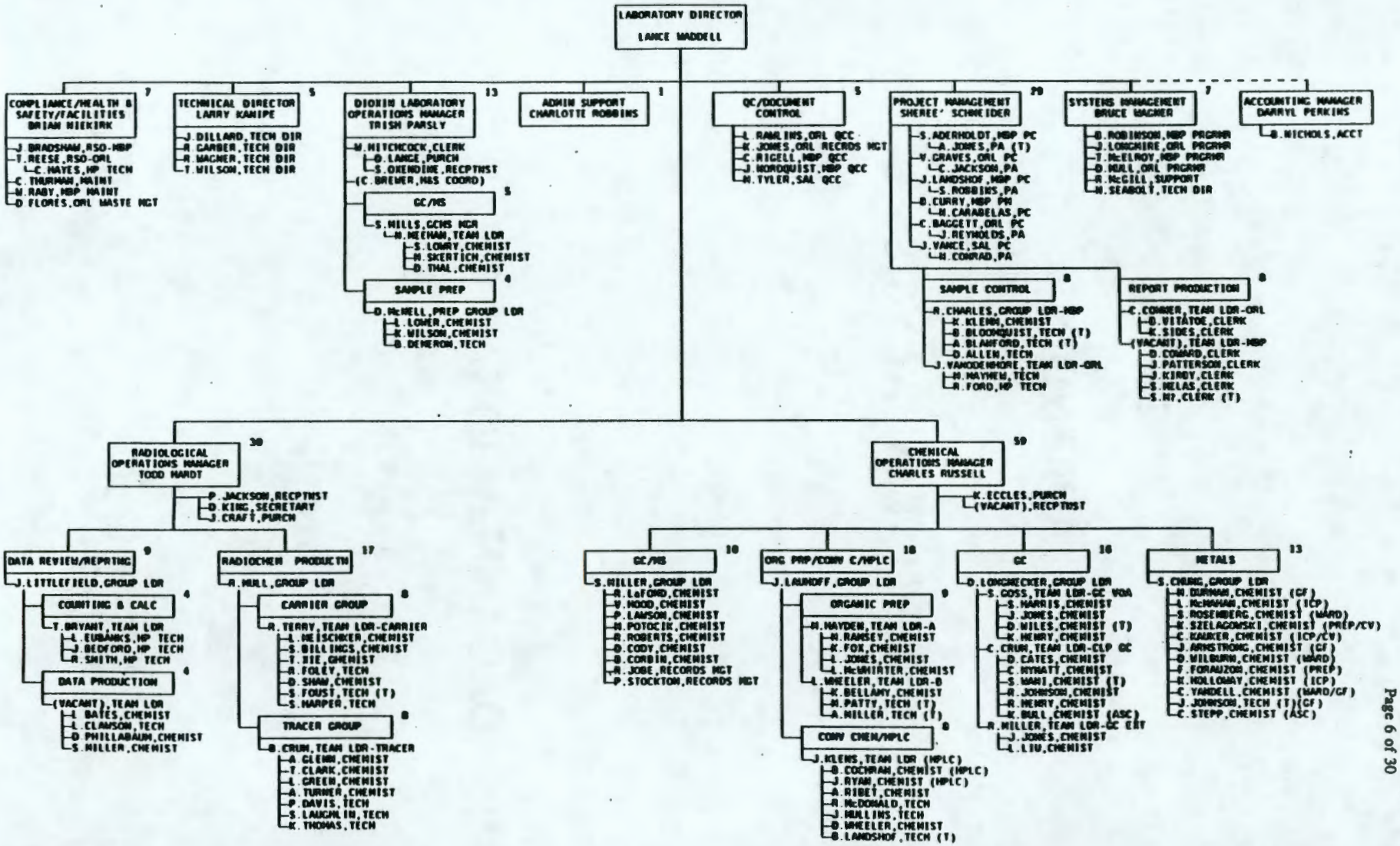
FIGURE SA-1-1

ITAS-KNOXVILLE LABORATORY



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APPENDIX

SPECIAL ANALYSIS - 2

INSTRUMENT LIST

TABLE SA-2-1
INSTRUMENT INVENTORY

INSTRUMENT TYPE	MANUFACTURER	MODEL	AUTOSAMPLER	AGE
GC/MS	Finnigan	4500		10
	Finnigan	TSQ-45B	7673A	7
	Hewlett Packard	5971A	7673A	2.5
	Finnigan	MAT-95	CTC-2000	2.0

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APPENDIX

SPECIAL ANALYSIS - 3

STANDARD OPERATING PROCEDURE LIST

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Table SA-3-1
ITAS-SPECIAL ANALYSIS LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	TITLE
STANDARD PREPARATION	
TDL000	Procurement, Receipt, Preparation, Storage, Traceability and Documentation of Standards for Dioxin/Furan Analysis
CALIBRATION	
TDL100	Use of Class S Weights
ITAS-SA-QC-0003	Annual Pipetter Calibration-Gravimetric Method and Quarterly Pipetter Calibration (Manufacturer's Method)
TDL102	Calibration of Thermometers
TDL103	Balance Calibration Checks
SAMPLE RECEIPT	
ITAS-SA-SC-0001	Sample Handling and Storage
ITAS-SA-SC-0002	Sample Receipt, Coding, Tracking and Initiation of Testing
ORGANIC SAMPLE PREPARATION	
ITAS-SA-OP-001	Dioxin and Furan-Extraction Method for Soil and Sediment (Jar Extraction)
TDL304	Dioxin and Furan-Preparation of Building Scrape Material for Extraction
TDL305	Dioxin and Furans-Extraction Method for Water
TDL306	Dioxin and Furan-Extraction Method for Wipes (Jar Extraction)
TDL307	Dioxin and Furan-Extraction Method for Wipes (Soxhlet Extraction)
TDL308	Dioxin and Furan-Extraction Method for Fly Ash and Other Carbonaceous Materials (Acid Pre-treatment)
TDL309	Dioxin and Furan-Extraction Method for Organic Material
TDL310	Dioxin and Furan-Extraction Method for Industrial Hygiene Samples
TDL311	Dioxin and Furan-Extraction Method for Biological Samples
TDL312	Dioxin and Furan-Single Column Cleanup
TDL313	Dioxin and Furan Silica Gel/Alumina Column Cleanup
TDL314	Dioxin and Furan Caustic and Acid Cleanup
TDL315	Activated Carbon Cleanup for Isomer Specific and Total Dioxin/furan Analysis
ITAS-SA-OP-0015	Polychlorinated Biphenyl (PCB) Infraction Methods and Cleanup Procedures for GC/MS Analysis
GC\MS Analysis	
TDL316	2,3,7,8-TCDD & 2,3,7,8-TCDF Analysis Procedures by Multiple Ion Detection (MID) High Resolution Gas Chromatography/Low Resolution Mass Spectrometry (HRGC/LRMS)
TDL317	Total PCDD and PCDF Congener (Cl_4-Cl_8) Analysis Procedure by Multiple Ion Detection (MID) High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS)

Table SA-3-1
ITAS-SPECIAL ANALYSIS LABORATORY
SOP LIST
(continued)

SOP NO.	TITLE
ITAS-SA-MS-0003	2,3,7,8-TCDD and 2,3,7,8-TCDF Analysis Procedures by Selective Ion Recording (SIR) High Resolution Gas Chromatography/High Resolution Mass Spectroscopy (HRGC/HRMS)
ITAS-SA-MS-0004	Total PCDD and PCDF Congener Analysis Procedures by Selective Ion Monitoring (SIM) High Resolution Gas Chromatography/High Resolution Mass Spectroscopy (HRGC/HRMS)
ITAS-SA-MS-0005	Total Polychlorinated Biphenyl (PCB) Analysis Procedures by Selective Ion Recording (SIR) High Resolution Gas Chromatography/High Resolution Mass Spectroscopy (HRGC/MS)
ITAS-SA-MS-0006	Analysis of Standard Reference Material (SRM) 1614
DATA REPORTING	
TDL1500	Laboratory Data Recording in the GC/MS Labs
TDL1501	Dioxin and Furan Analysis Forms
ITAS-SA-DR-0001	Data Reports
TDL1503	Analytical Logbook Recording Procedures
TDL1504	Laboratory Notebook Recording Procedures
TDL1505	Client Notification of Corrected Data and Issuing Corrected Data Reports
DATA REVIEW	
TDL1600	Analyst Data Review
TDL1601	Final Data Review and QC Check
QUALITY CONTROL	
TDL1700	Blanks
TDL1701	Matrix Spike/Matrix Spike Duplicate Analysis
TDL1703	Blind QC Samples
TDL1705	Nonconformance and Corrective Action
TSL1706	Conduct of Internal Surveillances and Audits
TDL1707	Project Records Maintenance
TDL1708	Quality and Operations Records Retention
TDL1709	Personnel Training and Qualifications
TDL1711	On-site Storage of Project Records and Transferral to Off-site Storage
TDL1712	QC Sample Tracking
TDL1713	Detection Limit Determinations
TDL1714	Control Charting/Interpretation
TDL1716	Routine Monitoring of Refrigerators, Freezers, and Ovens
ITAS-SA-QC-0024	Material Procurement and Control

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Table SA-3-1
ITAS-SPECIAL ANALYSIS LABORATORY
SOP LIST
(continued)

SOP NO.	TITLE
ITAS-SA-QC-0033	Sample Rerun Requirements for Dioxin/Furan Analysis
ITAS-SA-QC-0034	Preventive Maintenance of Finnigan MAT 95
ITAS-SA-QC-0035	Preventive Maintenance of Hewlett Packard MSD
DOCUMENT CONTROL	
TDL1800	Preparation and Control of Procedures and Manuals
PREVENTATIVE MAINTENANCE	
TDL1900	Preventive Maintenance of the Finnigan 4500
TDL1901	Preventive Maintenance of the Finnigan TSQ
TDL1902	Preventive Maintenance of the VG 70-250s
TDL1903	Preventive Maintenance of Gas Chromatographs
MISCELLANEOUS	
TDL2000	Glassware Cleanup Procedure for Dioxin/Furan Analysis
TDL2010	Lockout/Tagout Procedures
TD-HS0001	Inspection, Maintenance, and Testing of Exhaust Hoods
HAZARDOUS WASTE MANAGEMENT	
TDL2200	Hazardous Waste Management Policy
TDL2201	Waste Characterization and Categorization
TDL2202	Waste Accumulation
TDL2203	Waste Packaging and Storage
TDL2204	Waste Shipping and Manifesting
TDL2205	Waste Minimization
TDL2206	Laboratory Treatability Study Exemption Tracking
TDL2207	Chemical Inventory

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APPENDIX

SPECIAL ANALYSIS - 4

ANALYTICAL METHODS

TABLE SA-4-1
SPECIAL ANALYSIS LABORATORY
Organic Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
PCBs by HRGC/HRMS[3]	Water	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
	Liquid	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
	Soil	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
Dioxins/ Dibenzofurans by HRGC/LRMS[2]	Water	Method 613[1]	Method 8280	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8280	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8280	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8280	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8280	Not Applicable	Not Applicable
Dioxins/ Dibenzofurans by HRGC/HRMS[3]	Water	Not Applicable	Method 8290	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8290	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8290	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8290	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8290	Not Applicable	Not Applicable

[1] Includes drinking, surface and saline water

[2] High Resolution Gas Chromatography/Low Resolution Mass Spectrometry

[3] High Resolution Gas Chromatography/High Resolution Mass Spectrometry

TABLE SA-4-2
SPECIAL ANALYSIS LABORATORY
Organic Analysis Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
PCBs by HRGC/HRMS[3]	Water	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
	Liquid	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
	Soil	Not Applicable	Not Applicable	Not Applicable	SOP# ITAS-SA-OP-0015
Dioxins/ Dibenzofurans by HRGC/LRMS[2]	Water	Method 613[1]	Method 8280	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8280	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8280	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8280	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8280	Not Applicable	Not Applicable
Dioxins/ Dibenzofurans by HRGC/HRMS[3]	Water	Not Applicable	Method 8290	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8290	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8290	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8290	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8290	Not Applicable	Not Applicable
2,3,7,8-TCDD by HRGC/HRMS	Water	N/A	N/A	N/A	EPA1613

[1] Includes drinking, surface and saline water

[2] High Resolution Gas Chromatography/Low Resolution Mass Spectrometry

[3] High Resolution Gas Chromatography/High Resolution Mass Spectrometry

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APPENDIX

SPECIAL ANALYSIS - 5

PRACTICAL QUANTITATION LIMITS

TABLE SA-5-1
SPECIAL ANALYSIS LABORATORY
DIOXIN/FURANS BY HRGC/LRMS METHOD 8280
Practical Quantitation Limits (PQL)[(1),(2)]

ANALYTE	WATER PQLs (ng/L)	SOIL PQLs[(3)] (ng/g)
2,3,7,8-TCDD	10.0	1.0
2,3,7,8-TCDF	10.0	1.0
Total-TCDD	10.0	1.0
1,2,3,7,8-PeDD	10.0	1.0
Total-PeDD	10.0	1.0
1,2,3,4,7,8-HxDD	10.0	1.0
1,2,3,6,7,8-HxDD	10.0	1.0
1,2,3,7,8,9-HxDD	10.0	1.0
Total-HxDD	10.0	1.0
1,2,3,4,6,7,8-HpDD	10.0	1.0
Total-HpDD	10.0	1.0
OCDD	10.0	1.0
Total-TCDF	10.0	1.0
1,2,3,7,8-PeDF	10.0	1.0
2,3,4,7,8-PeDF	10.0	1.0
Total-PeDF	10.0	1.0
1,2,3,4,7,8-HxDF	10.0	1.0
1,2,3,6,7,8-HxDF	10.0	1.0
2,3,4,6,7,8-HxDF	10.0	1.0
1,2,3,7,8,9-HxDF	10.0	1.0
Total-HxDF	10.0	1.0
1,2,3,4,6,7,8-HpDF	10.0	1.0
1,2,3,4,7,8,9-HpDF	10.0	1.0

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TABLE SA-5-1
SPECIAL ANALYSIS LABORATORY
DIOXIN/FURANS BY HRGC/LRMS METHOD 8280
Practical Quantitation Limits (PQL)[1],[2]
(continued)

ANALYTE	WATER PQLs (ng/L)	SOIL PQLs[3] (ng/g)
Total-HpDF	10.0	1.0
OCDF	10.0	1.0

(1) Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always by achievable.

(2) Practical Quantitation Limits are based on the lower end of calibration range of method and specific sample size.

(3) Quantitation limits listed for soils are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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TABLE SA-5-2
SPECIAL ANALYSIS LABORATORY
DIOXIN/FURANS BY HRGC/HRMS METHOD 8290
Practical Quantitation Limits (PQL)[1],[2]

ANALYTE	WATER PQLs (pg/L)	SOIL PQLs [3] (pg/g)
2,3,7,8-TCDD	10.0	1.0
2,3,7,8-TCDF	10.0	1.0
Total-TCDD	10.0	1.0
1,2,3,7,8-PeDD	50.0	5.0
Total-PeDD	50.0	5.0
1,2,3,4,7,8-HxDD	50.0	5.0
1,2,3,6,7,8-HxDD	50.0	5.0
1,2,3,7,8,9-HxDD	50.0	5.0
Total-HxDD	50.0	5.0
1,2,3,4,6,7,8-HpDD	50.0	5.0
Total-HpDD	50.0	5.0
OCDD	100.0	10.0
Total-TCDF	10.0	1.0
1,2,3,7,8-PeDF	50.0	5.0
2,3,4,7,8-PeDF	50.0	5.0
Total-PeDF	50.0	5.0
1,2,3,4,7,8-HxDF	50.0	5.0
1,2,3,6,7,8-HxDF	50.0	5.0
2,3,4,6,7,8-HxDF	50.0	5.0
1,2,3,7,8,9-HxDF	50.0	5.0
Total-HxDF	50.0	5.0
1,2,3,4,6,7,8-HpDF	50.0	5.0
1,2,3,4,7,8,9-HpDF	50.0	5.0

TABLE SA-5-2
SPECIAL ANALYSIS LABORATORY
DIOXIN/FURANS BY HRGC/HRMS METHOD 8290
Practical Quantitation Limits (PQL)[1],[2]
(continued)

ANALYTE	WATER PQLs (pg/L)	SOIL PQLs [3] (pg/g)
Total-HpDF	50.0	5.0
OCDF	100.0	10.0

(1) Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always by achievable.

(2) Practical Quantitation Limits were arrived at by lower end of calibration range of method and specific sample size.

(3) Quantitation limits listed for soils are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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TABLE SA-5-3
SPECIAL ANALYSIS LABORATORY
PCBs BY HRGC/HRMS (SOP # ITAS-SA-OP-0015)
Practical Quantitation Limits (PQL)[1],[2]

ANALYTE	WATER PQLs (ng/L)	SOIL PQLs [3] (ng/g)
Mono-PCB	5.0	0.5
Di-PCB	5.0	0.5
Tri-PCB	5.0	0.5
Tetra-PCB	5.0	0.5
Penta-PCB	5.0	0.5
Hexa-PCB	5.0	0.5
Hepta-PCB	5.0	0.5
Octa-PCB	5.0	0.5
Nona-PCB	5.0	0.5
Deca-PCB	5.0	0.5

(1) Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always by achievable.

(2) Practical Quantitation Limits were arrived at by lower end of calibration range of method and specific sample size.

(3) Quantitation limits listed for soils are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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Table SA-5-4
SPECIAL ANALYSIS LABORATORY
2,3,7,8 -TCDD by HRGC/HRMS Method 1613 (PQL)[(1),(2)]

ANALYTE	WATER (pg/L)	SOIL
2,3,7,8-TCDD	10.0	Not Applicable

(1) Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always by achievable.

(2) Practical Quantitation Limits were arrived at by lower end of calibration range of method and specific sample size.

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APPENDIX

SPECIAL ANALYSIS - 6

PERFORMANCE EVALUATION SAMPLE STUDIES

TABLE SA-6-1
ITAS-SPECIAL ANLAYSIS LABORATORY
PE Sample Programs

PE Sample Program Description	Analysis Performed	Frequency of Participation
Internal PE Samples (Soil)	2,3,7,8-TCDD/TCDF and Totals Tetra through Octa dioxin and furan homologs (HRGC/HRMS and HRGC/LRMS)	Quarterly
USEPA Water Supply (WS) Studies	2,3,7,8-TCDD	Semi-Annually

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APPENDIX

SPECIAL ANALYSIS - 7

PREVENTIVE MAINTENANCE SCHEDULE

FIGURE SA-7-1
ITAS-SPECIAL ANLAYSIS LABORATORY
Example GC/MS Preventive Maintenance Schedule

Month _____ Year 199___

GC/MS PREVENTATIVE MAINTENANCE SCHEDULE

Inst:_____

Instal Date Column when maint. is performed		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
GC Maintenance																																
1. Replace Septum	(A)																															
2. Replace Injection Port Liner	(A)																															
3. Perform Column Maintenance	(A)																															
4. Replace Carrier Gas Filter	(A)																															
5. Check Carrier Gas Pressure (Record)	(B)																															
6. Install Column (Type and ID Number)	(A)																															
Ion Source Maintenance																																
1. Clean Ion Source	(A)																															
2. Clean Quadrupole Rods (LRMS)																																
3. Install Clean Ion Volume	(A)																															
4. Install new Filament	(A)																															
5. Replace PFK Reservoir Septum (HRMS)	(A)																															
6. Replace PFK Reservoir Jet (VG only)	(A)																															
7. Replace GC Inlet Jet (VG only)	(A)																															
MS Vacuum System Maintenance																																
1. Change Mechanical Pump Oil	(D)																															
2. Change Turbo Pump Oil (Finnegan)	(E)																															
3. Change Difussion Pump Oil (VG,HP)	(D)																															
4. Check Coolant Level and Temperature	(B)																															
MS Electronics Maintenance																																
1. Check Cooling Fans	(B)																															
2. Clean Cooling Fan Filters	(C)																															
3. Check PCB seating and alignment	(D)																															
4. Check Power Supply Voltages	(D)																															
Other Maintenance																																
1. Clean Printer	(C)																															
2. Replace Printer Ribbon and/or Toner	(A)																															
3. Other (Specify)																																
Instrument Downtime (Hrs)																																

Frequency

(A) As Needed
(B) Weekly
(C) Monthly
(D) Biannually (Jan, Jul)
(E) Annually (Jan)

GC Columns	Installation Date	Phase	Lgth	Id	Serial #

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APPENDIX

SPECIAL ANALYSIS - 8

ADDITIONAL OPERATION-SPECIFIC INFORMATION

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Operation-Specific
QUALITY ASSURANCE MANAGEMENT PLAN
IT ANALYTICAL SERVICES DIVISION

KNOXVILLE LABORATORY
APPENDIX

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APPENDIX

KNOXVILLE - 0

LISTS OF APPENDIX SECTIONS, TABLES, AND FIGURES

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LIST OF APPENDIX SECTIONS

SECTION NO.	CONTENTS	COVER PAGE
KNOXVILLE - 0	Lists of Appendix Sections, Tables, and Figures	2
KNOXVILLE - 1	Organizational Chart	5
KNOXVILLE - 2	Instrument List	7
KNOXVILLE - 3	Standard Operating Procedure List	12
KNOXVILLE - 4	Analytical Methods	18
KNOXVILLE - 5	Practical Quantitation Limits	44
KNOXVILLE - 6	Performance Evaluation Studies	63
KNOXVILLE - 7	Preventive Maintenance Schedules	65
KNOXVILLE - 8	Additional Operation-Specific Information	75

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
KN-1-1	Organizational Chart	6

LIST OF TABLES

TABLE NO.	TITLE	PAGE
KN-2-1	Instrument Inventory	8
KN-3-1	ITAS-Knoxville Standard Operating Procedures	13
KN-4-1	Wet Chemistry Methods	19
KN-4-2	Metals Sample Preparation Methods	29
KN-4-3	Inductively Coupled Plasma Emission Spectroscopy Methods	31
KN-4-4	Graphite Furnace Atomic Absorption Methods	32
KN-4-5	Cold Vapor Atomic Absorption Methods	35
KN-4-6	Organic Sample Preparation Methods	36
KN-4-7	Organic Methods	40
KN-5-1	Practical Quantitation Limits for Wet Chemistry	45
KN-5-2	ICAP Metals Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	47
KN-5-3	AA Metals Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	49
KN-5-4	Volatile Organics Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	50

LIST OF TABLES
(continued)

TABLE NO.	TITLE	PAGE
KN-5-5	Semivolatile Organics Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	52
KN-5-6	Pesticides and PCBs Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	55
KN-5-7	Explosives Method Detection Limits (MDL) and Practical Quantitation Limits (PQL)	57
KN-5-8	Aromatic Volatiles / Low Boiling Petroleum Hydrocarbons by GC Method Detection Limits (MDL) and Practical Quantitation Limits (PQL)	58
KN-5-9	Polynuclear Aromatic Hydrocarbons by HPLC Method Detection Limits (MDL) and Practical Quantitation Limits (PQL)	59
KN-5-10	Total High Boiling Petroleum Hydrocarbons Method Detection Limits (MDL) and Practical Quantitation Limits (PQL)	60
KN-5-11	Halogenated and Aromatic Volatiles by GC Method Detection Limits (MDL) and Practical Quantitation Limits (PQL)	61
KN-6-1	Performance Evaluation Sample Studies	61
KN-7-1	Maintenance Schedule - Graphite Furnace Atomic Absorption	66
KN-7-2	Maintenance Schedule - ICP	6[illegible]
KN-7-3	Maintenance Schedule - High Pressure Liquid Chromatography	68
KN-7-4	Maintenance Schedule - Ion Chromatography	69
KN-7-5	Maintenance Schedule - Total Organic Halide Analyzer	70
KN-7-6	Maintenance Schedule - Total Organic Carbon Analyzer	71
KN-7-7	Maintenance Schedule - Gas Chromatography	72
KN-7-8	Maintenance Schedule - Mass Spectrometers	73

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APPENDIX

KNOXVILLE - 1

ORGANIZATIONAL CHART

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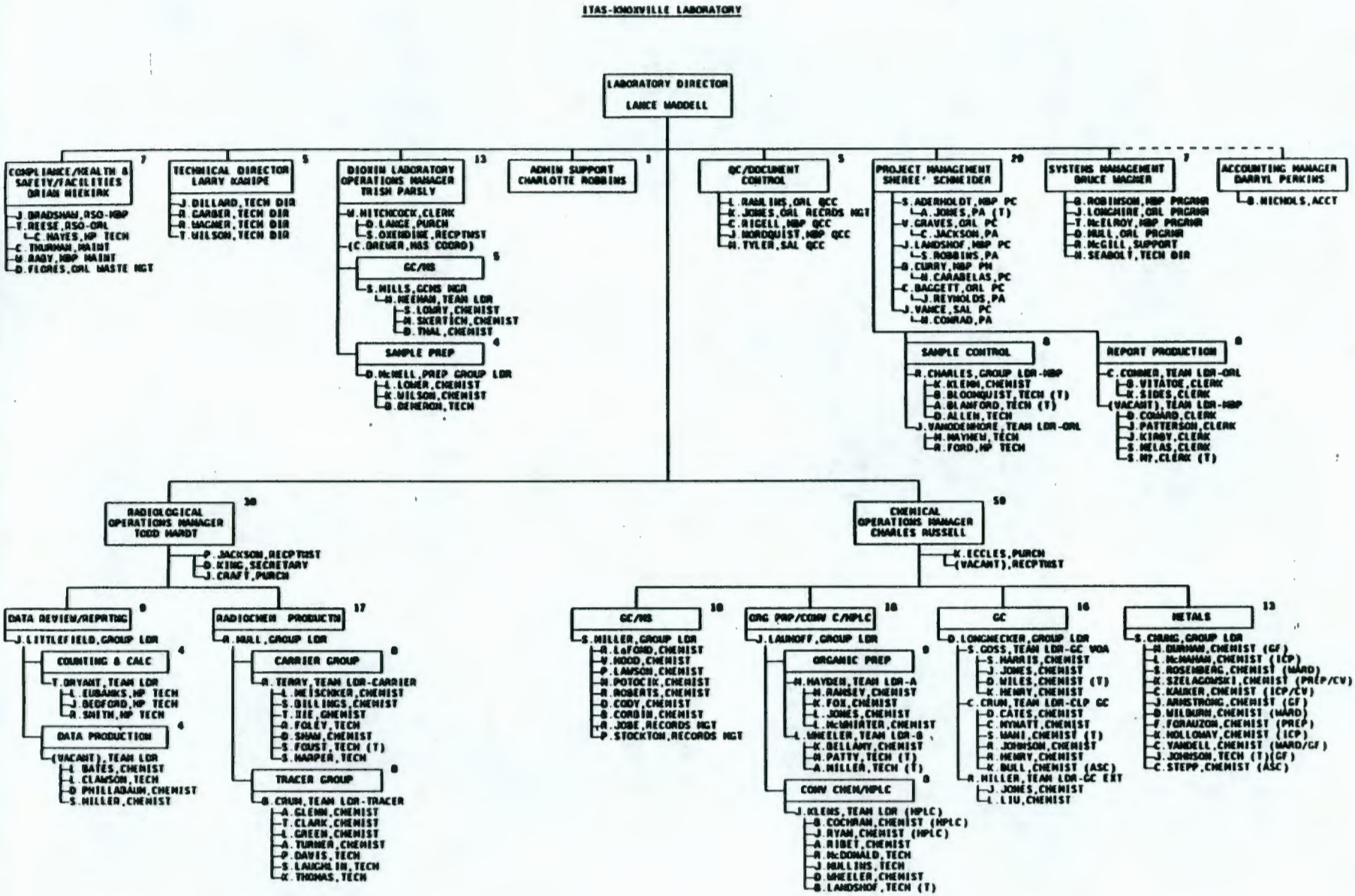
FIGURE KN-1-1



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APPENDIX

KNOXVILLE - 2

INSTRUMENT LIST

TABLE 2-1
INSTRUMENT INVENTORY
MIDDLEBROOK LABORATORY

INSTRUMENT TYPE	MANUFACTURER	MODEL	AUTOSAMPLER	AGE
GC/MS	Finnigan	4500	HP 7673	7
	Finnigan	Incos 500	Tekmar ALS2016	2
	Finnigan	Incos XL	CTC Anal. A2005	1
	VG	Trio I	HP 7673A	3
	Hewlett Packard	5970	Tekmar ALS2016	10
	Hewlett Packard	5970	Tekmar ALS2016	10
GC	Hewlett Packard	5890 ECD K/L	HP 7673A	1
	Hewlett Packard	5890 NPD	HP 7673	2
	Hewlett Packard	5890 FID	HP 7673	3
	Hewlett Packard	5890 FID	HP 7673	3
	Hewlett Packard	5890 ECD M/N	HP 7673A	6
	Hewlett Packard	5890 ECD C/D	HP 7673	3
	Hewlett Packard	5890 ECD G/H	HP 7673	3
	Varian	3740 ECD A/B	Series 8000	7
	Varian	3600 PID&HALL	Tekmar ALS2016	4
	Varian	3400 PID&HALL	Tekmar ALS2016	3
	Varian	3400 FID & PID	Tekmar ALS2016	2
	Varian	3700 FID & PID	Tekmar ALS2016	8
	Varian	3700 ECD E/F	Series 8000	10
	Varian	3700 ECD 5/6	Series 8000	8

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TABLE 2-1
INSTRUMENT INVENTORY
MIDDLEBROOK LABORATORY
(continued)

INSTRUMENT TYPE	MANUFACTURER	MODEL	AUTOSAMPLER	AGE
GC (continued)	Varian	3700 ECD 1/2	Series 8000	10
	Varian	3400 PID&HALL	Tekmar ALS2016	3
METALS	Perkin Elmer	Zeeman 5100-A	PE AS-60	3
	Perkin Elmer	Zeeman 5100-B	PE AS-60	2
	Perkin Elmer	PC 5100-C	PE AS-60	3
	Thermo Jarrell Ash	1100		5
	Thermo Jarrell Ash	ICAP 61E		2
HPLC	Perkin Elmer	LC-235	PE LC-600	7
	Perkin Elmer	LC-235	PE LC-600	7
	Perkin Elmer	LC-95	PE ISS-100	10
	Waters	200	WISP 712	1
WW	Coleman	Model 35		3.5
	Dormann	Xertex		
	Hach	DR2		6
	Hach	2100A		6
	Lachat	1300-000	Lachat 1100-000	
	Lachat	1300-000	Lachat 1100-000	
	Lachat	Quick Chem AE	Lachat 2100	1
	OI Corporation	700		7
	Orion	SA520		6

TABLE 2-1
INSTRUMENT INVENTORY
MIDDLEBROOK LABORATORY
(continued)

INSTRUMENT TYPE	MANUFACTURER	MODEL	AUTOSAMPLER	AGE
	Orion	920A		
WW (Continued)	YSI	Model 35	Lachat 2100	4
Organic Prep	ABC 1	GPC Autoprep Model 1002B		3
	ABC 2	GPC Autoprep Model 1002B		3
	ABC A	GPC Autoprep Model 1002B		3
	ABC B	GPC Autoprep Model 1002B		1
	Hewlett Packard	5890 Series II	HP 7673	2
	Zymark	Turbo VAP II 2		1
	Zymark	Turbo VAP II 1		4
	Zymark	Turbo VAP 7		4
	Zymark	Turbo VAP 6		4
	Zymark	Turbo VAP 5		4
	Zymark	Turbo VAP 4		4
	Zymark	Turbo VAP 3		4
	Zymark	Turbo VAP 2		4
	Zymark	Bench. Work.		1
	Zymark	Turbo VAP 1		4

TABLE 2-1
INSTRUMENT INVENTORY
MIDDLEBROOK LABORATORY
(continued)

INSTRUMENT TYPE	MANUFACTURER	MODEL	AUTOSAMPLER	AGE
	Tekmar	Sonicator TM600-2		
	Tekmar	Sonicator TM600-2		
Organic Prep (Continued)	Tekmar	Sonicator TM500		
	Tekmar	Sonicator TM500		

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APPENDIX

KNOXVILLE - 3

STANDARD OPERATING PROCEDURE LIST

ITAS-KNOXVILLE LABORATORY

STANDARD OPERATING PROCEDURES INDEX

SOP NO.	REV NO.	REV. DATE	TITLE
AD910306R0	0	3/7/91	Transfer of Document Files to Off-Site Storage
AD910312R1	1	11/1/91	General Health and Safety Practices for Tasks Performed in the ITAS-Knoxville Laboratory
AD910313R1	1	5/28/91	Internal Chain-of-Custody and Sample Security for ITAS-Knoxville
CD900420R1	1	5/14/93	NJDEPE X-26174 IFB Specific Requirements for Sample Container Preparation and Shipping, Sample Receipt and Logging, Internal Chain of Custody and Sample Storage
GC841213R3	3	5/10/93	GC Sample Analysis and Tracking
GC860529R3	3	12/30/91	GC Data Review for CLP Data Package - SOW OLMO1
IT-CO-0020	1	5/14/93	Extraction of Low Level Semivolatiles from Soil/Sediment Samples Using CLP Protocol
IT-CO-0021	1	5/10/93	Extraction of Medium Level Semivolatile Compounds from Soil/Sediment Samples Using CLP Protocol
IT-CO-0024	1	5/14/93	Semivolatile Extractions by Continuous Liquid-Liquid Extraction, CLP Protocol
IT-CO-0030	0	5/10/93	Analysis of Pesticides and PCBs by the CLP Protocol
IT-CO-3640	0	5/10/93	Gel Permeation Chromatography Organic Extract Cleanup Procedure - Semivolatiles
ITAS-KN-GC-6407	1	9/1/93	Gas Chromatography Analysis of Pesticides and PCBs by Contract Laboratory Protocol SOW 3/90
ITAS-KN-MS-6821	1	9/1/93	GC/MS Semivolatile Organic Analysis by USEPA SW-846 Method 8270
ITAS-KN-MS-6823	1	9/1/93	GC/MS Semivolatile Organic Analysis by Contract Laboratory Protocol OLMO1.0, SOW 3/90
ITAS-KN-MS-6831	1	9/2/93	GC/MS Volatile Organic Analysis by USEPA SW-846 Method 8240
ITAS-KN-MS-6834	1	9/1/93	GC/MS Volatile Organic Analysis by Contract Laboratory Protocol OLMO1.0, SOW 3/90

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ITAS-KNOXVILLE LABORATORY

STANDARD OPERATING PROCEDURES INDEX

SOP NO.	REV NO.	REV. DATE	TITLE
ITAS-KN-MT-6200	1	9/1/93	ICP Method for Trace Element Analysis of Water and Wastes
ITAS-KN-MT-6201	1	9/1/93	Analysis of Trace Metals by Furnace Atomic Absorption Spectrometry by CLP
ITAS-KN-MT-6202	1	9/1/93	Flame Atomic Absorption Method for Potassium Analysis by CLP SOW 3/90
ITAS-KN-MT-6203	1	9/1/93	Analysis of Mercury in Liquid Waste by CLP SOW 3/90 and SW-846
ITAS-KN-MT-6211	1	9/1/93	Sample Preparation for Metals Analysis by CLP SOW 3/90
ITAS-KN-OP-6690	1	9/1/93	Toxicity Characteristic Leaching Procedure for Metals, Semivolatiles, Pesticides, PCBs and Herbicides
ITAS-KN-WC-6000	1	8/31/93	Alkalinity Analyses: Total, Bicarbonate, Carbonate and Hydroxide Alkalinity
ITAS-KN-WC-6001	1	8/31/93	Filterable Residue Analysis (Gravimetric, Dried at 180°C)
ITAS-KN-WC-6002	1	8/31/93	Nonfilterable Residue Analysis (Gravimetric, Dried at 103-105°C
ITAS-KN-WC-6003	1	8/31/93	Analysis of Total Cyanide in Water, Soil and Sediment Media by USEPA CLP Protocol (Automated)
ITAS-KN-WC-6004	1	8/31/93	Chloride by Flow Injection Analysis
ITAS-KN-WC-6005	1	8/31/93	Sulfate by Flow Injection Analysis (Automated, Methylthymol Blue, AAII)
ITAS-KN-WC-6006	1	8/31/93	Total and Ortho Phosphorus by Flow Injection Analysis
ITAS-KN-WC-6007	1	9/1/93	Nitrate/Nitrite by Flow Injection Analysis (Automated, Cadmium Reduction)
ITAS-KN-WC-6008	1	9/1/93	Analysis of Total Organic Carbon in Water (UV Promoted, Persulfate Oxidation)
ITAS-KN-WC-6009	1	9/1/93	Analysis of Oil and Grease and Total Petroleum Hydrocarbons (TPH, Gravimetric)

ITAS-KNOXVILLE LABORATORY

STANDARD OPERATING PROCEDURES INDEX

SOP NO.	REV NO.	REV. DATE	TITLE
ITAS-KN-WC-6010	1	9/1/93	Ammonia Nitrogen Analysis (Nesslerization)
ITAS-KN-WC-6011	1	9/1/93	Determination of Total Organic Nitrogen (TON)
ITAS-KN-WC-6012	1	9/1/93	Analysis of Ph in Water and Soil Samples
ITAS-KN-WC-6014	1	9/1/93	Total Kjeldahl Nitrogen (TKN) by Nesslerization
ITAS-KN-WC-6016	1	9/1/93	Fluoride Analysis by Ion Selective Electrode (ISE)
ITAS-KN-WC-6017	1	9/1/93	Analysis of Sulfides in Waters (Titrimetric)
ITAS-KN-WC-6020	1	9/1/93	Analysis of Total Organic Halides (TOX)
ITAS-KN-WC-6022	1	9/1/93	Analysis of Sulfite in Waters
ITAS-KN-WC-6023	1	9/1/93	Total Residue
ITAS-KN-WC-6030	1	9/1/93	Hexavalent Chromium in Water and Soil
ITAS-KN-WC-6031	1	9/1/93	Analysis of Phenolic Compounds in Water and Soil (Automated)
ITAS-KN-WC-6038	1	9/1/93	Conductivity
ITAS-KN-WC-6039	1	9/1/93	Residual Chlorine
ITAS-KN-WC-6040	1	9/1/93	Ignitability by Penske-Martens Closed Flash Tester
ITAS-KN-WC-6041	1	9/1/93	Ignitability of Liquids by Setaflash
ITAS-KN-WC-6053	1	9/1/93	Hardness by Titration
ITMS390V	0	6/15/92	GC/MS Volatile Organic Analysis by EPA CLP 3/90 SOW W/Revisions

ITAS-KNOXVILLE LABORATORY

STANDARD OPERATING PROCEDURES INDEX

SOP NO.	REV NO.	REV. DATE	TITLE
KN-CO-0006R0	0	5/10/93	Gel Permeation Chromatography Organic Extract Cleanup Procedure - Pesticides/PCBs
KN-GC-0003R0	0	5/10/93	Standard Preparation Notebook Usage - GC
KN-HS-0012R1	1	1/10/92	Hazardous Waste Management Policy
KN-HS-0013R0	0	1/10/92	Waste Characterization and Categorization
KN-HS-0014R0	0	1/10/92	Waste Accumulation
KN-HS-0015R0	0	1/10/92	Waste Packaging and Storage
KN-HS-0016R0	1	1/10/92	Waste Shipping and Manifesting
KN-HS-0017R0	1	1/10/92	Waste Minimization Policy
KN-MS-0001R0	0	5/10/93	Data Management and Handling in GC/MS and GC (Organics) Departments Under the USEPA CLP OLMO1
KN-OP-0001R0	0	5/10/93	Records Management - Organic Extractions
KN-OP-0002R0	0	5/10/93	Reagent Purity Check Procedures
KN-OP-0003R0	0	2/4/93	Sonicator Horn Tuning in Organic Extractions
KN-OP-0004R0	0	5/10/93	Sample Handling Protocol - Organic Extractions
KN-QC-0001R0	0	2/19/93	Pipettor Calibration - Gravimetric Method
KN-QC-0002R0	0	5/10/93	Personnel Training and Qualifications
KN-QC-0003R0	0	5/10/93	Facility Security
KN-QC-0004R0	0	2/1/93	Data Recording Practices

ITAS-KNOXVILLE LABORATORY

STANDARD OPERATING PROCEDURES INDEX

SOP NO.	REV NO.	REV. DATE	TITLE
KN-QC-0005R0	0	5/10/93	Nonconformance and Corrective Action
KN-QC-0006R2	0	5/10/93	Balance Calibration and Use of Class S Weights
KN-QC-0008R0	0	5/10/93	Quality and Operations Records Retention
KN-QC-0009R0	0	5/10/93	Calibration of Thermometers
KN-QC-0010R0	0	5/10/93	Temperature Monitoring
KN-QC-0015R0	0	5/10/93	Determination of MDL, CRDL and CRQL
KN-SC-0001R0	0	5/10/93	Receipt and Logging In of USEPA CLP and SAS Samples
KN-SC-0003R0	0	5/10/93	Procedure and Documentation Requirements for Sample Archiving and Disposal
M_841218R2	2	5/10/93	GC/MS Sample Tracking
M_870715R1	0	5/10/93	Records Management - GC/MS
M_880520R2	2	9/3/91	EPA-CLP and SAS Case File Assembly
M_880630R2	2	9/3/91	Shipment of EPA CLP and SAS Deliverable Packages
M_911220R0	0	12/20/91	Review of EPA-CLP OLMO1 Diskette Deliverables
OP841214R3	3	12/11/91	Glassware Cleanup for Organic Extractions
OP910904R1	0	5/10/93	Extraction Procedures for USEPA Target Compound List Chlorinated Pesticides and Aroclors by USEPA CLP 3/90 SOW Protocol
OP910925R1	0	5/10/93	Extraction of Pesticides/PCBs from Soil/Sediment Samples Using EPA CLP SOW OLMO1
OP911230R0	0	12/30/91	GC FID Screening

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ITAS-KNOXVILLE LABORATORY

STANDARD OPERATING PROCEDURES INDEX

SOP NO.	REV NO.	REV. DATE	TITLE
QA841113R2	2	9/5/91	Sample Storage for EPA Contract Laboratory Program
QA841214R1-6	1	2/13/87	Water Purification System Monitoring

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APPENDIX

KNOXVILLE - 4

ANALYTICAL METHODS

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TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Acidity	Water	Method 305.2	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Alkalinity	Water	Method 310.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ammonia	Water	Method 350.2	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 350.2 (1)
Biochemical Oxygen Demand (BOD)	Water	Method 405.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Bromide	Water	Method 300.0	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Bromide (continued)	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 300.0 (2)
Chemical Oxygen Demand (COD)	Water	Not Applicable	Not Applicable	Not Applicable	HACH
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Chloride	Water	Method 300.0 Method 325.3	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 300.0 (2) Method 325.3 (3)
Conductivity	Water	Method 120.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Amenable)	Water	Method 335.1	Method 9010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Cyanide (Amenable) (continued)	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Free)	Water	Not Applicable	Not Applicable	Not Applicable	Standard Methods 412 H
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Standard Methods 412 H
Cyanide	Water	Method 335.2	Method 9010	Method ILM01.0	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9010[4]	Method ILM01.0	Not Applicable
Dissolved Oxygen	Water	Method 360.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Dissolved Organic Carbon (DOC)	Water	Method 415.1	Method 9060	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Dissolved Organic Carbon (DOC) (continued)	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Fluoride	Water	Method 300.0 Method 340.2	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 300.0 [2] Method 340.2 [3]
Hardness	Water	Not Applicable	Not Applicable	Not Applicable	SM 314A
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Kjeldahl Nitrogen (total)	Water	Method 351.3	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 351.3[5]
Nitrite (NO_2)	Water	Method 300.0 (non-preserved) Method 353.2 (LACHAT) (preserved)	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Nitrite (NO_2) (continued)	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitrate (NO_3)	Water	Method 300.0 (non-preserved) Method 353.2 (LACHAT) (preserved)	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitrate plus Nitrite	Water	Method 353.2 (LACHAT)	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 353.2 (3) (LACHAT)
Oil and Grease	Water	Method 413.1	Method 9070	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 9071	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9071	Not Applicable	Not Applicable

94K3282-0528

TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Orthophosphate	Water	Method 300.0 Method 365.3 (LACHAT)	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 365.3 [3] (LACHAT)
pH	Water	Method 150.1	Method 9040	Method OLM01.8	Not Applicable
	Liquid	Not Applicable	Method 9040	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 9040	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 9045	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9045	Method OLM01.8	Not Applicable
Phenol	Water	Method 420.2 (LACHAT)	Method 9065 (LACHAT)	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9065[4] (LACHAT)	Not Applicable	Not Applicable
Phosphorus (Total)	Water	Method 365.3	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge,Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Residual Chlorine	Water	Not Applicable	Not Applicable	Not Applicable	HACH
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfate (SO_4)	Water	Method 300.0 Method 375.4	Method 9038	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfide (SO)	Water	Method 376.1	Method 9030	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 376.1 [6]
Sulfite (SO_3)	Water	Method 377.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 377.1 [6]
Total Organic Carbon (TOC)	Water	Method 415.1	Method 9060	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
TOC (continued)	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9060 (7)	Not Applicable	Not Applicable
Total Dissolved Solids	Water	Method 160.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Setteable Solids	Water	Method 160.5	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Solids	Water	Method 160.3	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Suspended Solids	Water	Method 160.2	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Suspended Solids (continued)	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Volatile Solids	Water	Method 160.4	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Turbidity	Water	Method 180.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable

TABLE KN-4-1
KNOXVILLE LABORATORY
Wet Chemistry Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Turbidity (continued)	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

(1) 5 g soil is added to 250 ml DI water in the distillation flask; the distillation and analysis procedure is followed as described in the reference EPA method(s).

(2) Soil is leached.

(3) 1 g soil is added to 100 ml DI water and sonicated for 30 minutes in a water bath. A portion of the leachate is then decanted, filtered if necessary, and analyzed according to the referenced method(s). The results are reported as water leachable concentrations of the analytes.

(4) 5 g soil is added to 500 ml DI water in the distillation flask; the distillation and analysis procedure is then followed as described in the referenced EPA method(s).

(5) 1 g soil is added to 50 ml DI water in the digestion apparatus: the digestion, distillation, and analysis procedure is then followed as described in the referenced EPA method.

(6) 2 g soil is added to an appropriate volume of DI water (200 ml for sulfide analysis, 50 ml for sulfite analysis); the solution is agitated with a magnetic stirrer and titrated in accordance with the referenced EPA methods.

(7) Samples are weighed in a glass ampule and mixed with a phosphoric and sodium persulfate reagent solution. The phosphoric acid immediately converts all inorganic carbon to carbon dioxide (CO_2) which is purged from the ampule with oxygen. The ampule is sealed under oxygen and heated to approximately 100° in a water bath for 30 minutes. The heating process converts the organic carbon to CO_2 which is trapped in the sealed ampule. The samples are analyzed according to the referenced EPA methods by an O. I. Corporation Total Organic Carbon Analyzer, Model 700. The carbon is quantified by an infrared detector in the analyzer by measuring the absorbance of CO_2.

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TABLE KN-4-2
KNOXVILLE LABORATORY
Metals Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Toxicity Characteristic Leaching Procedure (TCLP)	Water	Not Applicable	Method 1311	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 1311	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 1311	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 1311	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 1311	Not Applicable	Not Applicable
ICAP Metals	Water	Not Applicable	Method 3005 Method 3010	Method ILMO1.0	Not Applicable
	Liquid	Not Applicable	Method 3040	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 3050	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3050	Method ILMO1.0	Not Applicable
CVAA Mercury	Water	Method 245.1	Method 7470	Method ILMO1.0	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Method 7470	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 7471	Not Applicable	Not Applicable
	Soil	Method 245.5	Method 7471	Method ILMO1.0	Not Applicable

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TABLE KN-4-2
KNOXVILLE LABORATORY
Metals Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
GFAA Metals	Water	Element / Method Arsenic 206.2 Antimony 204.2 Cadmium 213.2 Chromium 218.2 Lead 239.2 Nickel 249.2 Selenium 270.2 Silver 272.2 Thallium 279.2	Method 3020	Method ILMO1.0	Not Applicable
	Liquid	Not Applicable	Method 3020	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3020	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment		Method 3050	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3050	Method ILMO1.0	Not Applicable

TABLE KN-4-3
KNOXVILLE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Al, Sb, As, Ba, Be, Bo, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Mo, Ni, Os, K, Se Si, Ag, Na, Sr, Tl, Sn, Ti, V, Zn	Water	Not Applicable	Method 6010	Method ILM01.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method ILM01.0	Not Applicable

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TABLE KN-4-4
KNOXVILLE LABORATORY
Graphite Furnace Atomic Absorption Methods

Parameter	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Antimony	Water	Method 204.2	Method 7041	Method ILMO1.0	Not Applicable
	Liquid	Not Applicable	Method 7041	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7041	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7041	Method ILMO1.0	Not Applicable
Arsenic	Water	Method 206.2	Method 7060	Method ILMO1.0	Not Applicable
	Liquid	Not Applicable	Method 7060	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7060	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7060	Method ILMO1.0	Not Applicable
Cadmium	Water	Method 213.2	Method 7131	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 7131	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7131	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7131	Not Applicable	Not Applicable
Chromium	Water	Method 218.2	Method 7191	Not Applicable	Not Applicable

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TABLE KN-4-4
KNOXVILLE LABORATORY
Graphite Furnace Atomic Absorption Methods

Parameter	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Chromium (continued)	Liquid	Not Applicable	Method 7191	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7191	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7191	Not Applicable	Not Applicable
Lead	Water	Method 239.2	Method 7421	Method ILMO1.0	Not Applicable
	Liquid	Not Applicable	Method 7421	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7421	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7421	Method ILMO1.0	Not Applicable
Nickel	Water	Method 249.2	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Selenium	Water	Method 270.2	Method 7740	Method ILMO1.0	Not Applicable
	Liquid	Not Applicable	Method 7740	Method ILMO1.0	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-4
KNOXVILLE LABORATORY
Graphite Furnace Atomic Absorption Methods

Parameter	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Selenium (continued)	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7740	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7740	Method ILMO1.0	Not Applicable
Silver	Water	Method 272.2	Method 7761	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 7761	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7761	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7761	Not Applicable	Not Applicable
Thallium	Water	Method 279.2	Method 7841	Method ILMO1.0	Not Applicable
	Liquid	Not Applicable	Method 7841	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7841	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7841	Method ILMO1.0	Not Applicable

TABLE KN-4-5
KNOXVILLE LABORATORY
Cold Vapor Atomic Absorption Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Mercury	Water	Method 245.1	Method 7470	Method ILM01.0	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Method 7470	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7471	Not Applicable	Not Applicable
	Soil	Method 245.5	Method 7471	Method ILM01.0	Not Applicable

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TABLE KN-4-6
KNOXVILLE LABORATORY
Organic Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Volatiles by GC/MS	Water	Method 624	Method 5030	Method OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 5030	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 5030	Method OLMO1.8	Not Applicable
Volatiles by GC	Water	Method 601	Method 5030	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 5030	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 5030	Not Applicable	Not Applicable
Aromatic Volatiles by GC	Water	Method 602	Method 5030	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 5030	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 5030	Not Applicable	Not Applicable
Semivolatiles by GC/MS	Water	Method 625	Method 3510 Method 3520	Method OLM01.8	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3510 Method 3520	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable

TABLE KN-4-6
KNOXVILLE LABORATORY
Organic Sample Preparation Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Semivolatiles by GC/MS (continued)	Soil	Not Applicable	Method 3540 Method 3550	Method OLMO1.8	Not Applicable
Pesticides/ PCBs by GC	Water	Method 608	Method 3510 Method 3520	Method OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3510 Method 3520	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3540 Method 3550	Method OLMO1.8	Not Applicable
Herbicides by GC	Water	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Low Boiling Petroleum Hydrocarbons by GC	Water	Not Applicable	Method 5030	Not Applicable	TN GRO Method
	Liquid	Not Applicable	Method 5030	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 5030	Not Applicable	TN GRO Method
High Boiling Petroleum Hydrocarbons by GC	Water	Not Applicable	Method 3510 Method 3520	Not Applicable	TN DRO Method
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable

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TABLE KN-4-6
KNOXVILLE LABORATORY
Organic Sample Preparation Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
High Boiling Petroleum Hydrocarbons by GC (continued)	Soil	Not Applicable	Method 3540 Method 3550	Not Applicable	TN DRO Method
Nitroaromatics by HPLC	Water	Not Applicable	Method 8330	Not Applicable	USATHAMA UW-11
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediments	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8330	Not Applicable	USATHAMA LW-06
Polynuclear Aromatic Hydrocarbons by HPLC	Water	Method 610	Method 3510 Method 3520	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable
Nitroaromatics by GC	Water	Method 609	Method 3510 Method 3520	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable
Organophosphorus Pesticides by GC	Water	Not Applicable	Method 3510 Method 3520	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable

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TABLE KN-4-6
KNOXVILLE LABORATORY
Organic Sample Preparation Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Organophosphorus Pesticides by GC (continued)	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable

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TABLE KN-4-7
KNOXVILLE LABORATORY
Organic Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Volatiles by GC/MS	Water	Method 624	Method 8240 & 8260	Method OLMO1.8 & OLV01.0	Method 524.2
	Liquid	Not Applicable	Method 8240	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8240	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8240	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8240 & 8260	Method OLM01.8	Not Applicable
Halogenated Volatiles by GC	Water	Method 601	Method 8010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8010	Not Applicable	Not Applicable
Aromatic Volatiles by GC	Water	Method 602	Method 8020	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8020	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8020	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8020	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8020	Not Applicable	Not Applicable
Semivolatiles by GC/MS	Water	Method 625	Method 8270	Method OLM01.8	Not Applicable
	Liquid	Not Applicable	Method 8270	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8270	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8270	Not Applicable	Not Applicable

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TABLE KN-4-7
KNOXVILLE LABORATORY
Organic Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Semivolatiles by GC/MS (continued)	Soil	Not Applicable	Method 8270	Method OLM01.8	Not Applicable
Pesticides/ PCBs by GC	Water	Method 608	Method 8080	Method OLM01.8	Not Applicable
	Liquid	Not Applicable	Method 8080	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8080	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8080	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8080	Method OLM01.8	Not Applicable
Herbicides by GC	Water	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Low Boiling Petroleum Hydrocarbons by GC	Water	Not Applicable	CA MOD. Method 8015	Not Applicable	TN GRO Method
	Liquid	Not Applicable	CA MOD. Method 8015	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids Sediment	Not Applicable	CA MOD. Method 8015	Not Applicable	Not Applicable
	Soil	Not Applicable	CA MOD. Method 8015	Not Applicable	TN GRO Method
High Boiling Petroleum Hydrocarbons by GC	Water	Not Applicable	CA MOD. Method 8015	Not Applicable	TN DRO Method
	Liquid	Not Applicable	CA MOD. Method 8015	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE KN-4-7
KNOXVILLE LABORATORY
Organic Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
High Boiling Petroleum Hydrocarbons by GC (continued)	Domestic Waste, Industrial Waste Sludge, Solids, Sediment	Not Applicable	CA MOD. Method 8015	Not Applicable	Not Applicable
	Soil	Not Applicable	CA MOD. Method 8015	Not Applicable	TN DRO Method
Nitroaromatics by HPLC	Water	Not Applicable	Method 8330	Not Applicable	USATHAMA UW-11
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8330	Not Applicable	USATHAMA LW-06
Polynuclear Aromatic Hydrocarbons by HPLC	Water	Method 610	Method 8310	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8310	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8310	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8310	Not Applicable	Not Applicable
Nitroaromatics by GC	Water	Method 609	Method 8090	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8090	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8090	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8090	Not Applicable	Not Applicable
Organophosphorus Pesticides by GC	Water	Not Applicable	Method 8141	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8141	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable

TABLE KN-4-7
KNOXVILLE LABORATORY
Organic Methods
(continued)

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Organophosphorus Pesticides by GC (continued)	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8141	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8141	Not Applicable	Not Applicable

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APPENDIX

KNOXVILLE - 5

PRACTICAL QUANTITATION LIMITS

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TABLE KN-5-1
KNOXVILLE LABORATORY
Practical Quantitation Limits for Wet Chemistry

Parameter	Method	Water PQL (mg/l except as noted)	Soil PQL (mg/kg)
Acidity	305.2	1	Not Applicable
Alkalinity	310.1	1	Not Applicable
Ammonia	350.2	0.1	5
BOD	405.1	1	Not Applicable
COD	HACH	1	Not Applicable
Bromide	300.0	0.4	0.4
Chloride	325.3 300.0	0.5 0.4	5.0 0.4
Chlorine, Total Residual	HACH	0.1	Not Applicable
Conductivity	120.1	1 umhos/cm	Not Applicable
Cyanide	335.2/9010/ILMO1.0	0.01	1
Cyanide, amenable	335.1/9010	0.01	Not Applicable
Dissolved Oxygen	360.1	1	Not Applicable
Fluoride	340.2 300.0	0.1 0.4	10 0.4
Hardness	SM 314A	0.2	Not Applicable
Nitrate	353.2 300.0	0.02 0.4	Not Applicable 0.4
Nitrate/Nitrite	353.2	0.02	3
Nitrite	353.2 300.0	0.02 0.4	Not Applicable
TKN	351.3	0.1	5
Oil & Grease	413.1/9070/9071	1	50
Orthophosphate	365.3 300.0	0.01 1.0	1 1.0
pH	150.1/9040/9045	0.01 Standard Units	0.01 Standard Units
Phenols	420.2/9065	0.02	1
Sulfate	375.4/9038 300.0	10 1.5	Not Applicable 1.5
Sulfide	376.1/9030	0.2	20
Sulfite	377.1	0.5	20
Total Dissolved Solids	160.1	1	Not Applicable
Total Settleable Solids	160.5	0.1 ml/liter	Not Applicable

Parameter	Method	Water PQL (mg/l except as noted)	Soil PQL (mg/kg)
Acidity	305.2	1	Not Applicable
Total Solids	160.3	1	Not Applicable
Total Suspended Solids	160.2	1	Not Applicable
Total Volatile Solids	160.4	1	Not Applicable
TOC/DOC	415.1/9060	1	1
Turbidity	180.1	0.1 NTU	Not Applicable

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TABLE KN-5-2
KNOXVILLE LABORATORY
ICAP Metals
Contract Required Detection Limits (CRDL)[1],
Method Detection Limits (MDL)[2],
and Practical Quantitation Limits (PQL)[3]

Element	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (mg/Kg)	Water MDL (ug/L)	Soil MDL[4] (mg/Kg)	Water PQL (ug/L)	Soil PQL[4] (mg/Kg)
Aluminum	7429-90-5	200	40	21		40	8
Antimony	7440-36-0	60	12	7.4		30	6
Arsenic	7440-38-2	10	2	18		30	6
Barium	7440-39-3	200	40	0.4		2	0.4
Beryllium	7440-41-7	5	1	0.2		1	0.2
Boron	7440-42-8			6.6		10	2
Cadmium	7440-43-9	5	1	1.5		5	1
Calcium	7440-70-2	5000	1000	19		30	6
Chromium	7440-47-3	10	2	3.6		10	2
Cobalt	7440-48-4	50	10	4.6		20	4
Copper	7440-50-8	25	5	2.6		10	2
Iron	7439-89-6	100	20	2.4		10	2
Lead	7439-92-1	3	0.6	12		30	6
Lithium	7439-93-2			4.0		5	20
Magnesium	7439-95-4	5000	1000	24		30	6
Manganese	7439-96-5	15	3	0.5		2	0.4
Molybdenum	7439-98-7			5.2		10	2
Nickel	7440-02-0	40	8	4.2		20	4
Potassium	7440-09-7	5000	1000	630		1000	200
Selenium	7782-49-2	5	1	40		60	12
Silicon	7440-21-3			15		20	2
Silver	7440-22-4	10	2	3.8		5	1
Sodium	7440-22-4	5000	1000	30		200	40
Strontium	7440-24-6			0.2		1	0.2
Thallium	7440-28-0	10	2	27		3	6
Tin	7440-31-5					20	4
Titanium	7440-32-6			1.5		3	0.6

TABLE KN-5-2
KNOXVILLE LABORATORY
ICAP Metals
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Element	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (mg/Kg)	Water MDL (ug/L)	Soil MDL[4] (mg/Kg)	Water PQL (ug/L)	Soil PQL[4] (mg/Kg)
Vanadium	7440-62-2	50	10	2.2		10	2
Zinc	*7440-66-6*	20	4	1.3		5	1

1 CRDLs apply to analyses performed in accordance with the USEPA CLP Statement of Work for Inorganics Analysis, Document Number ILMO1.0

2 The method detection limit study was performed on 12/02/92 using SW-846 method 6010.

3 PQLs were estimated from the results of water MDL determinations.

4 Soil detection limits are based on wet weight of sample and will be higher when converted to a dry weight basis.

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TABLE KN-5-3
KNOXVILLE LABORATORY
AA Metals
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Element	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (mg/Kg)	Water MDL (ug/L)	Soil MDL[4] (mg/Kg)	Water PQL (ug/L)	Soil PQL[4] (mg/Kg)
Antimony	7440-36-0	60	12	4.5	0.36	6	0.6
Arsenic	7440-38-2	10	2	1.7	0.091	3	0.3
Cadmium	7440-43-9	5	1			0.2	0.6
Chromium	7440-47-3	10	2			3	0.6
Lead	7439-92-1	3	0.6	1.9	0.098	3	0.3
Nickel	7440-02-0	40	8			3	
Selenium	7782-49-2	5	1	0.50	0.023	3	0.3
Silver	7440-22-4	10	2	6.4	0.64	8	0.8
Thallium	7440-28-0	10	2	2.38	0.204	3	0.3
Mercury[5]	7439-97-6	0.2	0.1	0.175	0.013	0.2	0.1

[1] CRDLs apply to analyses performed in accordance with the USEPA CLP Statement of Work, Document Number ILM01.0.

[2] Method detection limit studies were performed during 10/92 - 11/92 using SW-846 7000 series methodology.

[3] PQLs were estimated from the results of water MDL determinations.

[4] Soil detection limits are based on wet weight of sample and will be higher when converted to a dry weight basis.

[5] Mercury is analyzed by cold vapor AA; all other elements are analyzed by graphite furnace AA.

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TABLE KN-5-4
KNOXVILLE LABORATORY
Volatile Organics
Contract Required Detection Limits (CRDL)[1],
Method Detection Limits (MDL)[2] and
Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/Kg)
Chloromethane	74-87-3	10	10	2.9		10	10
Bromomethane	74-83-9	10	10	2.6		10	10
Vinyl Chloride	75-01-4	10	10	3.1		10	10
Chloroethane	75-00-3	10	10	3.0		10	10
Methylene Chloride	75-09-2	10	10	3.1		5	5
Acetone	67-64-1	10	10	6.5		100	100
Carbon Disulfide	75-15-0	10	10	2.7		5	5
1,1-Dichloroethene	75-35-4	10	10	3.3		5	5
1,1-Dichloroethane	75-34-3	10	10	3.2		5	5
1,2-Dichloroethene (total)	540-59-0	10	10	3.4		5	5
Chloroform	67-66-3	10	10	3.1		5	5
1,2-Dichloroethane	107-06-2	10	10	3.4		5	5
2-Butanone	78-93-3	10	10	7.5		100	100
1,1,1-Trichloroethane	71-55-6	10	10	3.3		5	5
Carbon Tetrachloride	56-23-5	10	10	3.0		5	5
Vinyl Acetate		NA	NA	3.5		50	50
Bromodichloromethane	75-27-4	10	10	4.1		5	5
1,2-Dichloropropane	78-87-5	10	10	3.4		5	5
cis-1,3-Dichloropropene	10061-01-5	10	10	3.6		5	5
2-chloroethylvinylether	110-75-8	NA	NA	6.6		10	10
Trichloroethene	79-01-6	10	10	3.7		5	5
Dibromochloromethane	124-48-1	10	10	4.1		5	5
1,1,2-Trichloroethane	79-00-5	10	10	3.9		5	5
Benzene	71-43-2	10	10	3.0		5	5
trans-1,3-Dichloropropene	10061-02-6	10	10	5.7		5	5
Bromoform	75-25-2	10	10	3.7		5	5
4-Methyl-2-Pentanone	108-10-1	10	10	5.1		50	50

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TABLE KN-5-4
KNOXVILLE LABORATORY
Volatile Organics
Contract Required Detection Limits (CRDL)[1],
Method Detection Limits (MDL)[2] and
Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/Kg)
2-Hexanone	591-78-6	10	10	5.8		50	50
Tetrachloroethene	127-18-4	10	10	2.9		5	5
Toluene	108-88-3	10	10	3.6		5	5
1,1,2,2-Tetrachloroethane	79-34-5	10	10	3.6		5	5
Chlorobenzene	108-90-7	10	10	3.0		5	5
Ethylbenzene	100-41-4	10	10	3.0		5	5
Styrene	100-42-5	10	10	3.4		5	5
Xylene (total)	1330-20-7	10	10	3.2		5	5
Acrolein	107-02-8	10	10	7.9		10	10
Acrylonitrile	107-13-1	10	10	4.5		10	10
cis-1,2-Dichloroethene	156-59-2	10	10	2.8		10	10
Trichlorofluoromethane	75-69-4	10	10	3.5		10	10

[1] CRDLs apply to analyses performed in accordance with the USEPA CLP Statement of Work for Inorganics Analysis, Document Number OLMO1.8.

[2] The Method Detection Limit study for water was performed on 5/14/93 using SW-846 method 8240.

[3] Practical Quantitation Limits are taken from SW-846 Method 8240.

[4] Quantitation limits listed for soil are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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TABLE KN-5-5
KNOXVILLE LABORATORY
Semivolatile Organics
Contract Required Detection Limits (CRDL)[1],
Method Detection Limits (MDL)[2], and
Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/kg)
Phenol	108-95-2	10	330	0.9		10	330
bis(2-Chloroethyl)ether	111-44-4	10	330	1.1		10	330
2-Chlorophenol	95-57-8	10	330	1.8		10	330
1.3-Dichlorobenzene	541-73-1	10	330	1.9		10	330
1,4-Dichlorobenzene	106-46-7	10	330	2.1		10	330
Benzyl Alcohol	100-51-6	NA	NA	2.5		20	670
1,2-Dichlorobenzene	95-50-1	10	330	1.7		10	330
2-Methylphenol	95-48-7	10	330	1.7		10	330
bis(2-chloroisopropyl)ether	108-60-1	10	330	1.2		10	330
4-Methylphenol	106-44-5	10	330	4.3		10	330
n-Nitroso-di-n-Propylamine	621-64-7	10	330	1.8		10	330
Hexachloroethane	67-72-1	10	330	2.2		10	330
Nitrobenzene	98-95-1	10	330	0.9		10	330
Isophorone	78-59-1	10	330	1.1		10	330
2-Nitrophenol	88-75-5	10	330	1.6		10	330
2,4-Dimethylphenol	105-67-9	10	330	1.9		10	330
Benzoic Acid	65-85-0	NA	NA			50	1600
bis(2-Chloroethoxy) Methane	111-91-1	10	330	1.2		10	330
2,4-Dichlorophenol	120-83-2	10	330	1.7		10	330
1,2,4-Trichlorobenzene	120-82-1	10	330	2.3		10	330
Naphthalene	91-20-3	10	330	1.1		10	330
4-Chloroaniline	106-47-8	10	330	1.8		20	670
Hexachlorobutadiene	87-68-3	10	330	2.3		10	330
4-Chloro-3-Methylphenol	59-50-7	10	330	1.8		20	670
2-Methylnaphthalene	91-57-6	10	330	2.1		10	330
Hexachlorocyclopentadiene	77-47-4	10	330	1.9		10	330
2,4,6-Trichlorophenol	88-06-2	10	330	1.7		10	330
2,4,5-Trichlorophenol	95-95-4	25	800	1.3		10	330

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TABLE KN-5-5
KNOXVILLE LABORATORY
Semivolatile Organics
Contract Required Detection Limits (CRDL)[1],
Method Detection Limits (MDL)[2], and
Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/kg)
2-Chloronaphthalene	91-58-7	10	330	1.1		10	330
2-Nitroaniline	88-74-4	25	800	1.4		50	1600
Dimethyl Phthalate	131-11-3	10	330	3.2		10	330
Acenaphthylene	208-96-8	10	330	1.4		10	330
2,6-Dinitrotoluene	606-20-2	10	330	1.2		10	330
3-Nitroaniline	99-09-2	25	800	1.6		50	1600
Acenaphthene	83-32-9	10	330	1.5		10	330
2,4-Dinitrophenol	51-28-5	25	800	2.7		50	1600
4-Nitrophenol	100-02-7	25	800	1.4		50	1600
Dibenzofuran	132-64-9	10	330	1.0		10	330
2,4-Dinitrotoluene	121-14-2	10	330	1.6		10	330
Diethylphthalate	84-66-2	10	330	4.4		10	330
4-Chlorophenyl-phenylether	7005-72-36	10	330	1.0		10	330
Fluorene	86-73-7	10	330	1.1		10	330
4-Nitroaniline	100-01-6	25	800	1.8		50	1600
4,6-Dinitro-2-Methylphenol	534-52-1	25	800	3.3		50	1600
n-Nitrosodiphenylamine	86-30-6	10	330	1.2		10	330
4-Bromophenyl-phenylether	101-55-3	10	330	1.2		10	330
Hexachlorobenzene	118-74-1	10	330	1.2		10	330
Pentachlorophenol	87-86-5	25	800	2.6		50	1600
Phenanthrene	85-01-8	10	330	1.1		10	330
Anthracene	120-12-7	10	330	1.1		10	330
Carbazole	86-74-8	10	330	NA		10	330
Di-n-Butylphthalate	84-74-2	10	330	3.4		10	330
Fluoranthene	206-44-0	10	330	1.1		10	330
Pyrene	129-00-0	10	330	1.4		10	330
Butylbenzylphthalate	85-68-7	10	330	3.0		10	330
3,3'-Dichlorobenzidine	91-94-1	10	330	1.6		20	670

TABLE KN-5-5
KNOXVILLE LABORATORY
Semivolatile Organics
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/kg)
Benzo(a)anthracene	56-55-3	10	330	1.1		10	330
Chrysene	218-01-9	10	330	0.8		10	330
bis(2-Ethylhexyl)phthalate	117-81-7	10	330	1.1		10	330
Di-n-Octylphthalate	117-84-0	10	330	1.3		10	330
Benzo(b)fluoranthene	205-99-2	10	330	2.0		10	330
Benzo(k)fluoranthene	207-08-9	10	330	1.8		10	330
Benzo(a)pyrene	50-32-8	10	330	1.3		10	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	330	1.3		10	330
Dibenzo(a,h)anthracene	53-70-3	10	330	1.2		10	330
Benzo(g,h,i)perylene	191-24-2	10	330	1.2		10	330
1,2-Diphenylhydrazine	122-66-7			1.1			
Aniline	62-53-3			2.2			

1 CRDLs apply to analyses performed in accordance with the USEPA CLP Statement of Work for Organics Analysis, Document Number OLMO1.8.

2 The Method Detection Limit for water was performed by SW-846 Method 8270 on 1-19-93.

3 Practical Quantitation Limits are taken from SW-846 Method 8270; soil detection limits are based on wet weight, and are the same with and without GPC cleanup.

4 Quantitation limits listed are for low soil procedure, and are based on wet weight. The quantitation limits based on dry weight as required, will be higher. The quantitation limits for medium level soil procedures will be higher by a factor of 30 than the low soil limits.

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TABLE KN-5-6
KNOXVILLE LABORATORY
Pesticides and PCBs
Contract Required Detection Limits (CRDL)[1],
Method Detection Limits (MDL)[2], and
Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/Kg)
α-BHC	319-84-6	0.05	1.7	0.0005		0.03	2
β-BHC	319-85-7	0.05	1.7	0.0025		0.06	4
δ-BHC	319-86-8	0.05	1.7	0.0054		0.09	6
γ-BHC (Lindane)	58-89-9	0.05	1.7	0.0007		0.04	3
Heptachlor	76-44-8	0.05	1.7	0.0017		0.03	2
Aldrin	309-00-2	0.05	1.7	0.0018		0.04	2
Heptachlor Epoxide	1024-57-3	0.05	1.7	0.0023		0.8	60
Endosulfan I	959-98-8	0.05	1.7	0.0041		0.1	9
Dieldrin	60-57-1	0.10	3.3	0.0016		0.02	2
4,4'-DDE	72-55-9	0.10	3.3	0.0013		0.04	2
Endrin	72-20-8	0.10	3.3	0.0038		0.06	4
Endosulfan II	33213-65-9	0.10	3.3	0.0035		0.04	2
4,4'-DDD	72-54-8	0.10	3.3	0.0020		0.1	8
Endosulfan sulfate	1031-07-8	0.10	3.3	0.0060		0.7	40
4,4'-DDT	50-29-3	0.10	3.3	0.0018		0.1	8
Methoxychlor	72-43-5	0.50	17.0	0.0091		2	120
Endrin Aldehyde	7421-93-4	0.10	3.3			0.2	16
Endrin Ketone	53494-70-5	0.10	3.3			NA	NA
α-Chlordane	5103-71-9	0.05	1.7			NA	NA
γ-Chlordane	5103-74-2	0.05	1.7			NA	NA
Chlordane (Tech)	57-74-9			0.013		0.1	9
Toxaphene	8001-35-2	5.0	170.0	0.43		2	160
Aroclor 1016	12674-11-2	1.0	33.0			0.6	40
Aroclor 1221	11104-28-2	2.0	67.0			0.6	40
Aroclor 1232	11141-16-5	1.0	33.0			0.6	40
Aroclor 1242	53469-21-9	1.0	33.0	0.041		0.6	40
Aroclor 1248	12672-29-6	0.50	33.0			0.6	40
Aroclor 1254	11097-69-1	1.0	33.0				90

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TABLE KN-5-6
KNOXVILLE LABORATORY
Pesticides and PCBs
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/Kg)
Aroclor 1260	11096-82-5	1.0	33.0			1	90

1 CRDLs apply to analyses performed in accordance with the USEPA Statement of Work for Organics Analysis, Document Number OLM01.8.

2 The Method Detection Limit studies for pesticides/PCBs were performed on 7/29/93 using SW-846 method 8080.

3 Practical Quantitation Limits are based on SW-846 method 8080.

4 Quantitation limits listed for soil are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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TABLE KN-5-7
KNOXVILLE LABORATORY
Explosives
Method Detection Limits (MDL)[1] and Practical Quantitation Limits (PQL)[2]

Analyte	CAS Number	Water MDL (ug/L)	Soil MDL (mg/kg)	Water PQL (ug/L)	Soil PQL (mg/kg)
HMX	2691-41-0	4.8		25	2.2
RDX	121-82-4	5.4		24	1.0
1,3,5-Trinitrobenzene	99-35-4	3.3		24	0.25
1,3-Dinitrobenzene	99-65-0	2.4		24	0.25
Tetryl	479-48-8	5.9		26	0.65
Nitrobenzene	98-95-3	1.0		28	0.26
2,4,6-Trinitrotoluene	118-96-7	0.0		24	0.26
2,4 and 2,6-Dinitrotoluene	121-14-2 and 606-20-2	9.4		25	0.25
2-Nitrotoluene	88-72-2	5.1		25	0.25
4-Nitrotoluene	99-99-0	15		24	0.25
3-Nitrotoluene	99-08-1	3.6		28	0.25

[1] The Method Detection Limit study was performed on 11/20/93 using SW-846 method 8330.

[2] Practical Quantitation Limits are based on SW-846 method 8330.

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TABLE KN-5-8
KNOXVILLE LABORATORY
Aromatic Volatiles/Low Boiling Petroleum Hydrocarbons by GC
Method Detection Limits (MDL)[1], and
Practical Quantitation Limits (PQL)

Analyte	CAS Number	Water MDL (ug/L)	Soil MDL (mg/Kg)	Water PQL (ug/L)	Soil PQL (mg/Kg)
Benzene	71-43-2	0.12	0.01	1	0.1
Chlorobenzene	108-90-7	0.04	0.01	1	0.1
1,4-Dichlorobenzene	106-46-7	0.05	0.01	1	0.1
1,3-Dichlorobenzene	541-73-1	0.05	0.01	1	0.1
1,2-Dichlorobenzene	95-50-1	0.05	0.01	1	0.1
Ethylbenzene	100-41-4	0.04	0.01	1	0.1
Toluene	108-88-3	0.10	0.02	1	0.1
m,p-Xylene		0.11	0.05	1	0.1
o-Xylene	95-47-6	0.06	0.02	1	0.1
Methyl-*tert*-butyl ether		0.12	0.02	1	0.1
Low Boiling Petroleum Hydrocarbons		7.6	1.7	50	5.0

[1] MDLs were determined on 1/6/93 for water and on 1/7/93 for soil samples using SW-846 methods 8020/CA MOD. 8015 in series.

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TABLE KN-5-9
KNOXVILLE LABORATORY
Polynuclear Aromatic Hydrocarbons by HPLC
Method Detection Limits (MDL)[1], and
Practical Quantitation Limits (PQL)[2]

Analyte	CAS Number	Water MDL (µg/L)	Soil MDL (µg/kg)	Water PQL (µg/L)	Soil PQL (µg/kg)
Naphthalene	91-20-3	0.016		0.16	16
Acenaphthylene	208-96-8	0.015		0.16	16
Acenaphthene	83-32-9	0.015		0.16	16
Fluorene	86-73-7	0.015		0.080	8.0
Phenanthrene	85-01-8	0.014		0.080	8.0
Anthracene	120-12-7	0.018		0.080	8.0
Fluoranthene	206-44-0	0.031		0.080	8.0
Pyrene	129-00-0	0.022		0.080	8.0
Benzo(a)anthracene	56-55-3	0.013		0.080	8.0
Chrysene	218-01-9	0.018		0.080	8.0
Benzo(b)fluoranthene	205-99-2	0.012		0.080	8.0
Benzo(k)fluoranthene	207-08-9	0.015		0.080	8.0
Benzo(a)pyrene	50-32-8	0.012		0.080	8.0
Dibenzo(ah)anthracene	53-70-3	0.023		0.080	8.0
Benzo(ghi)perylene	191-24-2	0.033		0.080	8.0
Indeno(123-cd)pyrene	193-39-5	0.037		0.080	8.0

[1] MDLs were determined on 9/16/93 for waters using SW-846 method 8310.

[2] PQLs are based on SW-846 method 8310.

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TABLE KN-5-10
KNOXVILLE LABORATORY
Total High Boiling Petroleum Hydrocarbons
Method Detection Limits (MDL)[1]
and Practical Quantitation Limits (PQL)

Analyte	CAS Number	Water MDL (ug/L)	Soil MDL (mg/kg)	Water PQL (ug/L)	Soil PQL (mg/kg)
Total high boiling petroleum hydrocarbons, as compared to diesel fuel		19		50	5

[1] The Method Detection Limit study was performed on 1/9/93 using CA MOD. method 8015.

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TABLE KN-5-11
KNOXVILLE LABORATORY
Halogenated and Aromatic Volatiles by GC
Method Detection Limits $(MDL)_1$
and Practical Quantitation Limits $(PQL)_2$

Analyte	CAS Number	Water MDL (ug/L)	Soil MDL (µg/kg)	Water PQL (ug/L)	Soil PQL (µg/kg)
Dichlorodifluoromethane	75-71-8	0.50		1.8	1.8
Chloromethane	74-87-3	0.26		0.8	0.8
Vinyl chloride	75-01-4	0.37		1.8	1.8
Bromomethane	74-83-9	0.31		1.2	1.2
Chloroethane	75-00-3	0.34		5.2	5.2
Trichlorofluoromethane	75-69-4	0.47		2.0	2.0
1,1-Dichloroethene	75-35-4	0.20		1.3	1.3
Methylene Chloride	75-09-2	1.3		15	15
trans-1,2-Dichloroethene	156-60-5	0.09		1.0	1.0
1,1-Dichloroethene	75-34-3	0.09		0.7	0.7
cis-1,2-Dichloroethene	156-59-2	0.10		1.0	1.0
Trichloromethane	67-66-3	0.06		0.5	0.5
1,1,1-Trichloroethane	71-55-6	0.14		0.3	0.3
Carbon Tetrachloride	56-23-5	0.14		1.2	1.2
Benzene	71-43-2	0.10		2.0	2.0
1,2-Dichloroethane	107-06-2	0.09		0.3	0.3
Trichloroethene	79-01-6	0.14		1.2	1.2
1,2-Dichloropropane	78-87-5	0.06		0.4	0.4
Bromodichloromethane	75-27-4	0.05		1.0	1.0
Dibromomethane	74-95-3			2.0	2.0
2-Chloroethylvinyl Ether	110-75-8	0.21		1.3	1.3
cis-1,3-Dichloropropene	10061-01-5	0.04		3.4	3.4
Toluene	108-88-3	0.08		2.0	2.0
trans-1,3-Dichloropropene	10061-01-5	0.05		3.4	3.4
1,1,2-Trichloroethane	79-00-5	0.09		0.2	0.2
Tetrachloroethene	127-18-4	0.16		0.3	0.3
Dibromochloromethane	124-48-1	0.12		0.9	0.9

TABLE KN-5-11
KNOXVILLE LABORATORY
Halogenated and Aromatic Volatiles by GC
Method Detection Limits (MDL)[1] and Practical Quantitation Limits (PQL)[2]
(continued)

Analyte	CAS Number	Water MDL (ug/L)	Soil MDL (µg/kg)	Water PQL (ug/L)	Soil PQL (µg/kg)
Dichlorodifluoromethane	75-71-8	0.50		1.8	1.8
n-Hexyl Chloride	544-10-8			1.0	1.0
Chlorobenzene	108-90-7	0.07		2.0	2.0
Ethyl Benzene	100-41-4	0.11		2.0	2.0
1,1,1,2-Tetrachloroethane	630-20-6			0.3	0.3
Xylenes (total)	1330-20-7	0.10		1.0	1.0
Bromoform	75-25-2	0.11		2.0	2.0
1,1,2,2-Tetrachloroethane	79-34-5	0.16		0.3	0.3
1,2,3-Trichloropropane	96-18-4	0.16		1.0	1.0
Phenyl Bromide (Bromobenzene)	108-86-1			2.0	2.0
2-Chlorotoluene	108-41-8			1.0	1.0
1,3-Dichlorobenzene	541-73-1	0.06		3.2	3.2
1,4-Dichlorobenzene	106-46-7	0.09		2.4	2.4
1,2-Dichlorobenzene	95-50-1	0.07		1.5	1.5
bis(2-Chloroisopropyl) ether	108-60-1			20	20

[1] The Method Detection Limit Study was performed on 12/11/92 using SW-846 methods 8010 and 8020 in series.

[2] Practical quantitation limits are based on SW-846 methods 8010 and 8020.

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APPENDIX

KNOXVILLE - 6

PERFORMANCE EVALUATION SAMPLE STUDIES

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TABLE 6-1
KNOXVILLE LABORATORY
Performance Evaluation Sample Studies

PE Sample Program Description	Analysis Performed	Frequency of Participation
US EPA Water Supply Study	Res. Cl, SO_4, Turbidity, Anions, PAH by 8310, VOC, THM, Pesticides, Herbicides, Corrosivity, Sodium, Trace Metals, Cyanide (CN).	Semiannual
US EPA Water Pollution Study	Trace Metals, Minerals, Nutrient, Demand, PCBs, Chlorinated Hydrocarbon, Pesticides, Volatile Halocarbons, Volatile Aromatics, Total CN, TSS, Oil and Grease, Phenols, Res. Cl.	Semiannual
US EPA Contract Laboratory Program - Organics	CLP Organics	Quarterly
US Army Corps of Engineers	Explosives, Volatile Organics, Halogenated VOAs, Aromatic VOAs, Semivolatile Organics, Pesticides, PCBs, PP and RCRA Metals, TOC, CN, Anions, Herbicides.	Biennial
New York State Potable and Non Potable Water Studies	Refer to EPA WS and WP analyses.	Semiannual
State of North Carolina Department of Human Resources	MBAS, Turbidity, COD, Semivolatile Organics.	Annual

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APPENDIX

KNOXVILLE - 7

PREVENTIVE MAINTENANCE SCHEDULES

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TABLE 7-1
KNOXVILLE LABORATORY
Maintenance Schedule

Graphite Furnace Atomic Absorption[1]			
Daily	**Monthly**	**Semi-annually**	**Annually**
Clean Optical Windows	Check coolant level in cooling unit. Add coolant if error message appears	Replace contact cylinders	Notify repairman to perform cleaning of optics
Clean contact cylinders			
Check tubes and platform, replace if corroded, flaking, or if low absorbance results			

[1] Refer to manufacturer's instructions for each instrument to perform maintenance operations

TABLE 7-2
KNOXVILLE LABORATORY
Maintenance Schedule

ICP[1]		
Daily	**Monthly**	**Semi-annually**
Check the pump winding, replace if needed.	Clean intelligence controller filters	Change vacuum pump oil
	Check and clean nebulizer, mixing chamber and torch.	
	Check the pump capillary tubing, clean or replace if needed.	
	Clean optical path windows	
	Clean RF generator filters	

[1] Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE 7-3
KNOXVILLE LABORATORY
Maintenance Schedule

High Pressure Liquid Chromatography[1]
As Needed
Column change: Columns are replaced when peak shape and resolution indicate that the chromatographic performance of the column is below method requirements.
Filters are cleaned every time a column change takes place.
The slides on the auto sampler are oiled when the sample does not advance as required.
[1] refer to the manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE 7-4
KNOXVILLE LABORATORY
Maintenance Schedule

Ion Chromatography[1]				
As Needed	**Daily**	**Weekly**	**Monthly**	**Semi-annually**
Clean micromembrane suppressor when decreases in sensitivity are observed	Check plumbing	Check pump heads for leaks	Clean conductivity cell	Replace gradient pump piston seal
Change fuses when power problems occur	Check UV/VIS detector for leaks	Check filter (inlet)	Check conductivity cell for calibration	Clean high pressure valve
Change column when peak shape and resolution deteriorate or when retention time shortening indicates that exchange sites have become deactivated.			Check all air and liquid lines for discoloration and crimping, if indicated.	
Degas pump head when flow is erratic				

[1] Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE 7-5
KNOXVILLE LABORATORY
Maintenance Schedule

Total Organic Halide Analyzer[1]		
Daily	**Weekly**	**Monthly**
Check exit tube and quartz wool.	Change quartz wool in inlet liner and exit tube.	Examine and clean pyrolysis tube.
Check for gas bubbles in titration sidearm.	Measure gas flow.	Clean titration cell.
Check inlet area for GAC spills	Perform cell performance check.	Perform electronic test.
Check electrolyte level, add if needed		Check o-rings, replace if worn.
Clean quartz boat.		

[1] Refer to manufacturer's instructions for each instrument to perform maintenance operations.

TABLE 7-6
KNOXVILLE LABORATORY
Maintenance Schedule

Total Organic Carbon Analyzer[1]			
Daily	**Weekly**	**Bi-monthly**	**Monthly**
Check oxygen supply	Check liquid-flow-rate-pump-tubing conditions	Change pump tubing	Change Sn and Cu.
Check persulfate supply	Check for moisture in LiOH tube.		
Check acid supply	Check injection port septum.		
Check printer paper.			
Check Sn and Cu scrubber			
Add a few drops of H_3PO_4 to GLS.			
Check carrier gas flow rate (≈ 200 cc/min).			

[1] Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE 7-7
KNOXVILLE LABORATORY
Maintenance Schedule

Gas Chromatography[1]	
As Needed	**Semi-annually**
Replace front portion of column packing or break off front portion of capillary columns. Replace column if this action fails to restore performance of the column or when column performance (*e.g.* peak tailing, poor resolution, high backgrounds, etc.) indicates it is required.	Perform ECD wipe test.
Change glass wool plug in injection port and/or replace injection port liner with cleaned liner when front portion of column packing is changed or front portion of capillary column is removed.	Replace carbon filters at instrument effluent sites.
Replace septum (usually approximately every 100 injections).	
Perform gas purity check (if high baseline indicates that impure carrier gas may be in use).	
replace or repair flow controller if constant gas flow cannot be maintained.	
Change fuse when performance indicates fuse has blown.	
Reactivate external carrier gas dryers when blue indicator changes to pink.	
Clean detectors when baseline indicates contamination or when response is low.	
Reactivate flow controller filter dryers when presence of moisture is suspected.	
Tekmar purge and trap devices: replace traps and columns when poor response or disappearance of reactive or poorly trapped compounds.	

[1] Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE 7-8
KNOXVILLE LABORATORY
Maintenance Schedule

Mass Spectrometers[1]			
Instrument	**As Needed**	**Monthly**	**Annually**
Mass Spectrometer	Check level of oil in mechanical pumps and diffusion pump if vacuum is insufficient. Add oil if needed between service contract maintenance.	Not Applicable	Not Applicable
	Electron multiplier: replace when the tuning voltage approaches the maximum and/or when sensitivity falls below required levels.		
	Clean Source, including all ceramics and lenses - the source cleaning is indicated by a variety of symptoms including inability of the analyst to tune the instrument to specifications, poor response, and high background contamination.		
Neslab Chiller	Check coolant level. Add coolant as required to maintain cooling.	Vacuum outside chiller to prevent dust from clogging filters	Clean on-line filter in Neslab

[1] Refer to manufacturer's instructions for each instrument to perform maintenance operations

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APPENDIX

KNOXVILLE - 8

ADDITIONAL OPERATION-SPECIFIC INFORMATION

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Operation-Specific
QUALITY ASSURANCE MANAGEMENT PLAN
IT ANALYTICAL SERVICES DIVISION

OAK RIDGE LABORATORY
APPENDIX

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APPENDIX

OAK RIDGE-0

LISTS OF APPENDIX SECTIONS, TABLES, AND FIGURES

LIST OF APPENDIX SECTIONS

SECTION NO.	CONTENTS	COVER PAGE
Oak Ridge - 0	Lists of Appendix Sections, Tables, and Figures	3
Oak Ridge - 1	Organizational Chart	7
Oak Ridge - 2	Instrument List	9
Oak Ridge - 3	Standard Operating Procedure List	13
Oak Ridge - 4	Analytical Methods	21
Oak Ridge - 5	Method Detection Limits and Practical Quantitation Limits	55
Oak Ridge - 6	Performance Evaluation Studies	69
Oak Ridge - 7	Preventive Maintenance Schedules	71
Oak Ridge - 8	Additional Operation-Specific Information	81

9413282.0582

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
OR-1-1	Organizational Chart	8
OR-5-1	Radiochemical Method Detection Limit Determinations	67

LIST OF TABLES

TABLE NO.	TITLE	PAGE
OR-2-1	Instrument List	10
OR-3-1	Standard Operating Procedure (SOP) List	14
OR-4-1	Inorganic Sample Preparation Methods	22
OR-4-2	Metals Sample Preparation Methods	33
OR-4-3	Organic Sample Preparation Methods	35
OR-4-4	Inductively Coupled Plasma Emission Spectroscopy Methods	37
OR-4-5	Flame Atomic Absorption Inorganic Methods	45
OR-4-6	Graphite Furnace Atomic Absorption Methods	46
OR-4-7	Cold Vapor Atomic Absorption Methods	48
OR-4-8	Organic Methods	49
OR-4-9	Radiological Methods	51
OR-5-1	Method Detection Limits for Wet Chemistry	56
OR-5-2	ICAP Metals: Contract Required Detection Limits (CRDL), Contract Laboratory Program (CLP), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	57
OR-5-3	GFAA Metals: Contract Required Detection Limits (CRDL), Contract Laboratory Program (CLP), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	59
OR-5-4	CLP or Hazardous Substance List for Volatile Organics with Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	60
OR-5-5	CLP or Hazardous Substance List for Semivolatile Organics with Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	62
OR-5-6	CLP (3/90) or Hazardous Substance List for Pesticides and PCBs with Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	65
OR-6-1	Performance Evaluation Studies	70
OR-7-1	Maintenance Schedule for Gas Chromatograph	72
OR-7-2	Maintenance Schedule for Gas Chromatograph/Mass Spectrometer (GC/MS)	73
OR-7-3	Maintenance Schedule for Mass Spectrometers	74
OR-7-4	Maintenance Schedule for Graphite Furnace Atomic Absorption	75
OR-7-5	Maintenance Schedule for Ion Chromatograph	76
OR-7-6	Maintenance Schedule for ICP	77
OR-7-7	Maintenance Schedule for Total Organic Carbon Analyzer	78
OR-7-8	Maintenance Schedule for Total Organic Halide Analyzer	79
OR-7-9	Maintenance Schedule for Radiological Analysis Equipment	80
OR-8-1	Summary of Radiological Instrument Calibrations	82
OR-8-2	Kinetic Phosphorescent Analyzer Calibrations	83

9413282.0583

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APPENDIX

OAK RIDGE-1

ORGANIZATIONAL CHART

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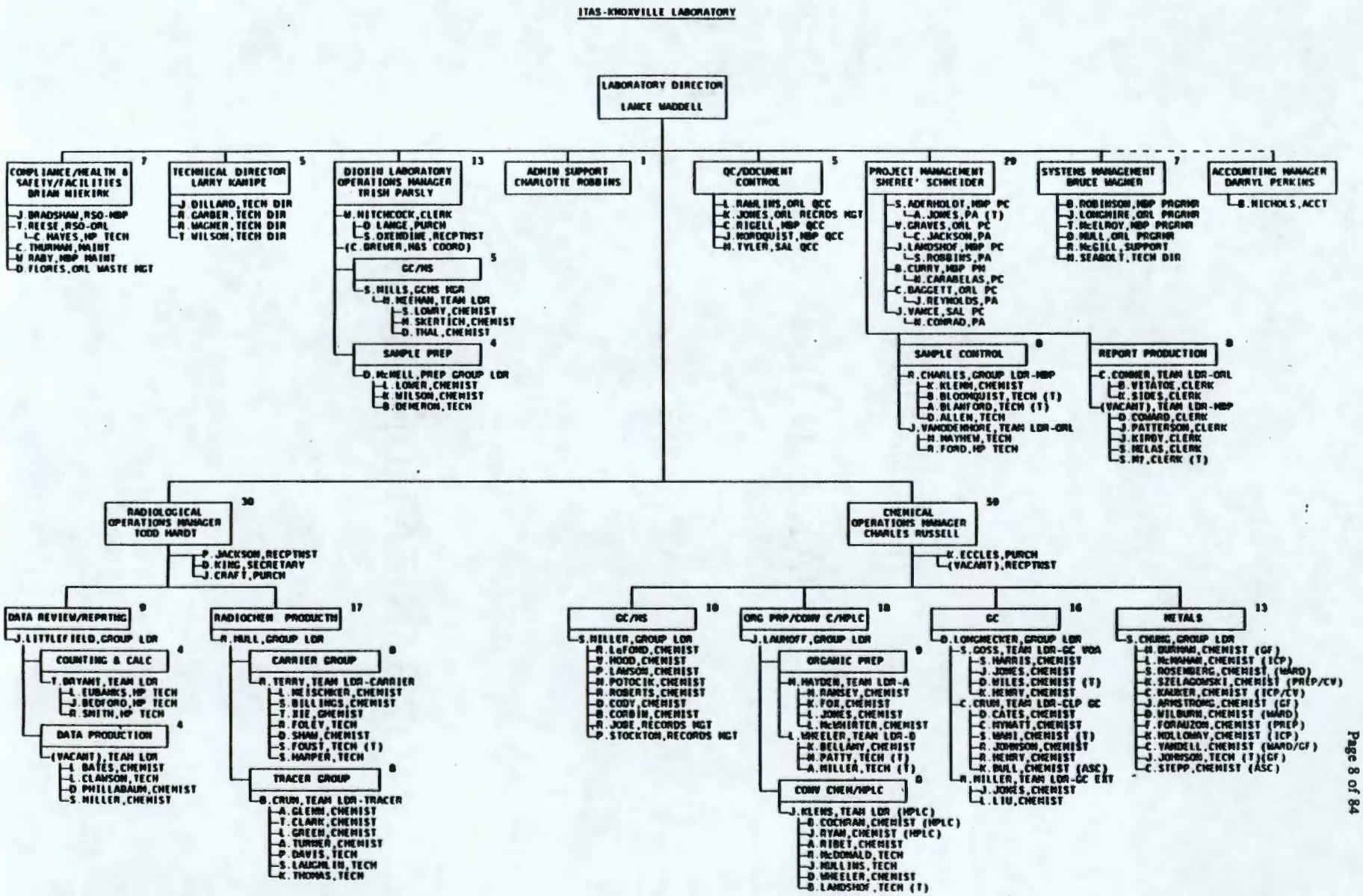
FIGURE OR-1-1



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APPENDIX

OAK RIDGE-2

INSTRUMENT LIST

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TABLE OR-2-1
ITAS-OAK RIDGE LABORATORY
Instrument List
May 10, 1993

Instrument Type	Manufacturer	Model	Autosampler	Age
Gas Chromatograph/Mass Spectrometer	VG	Trio 1	HP 7673A	4
	Finnigan MAT	20/30	Tekmar	10+
	Finnigan MAT	20/30	Tekmar	5
	Hewlett Packard	5890/5970	HP 7673A	5
	Hewlett Packard	5890/5970	HP 7673A	5
Gas Chromatograph	Shimadzu	9A Dual ECD		11
	Shimadzu	9A FID, ECD		7
	Hewlett Packard	5890A Dual EC	HP 7673A	7
	Hewlett Packard	5890A Dual EC	HP 7673A	5
	Hewlett Packard	5890A HP, FID	HP 7673A	5
ICP Emission Spectrometer	Thermo Jarrell Ash (simultaneous)	61		5
	Perkin Elmer (sequential)	Plasma 2		8
Atomic Absorption Spectrophotometer	Perkin Elmer	5100		4
	Perkin Elmer	5100		4
	Thermo Jarrell Ash	Smith-Hieftje 22		5
	Buck Scientific	400		6
Ion Chromatograph	Waters	ICM-001012	Waters WISP	4
IR Spectrophotometer	Mattson	GL-2020		3
LACHET Spectrophotometer	Lachet	1300-0000		4
TOX Analyzer	Dohrmann-Envirotech	DX-20		4
TOC Analyzer	Dohrmann	DC-80		7
UV/VIS Spectrophotometer	Sequoia-Turner	340		9
Laser Fluorometer	Chemchek	KPA-10		5
Gamma Analysis System	Nuclear Data	9900		6
Germanium Gamma Detector	Tennelec	CNVDs30		6

TABLE OR-2-1
ITAS-OAK RIDGE LABORATORY
Instrument List
May 10, 1993
(continued)

Instrument Type	Manufacturer	Model	Autosampler	Age
Germanium Gamma Detector	Tennelec	CNVDs30		6
Germanium Gamma Detector	Tennelec	CNVDs30		6
Germanium Gamma Detector	Tennelec	CNVDs30		6
Germanium Gamma Detector	Tennelec	CNVDs30		6
Germanium Gamma Detector	GEM-20200	Ortec		6
Germanium Gamma Detector	GEM-20200	Ortec		6
Liquid Scintillation Spectrometer	Hewlett Packard	2000 CA/LL		6
Liquid Scintillation Spectrometer	Beckman	LS 3801		6
Alpha/Beta Counting System (manual)	Tennelec	4000-16		6
Alpha/Beta Counting System (manual)	Tennelec	4000-16		6
Alpha/Beta Counting System (manual)	Tennelec	4000-16		6
Alpha Spectrometer	Tennelec	48 Chambers		6
Alpha Spectrometer	Ortec	16 Chambers		2

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APPENDIX

OAK RIDGE-3

STANDARD OPERATING PROCEDURE LIST

TABLE-OR-3-1
ITAS-OAK RIDGE LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	SOP TITLE
1001	Control and Retention of Client Related Contractual Information
2101	Operation of the Ludlum Model 3
2102	Operation of the Ludlum Model 12
2103	Operation of the Ludlum Model 1000
2105	Operation of the Ludlum Model 12S
2106	Operation of the Ludlum Model 2000
2107	Operation of the Ludlum Model 19
2111	Operation of the Ludlum Model 177 With Pancake GM Probe
2301	On-site Weekly Radiological Survey
2302	Inventory and Leak Testing of Sealed Sources
2303	Personnel Monitoring for Radioactive Contamination
2304	Surface Contamination Limits
2305	Radiation Work Permit
2306	Health Physics Training Program
2307	Sample Receipt & Radioactive Material Receipt/Shipment Surveys
2308	Issuance of Personnel Dosimetry
2312	Radiological Sample Screening and Classification
2313	Radiation Safety Training
2600	Site Safety Committee
2601	Monthly Fire Extinguisher Inspection
2602	Monthly Safety Shower/Emergency Eyewash Inspection
2603	IT-ORL Supervisory Commitment to Health and Safety
3001	Nonconformance and Corrective Actions
3002	Refrigeration Unit Installation/Maintenance
3003	Calibration Check for Thermometers
3004	Calibration Check for Automatic Pipettes
3005	Certification and Recall of Class S Weights
3006	Audits

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TABLE OR-3-1
ITAS-OAK RIDGE LABORATORY
Standard Operating Procedure (SOP) List
Continued

SOP NO.	SOP TITLE
3007	Preparation and Review of Control Charts
3008	Quality Assurance Orientation for New Employees
3009	Quarterly Calibration and Daily Balance Check Procedure
3011	Training and Qualifications of Laboratory Analysts
3012	Software Validation
3013	Procedure Preparation
3014	Laboratory Water Quality Assurance
3015	Quality and Operation Records Management
3016	Procurement Control and Documentation
3017	Instrument Repair and Preventive Maintenance
3018	Project Quality Assurance Summary
3020	Glassware Cleaning
3021	Documentation of Sample Condition Upon Receipt
3023	Document Storage
3024	Data Review Requirements for the Chemical Laboratories
3025	Document Control and Distribution
3027	Acquisition and Use of Standard Reference Materials for Radiochemical Standards
3028	External Intercomparison Study Performance Evaluation Program
4030	Waste Accumulation and Collection
4120	Radiological Classification of Liquid Waste
4200	Solidification/Treatability Studies
4210	In-Drum Waste Solidification
4310	Vehicle Operation and Maintenance
4320	Electrical Equipment Lock-Out/Tag-Out
4400	Site Security
5000	Sample Receiving
5001	Sample Log-In and Tracking
5002	Initiation of QC
5004	Internal Chain of Custody

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TABLE OR-3-1
ITAS-OAK RIDGE LABORATORY
Standard Operating Procedure (SOP) List
Continued

SOP NO.	SOP TITLE
5006	Sample Preservation Verification
5200	Electronic Data Transfer
5201	Data Packaging
5203	Computer Generated Certificate of Analysis
5401	Receiving and Reveiwing Subcontract Data
6000	Alkalinity Analyses: Total, Bicarbonate, Carbonate, and Hydroxide Alkalinity
6001	Filterable Residue Analysis (Gravimetric, Dried at 180°C)
6002	Non-Filterable Residue (Gravimetric, Dried at 103-105°C)
6003	Analysis of Total Cyanide in Water, Soil and Sediment Media by USEPA-CLp Protocol (Automated)
6004	Chloride by Flow Injection Analysis
6005	Sulfate by Flow Injection Analysis (Automated, Methylthymol Blue, AAII)
6006	Total and Ortho Phosphorus by Flow Injection Analysis
6007	Nitrate/Nitrite by Flow Injection Analysis (Automated, Cadmium Reduction)
6008	Analysis of Total Organic Carbon in Water (UV Promoted, Persulfate Oxidation)
6009	Analysis of Total Petroleum Hydrocarbons (TPH) and Oil & Grease (Gravimetric)
6010	Ammonia Nitrogen Analysis (Nesslerization)
6011	Determination of Total Organic Nitrogen (TON)
6012	Analysis of pH in Water and Soil Samples
6014	Total Kjeldahl Nitrogen (TKN) by Nesslerization
6015	Analysis of Total Organic Carbon in Soils, Sludge, or Non-soil Solids Matrix (Persulfate Oxidation)
6016	Fluoride Analysis by Ion Selective Electrode (ISE)
6017	Analysis of Sulfides in Waters (Titrimetric, Iodine)
6020	Analysis of Total Organic Halides (TOX)
6022	Analysis of Sulfite in Water
6030	Hexavalent Chromium in Water and Soil
6031	Analysis of Phenolic Compounds in Water and Soils (Automated)
6035	Phenolphthalein Alkalinity Analysis
6038	Conductivity

TABLE OR-3-1
ITAS-OAK RIDGE LABORATORY
Standard Operating Procedure (SOP) List
Continued

SOP NO.	SOP TITLE
6040	Ignitability by Penske-Martens Closed Flash Tester
6041	Ignitability of Liquids by Setaflash
6046	Heat of Combustion of Liquids
6050	Color Retention
6051	Silica
6058	Silfate (Turbidimetric)
6200	ICAP-AES Method for Trace Element Analysis of Water and Wastes
6201	The Analysis of Trace Metals by Furnace Atomic Absorption Spectroscopy by CLP
6202	Flame Atomic Absorption Method for Potassium Analysis - CLP SOW 3/90
6203	Analysis of Mercury in Liquid Waste by CLP and SW-846 Method
6204	Analysis of Mercury in Solid or Semisolid Waste by CLP Method
6205	Analysis of Mercury in Solid and Semisolid Waste by SW846
6207	Acid Digestion of Water Samples for Total Recoverable or Dissolved Metals for Analysis by Flame AA or ICAP-AES
6208	Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by Flame AA or ICAP-AES
6209	Acid Digestion of Aqueous Samples and Extracts for Total Metals Analysis by Graphite Furnace
6210	Acid Digestion of Sediments, Sludges, and Soils
6211	Sample Preparation for Metals Analysis by CLP Method: SOW 3/90
6219	Modification A to USEPA CLP SOW ILMO1.0, Statement of Work for Inorganic Analysis, Multimedia, Multiconcentration
6220	Modification B to USEPA CLP SOW ILMO1.0, Statement of Work for Inorganic Analysis, Multimedia, Multiconcentration
6408	GC Data Package Production
6602	Organic Solvent Check for GC Analysis
6604	% Moisture of Solid Matrices
6605	Extraction of Non-Volatile Organics from Soil and Sediment
6610	Extractions of Base/Neutral and Acid Extractables from Water and Effluent
6611	CLP Extraction of Base/Neutral and Acid Extractables from Water and Effluent

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TABLE OR-3-1
ITAS-OAK RIDGE LABORATORY
Standard Operating Procedure (SOP) List
Continued

SOP NO.	SOP TITLE
6614	CLP Extraction of Organochlorine Pesticides and Polychlorinated Biphenyls from Water and Effluent
6615	Extraction of Pesticides and PCPs from Water and Effluent
6617	Extraction of Polychlorinated Biphenyls (PCBs) from Tissues and Eggs
6618	Extraction Procedure for PCB Wipe Samples
6620	Concentration of Organic Extracts by Zymark Turbovap Concentrator
6640	Cleanup by Florisil
6650	Cleanup by Alumina
6655	Dilution of Non-Aqueous Waste Samples
6660	Cleanup by Gel Permeation Chromatography
6665	Extraction of Herbicides from Soil and Sediment
6670	Extraction of Herbicides from Water and Effluent
6690	Toxicity Characteristic Leaching Procedure for Semivolatiles, Metals, Pesticides, PCBs, and Herbicides
6695	Zero Headspace Extraction of the Toxicity Characteristic Leachate Procedure for Volatile Organics
6697	Extraction Procedure Toxicity
6800	GC/MS Data Package Production
6801	GC/MS Standards Tracking
6803	Modification D, Modification to USEPA CLP SOW OLMO1.8, Statement of Work for Organic Analysis, Multi-media, Multi-concnetration
6821	GC/MS Semivolatile Organic Analysis by USEPA Methods for Evaluating Solid Wastes, 3rd Edition, Method 8270
6823	GC/MS Semivolatile Organic Analysis by USEPA CLP Document # OLMO1.0, Revisions OLMO1.1 through OLMO1.8
6831	GC/MS Volatile Organic Analysis by USEPA SW-846, Method 8240, 3rd Edition
6834	GC/MS Volatile Organic Analysis by USEPA CLP Document # OLMO1.0, Revisions OLMO1.1 through OLMO1.8
6872	Mass Calibration of Finnigan OWA GC/MS
7001	Removal of Iron from Soil or Metallic Samples
7002	Preparation of Solid Samples Through Pulverizing, Drying, and Grinding to Achieve a Uniform Solid Matrix

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TABLE OR-3-1
ITAS-OAK RIDGE LABORATORY
Standard Operating Procedure (SOP) List
Continued

SOP NO.	SOP TITLE
7003	Preparation of Samples Which Require Gamma Spectroscopic Analysis
7004	Preparation of Samples Which are to be Processed for Isotopic Alpha Analysis and Strontium Analysis
7006	Instructions for Preparation of Samples for Radiochemical Analysis
7100	Sequential Determination of Radium-226 and Radium-228
7101	Determination of Radium-228 in Aqueous Samples
7102	Determination of Strontium-89 and Strintium-90
7103	Sequential Determination of Selected Alpha Emitting Isotopes
7104	Determination of Technetium-99 Activity
7105	Prepartion and Analysis of Samples for Gross Alpha and/or Beta Radioactivity
7107	Direct Counting of Tritium, Carbon-14, Calcium-45
7108	Preparation and Determination of Tritium in Aqueous Media
7111	Determination of Calcium-45 in Aqueous Samples after Chemical Separation
7112	Preparation and Determination of Carbon-14 in Aqueous Media
7113	Determination of Iron-55 in Aqueous Samples
7114	Determination of Promethium-147 in Aqueous, Environmental Samples and in Urine Samples
7116	Instructions for the Determination of Lead-210 in Aqueous Media
7119	Operating Instructions for Prolabo Model A-300
7121	Tritium by Cryogenic Distillation
7124	Actinide Coprecipitation for Alpha Spectrometry
7125	Determination of Plutonium and Americium in Small Soil and Fresh Water
7126	Total Uranium by Gross Alpha Counting
7127	Determination of Uranium in water by Pulsed-Laser Phosphorimetry
7128	Self Adsorption Curve Standardization
7130	Polonium in Environmental Soils and Waters
7132	Determination of Tritium in Aqueous Samples by Distillation
7137	Determination of Iodine-131 Activity in Milk and Water Samples
7203	Determination of Count Reproducibility and Background Stability of Liquid Scintillation Counting Samples

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TABLE OR-3-1
ITAS-OAK RIDGE LABORATORY
Standard Operating Procedure (SOP) List
Continued

SOP NO.	SOP TITLE
7204	Operation of Low Background Alpha/Beta Counting Instrumentation
7206	Initial Calibration and Daily Counts Reproducibility Check for Low Background Alpha/Beta Counting
7210	Energy Calibration/Linearity Check of Computer Assisted Germanium Spectroscopy Systems
7212	Operation of Gamma Spectroscopy Systems
7213	Efficiency Calibration of Germanium Gamma Spectroscopy System
7214	Determination of Germanium Gamma Detector Count Reproducibility
7215	Background Determination of a Germanium Detector System
7217	Operation of Liquid Scintillation Counting Instruments
7223	Process Controls for Daily Checks of Counting Room Instrumentation
7231	Sample Counting Using Computer Controlled Alpha Spectroscopy Systems
7232	Count Reproducibility Determination in Computer Controlled Alpha Spectroscopy Systems
7233	Background Determination in Computer Controlled Alpha Spectroscopy Systems
7234	Energy Calibration Verification of Computer Controlled Alpha Spectroscopy Systems
7235	Efficiency Calibration Verification of Computer Controlled Alpha Spectroscopy Systems
7301	Radiochemical Data Review

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APPENDIX

OAK RIDGE-4

ANALYTICAL METHODS

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TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Classical Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Acidity	Water	Method 305.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Alkalinity	Water	Method 310.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ammonia	Water	Method 350.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Bromide	Water	Method 300.0	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Cation Exchange Capacity	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9081	Not Applicable	Not Applicable
Chloride	Water	Method 300.0[1] Method 325.2[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Chromium VI Hexavalent	Water	Not Applicable	Method 7196	Not Applicable	Standard Method, 17th Ed., Method 3500-Cr^6 D
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable		Not Applicable	
Conductivity	Water	Method 120.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Cyanide (Amenable)	Water	Not Applicable	Method 9012	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 9012	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Free)	Water	Not Applicable	Not Applicable	Not Applicable	Standard Methods 412 H
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Standard Methods 412 H
Cyanide	Water	Method 335.3[2]	Method 9010/9012	CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 1311 to obtain leachate Method 9010/9012 for Leachate	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	CLP ILMO2.1	Not Applicable
Flashpoint	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 1010/1020	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Fluoride	Water	Method 300.0[1] Method 340.2[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Hardness	Water	Method 130.2	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitrite (NO_2)	Water	Method 300.0[1] (non-preserved) Method 354.1/353.2[2] (preserved)	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Nitrate (NO_3)	Water	Method 300.0[1] (non-preserved) Method 352.1/353.2[2] (preserved)	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitrate plus Nitrite	Water	Method 353.2[3]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitrogen, Total Kjeldahl (TKN)	Water	Method 351.3 Method 351.4	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Nitrogen, Total Organic (TON)	Water	Method 353.1 and 350.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Oil and Grease	Water	Method 413.1	Method 9070	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 9071	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9071	Not Applicable	Not Applicable
pH	Water	Method 150.1	Method 9040	Method CLP	Not Applicable
	Liquid	Not Applicable	Method 9040	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 9040	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 9045	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9045	Not Applicable	Not Applicable
Phenol	Water	Method 420.2[2]	Method 9060[2]	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Phosphate, Ortho & Total	Water	Method 300.0[1] Method 365.1[1]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Phosphate (Total)	Water	Method 365.1[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Phosphorus (Total)	Water	Method 365.1[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Reactivity	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Section 7.3 Only Applicable to solid waste	Not Applicable	Not Applicable
	Soil	NA	Not Applicable	Not Applicable	Not Applicable

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TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Residual Chlorine	Water	Method 330.4 Method 330.5	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Settable Matter	Water	Method 160.5[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfate (SO_4)	Water	Method 300.0[1]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfide (SO)	Water	Method 376.1[2]	Method 9030[4]	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Sulfite (SO_3)	Water	Method 377.1[5]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Dissolved Solids (TDS)	Water	Method 160.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Organic Carbon (TOC)	Water	Method 415.2[2]	Method 9060[2]	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Organic Halides (TOX)	Water	Not Applicable	Method 9020[6]	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Total Solids	Water	Method 160.3[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Suspended Solids	Water	Method 160.2[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Turbidity	Water	Method 180.1[4]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE OR-4-1
ITAS-OAK RIDGE LABORATORY
Inorganic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Volatile Residue	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Method 160.4	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

[1]Includes drinking water, surface water and mixed (aqueous) industrial waste effluents.

[2]Includes drinking, surface and saline waters, aqueous domestic and industrial waste.

[3]Includes drinking and other waters wherein the carbonaceous matter is either soluble or has a particle size of 0.2 mm or less. Homogenizing a sample to reduce the particle size may cause loss of purgeable organic carbon, thus yielding erroneously low results.

[4]Includes drinking, surface and saline waters.

[5]Includes drinking and surface waters, sewage and aqueous industrial waste.

[6]Includes drinking and ground waters.

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TABLE OR-4-2
ITAS-OAK RIDGE LABORATORY
Metals Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Toxicity Characteristic Leaching Procedure (TCLP)	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	40 CFR Part 268
	Soil	Not Applicable	Not Applicable	Not Applicable	40 CFR Part 268
ICAP Metals	Water	Method 200.7	Method 3005 Method 3010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Proper pretreatment is described in Section 9 of Method 200.7	Method 3050	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3050	Method CLP ILMO2.1	Not Applicable
CVAA Mercury	Water	Method 245.1	Method 7470	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Method 7470	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 7471	Not Applicable	Not Applicable
	Soil	Method 245.5	Method 7471	Method CLP ILMO2.1	Not Applicable
Flame AA Metals	Water	Element Method Potassium 258.1	Element Method Potassium 3005 3010	Element Method Potassium CIP ILMO2.1 Lithium CLP MOD-A	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Not Applicable	Not Applicable	Not Applicable

TABLE OR-4-2
ITAS-OAK RIDGE LABORATORY
Metals Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Flame AA Metals (continued)	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Element Method Potassium 3050	Not Applicable	Not Applicable
	Soil	Not Applicable	Element Method Potassium 3050	Element Method Potassium ClP ILMO2.1 Lithium CLP MOD-A	Not Applicable
GFAA Metals	Water	Element Method Arsenic 206.2 Antimony 204.2 Lead 239.2 Selenium 270.2 Thallium 279.2	Element Method Arsenic 3020 & 7060 Antimony 7041 & 3010 Lead 3020 Selenium 3020 & 7740 Thallium 3020 & 7841	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 3020	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3020	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment		Element Method Arsenic 3050 Antimony 7041 Lead 3050 Selenium 3050 Thallium 3050	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3050	Method CLP ILMO2.1	Not Applicable

[1]Includes drinking water, surface water and mixed (aqueous) industrial waste effluents.

[2]Includes drinking, surface and saline waters, aqueous domestic and industrial waste.

[3]Includes drinking and other waters wherein the carbonaceous matter is either soluble or has a particle size of 0.2 mm or less. Homogenizing a sample to reduce the particle size may cause loss of purgeable organic carbon, thus yielding erroneously low results.

[4]Includes drinking, surface and saline waters.

[5]Includes drinking and surface waters, sewage and aqueous industrial waste.

[6]Includes drinking and ground waters.

[7]Includes ground waters, drinking, surface and saline waters.

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TABLE-OR-4-3
ITAS-OAK RIDGE LABORATORY
Organic Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Volatiles by GC/MS	Water	Not Applicable	Method 5030	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 5030	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 5030	Method CLP OLMO1.8	Not Applicable
Semivolatiles by GC/MS	Water	Not Applicable	Method 3510 Method 3520	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3520	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3550 Method 3640	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3550 Method 3640	Method CLP OLMO1.8	Not Applicable
Pesticides/ PCBs by GC	Water	Not Applicable	Method 3510 Method 3620	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3510 Method 3620	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3550 Method 3640 Method 3620	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3550 Method 3640 Method 3620	Method CLP OLMO1.8	Not Applicable

TABLE OR-4-3
ITAS-OAK RIDGE LABORATORY
Organic Sample Preparation Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Herbicides by GC	Water	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8150	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8150	Not Applicable	Not Applicable

[1]Includes drinking, surface and saline water

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TABLE OR-4-4
ITAS-OAK RIDGE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Aluminum	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Antimony	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Arsenic	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Barium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable

This method is not recommend for this matrix.

TABLE OR-4-4
OAK RIDGE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Barium (continued)	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Beryllium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Bismuth	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable
Boron	Water	Method 200.7	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable

This method is not recommend for this matrix.

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TABLE OR-4-4
OAK RIDGE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Calcium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Cadmium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Cobalt	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Chromium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable

This method is not recommend for this matrix.

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TABLE OR-4-4
OAK RIDGE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Chromium (continued)	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Copper	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Iron	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Lead	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

This method is not recommend for this matrix.

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TABLE OR-4-4
OAK RIDGE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Magnesium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMLO2.1	Not Applicable
Manganese	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Molybdenum	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable
Nickel	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable

This method is not recommend for this matrix.

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TABLE OR-4-4
OAK RIDGE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Nickel (continued)	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Selenium	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Silicon	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable
Silver	Water	Method 200.7	Method 6010	CLP Method ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 4 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable

This method is not recommend for this matrix.

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TABLE OR-4-4
OAK RIDGE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Sodium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Tin	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable
Titanium	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable
Vanadium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable

This method is not recommend for this matrix.

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TABLE OR-4-4
OAK RIDGE LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Vanadium (continued)	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable
Zinc	Water	Method 200.7[1]	Method 6010	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO2.1	Not Applicable

[1]Includes drinking, surface and saline water, domestic and industrial waste effluents.

Oak Ridge Laboratory can recommend appropriate methodologies and can provide analysis for additional metals upon request.

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This method is not recommend for this matrix.

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TABLE OR-4-5
ITAS-OAK RIDGE LABORATORY
Flame Atomic Absorption Inorganic Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Flame AA Metals Lithium Potassium	Water	Element Method Potassium 258.1	Element Method Potassium 7610	Element Method Potassium CIP ILMO2.1 Lithium CLP MOD-A	Not Applicable
	Liquid	Not Applicable	Element Method Potassium 7610	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Element Method Potassium 7610	Not Applicable	Not Applicable
	Soil	Not Applicable	Element Method Potassium 7610	Element Method Potassium CIP ILMO2.1 Lithium CLP MOD-A	Not Applicable

[1]Includes drinking water, surface water and mixed (aqueous) industrial waste effluents.

[2]Includes drinking, surface and saline waters, aqueous domestic and industrial waste.

[3]Includes drinking and other waters wherein the carbonaceous matter is either soluble or has a particle size of 0.2 mm or less. Homogenizing a sample to reduce the particle size may cause loss of purgeable organic carbon, thus yielding erroneously low results.

[4]Includes drinking, surface and saline waters

[5]Includes drinking and surface waters, sewage and aqueous industrial waste.

[6]Includes drinking and ground waters

[7]Includes ground waters, drinking, surface and saline waters.

TABLE OR-4-6
ITAS-OAK RIDGE LABORATORY
Graphite Furnace Atomic Absorption Methods

Parameter	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Antimony	Water	Method 204.2[1]	Method 7041	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 7041	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 204.2 **Requires proper pretreatment.**	Method 7041	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7041	Method CLP ILMO1.2	Not Applicable
Arsenic	Water	Method 206.2[1]	Method 7060	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 7060	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 206.2 **Requires proper pretreatment**	Method 7060	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7060	Method CLP ILMO2.1	Not Applicable
Lead	Water	Method 239.2[1]	Method 7421	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 7421	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 239.2 **Requires proper pretreatment**	Method 7421	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7421	Method CLP ILMO2.1	Not Applicable
Selenium	Water	Method 270.2[1]	Method 7740	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 7740	Not Applicable	Not Applicable

This method is not recommend for this matrix.

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TABLE OR-4-6
OAK RIDGE LABORATORY
Graphite Furnace Atomic Absorption Methods
Continued

Parameter	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Selenium (continued)	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 270.2 Requires proper pretreatment	Method 7740	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7740	Method CLP ILMO2.1	Not Applicable
Thallium	Water	Method 279.2[1]	Method 7841	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Method 7841	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 279.2 Requires proper pretreatment	Method 7841	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7841	Method CLP ILMO2.1	Not Applicable

[1]Includes drinking, surface and saline waters

This method is not recommend for this matrix.

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TABLE OR-4-7
ITAS-OAK RIDGE LABORATORY
Cold Vapor Atomic Absorption Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
CVAA Mercury	Water	Method 245.1	Method 7470	Method CLP ILMO2.1	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Method 7470	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7471	Not Applicable	Not Applicable
	Soil	Method 245.5	Method 7471	Method CLP ILMO2.1	Not Applicable

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TABLE-OR-4-8
ITAS-OAK RIDGE LABORATORY
Organic Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Volatiles by GC/MS	Water	Method 624[1]	Method 8260	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 8260	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8260	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8260	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8260	Method CLP OLMO1.8	Not Applicable
Semivolatiles by GC/MS	Water	Method 625[1]	Method 8270	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 8270	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8270	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8270	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8270	Method CLP OLMO1.8	Not Applicable
Pesticides/ PCBs	Water	Method 608[1]	Method 8080	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 8080	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8080	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8080	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8080	Method CLP OLMO1.8	Not Applicable
Herbicides	Water	Method 615[1]	Method 8150	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8150	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8150	Not Applicable	Not Applicable

TABLE OR-4-8
OAK RIDGE LABORATORY
Organic Methods
Continued

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Herbicides (continued)	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Soils	Not Applicable	Method 8150	Not Applicable	Not Applicable

[1]Includes drinking, surface and saline water

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TABLE.OR-4-9
ITAS-OAK RIDGE LABORATORY
Radiological Methods

Analytical Parameters	Matrix	Method
Gross Alpha/Beta	Water	Direct Determination by Gas Flow Proportional Alpha/Beta Counting
	Soil	Direct Determination by Gas Flow Proportional Alpha/Beta Counting
	Filter	Direct Determination by Gas Flow Proportional Alpha/Beta Counting
Americium-241	Water	Sequential Separation by Ion Exchange and Determination by Alpha Spectrometry
	Soil	Sample Digestion, Sequential Separation by Ion Exchange and Determination by Alpha Spectrometry
	Other Matrices	Sample Digestion, Sequential Separation by Ion Exchange and Determination by Alpha Spectrometry
Carbon-14	Water	Direct Determination by Liquid Scintillation Counting Sample Distillation and Liquid Scintillation Counting
	Soil	Combustion of Sample, Collection of CO_2 and Determination by Liquid Scintillation Counting
	Other Matrices	Combustion of Sample, Collection of CO_2 and Determination by Liquid Scintillation Counting
Calcium-45	Water	Direct Determination by Liquid Scintillation Counting Chemical Separation and Liquid Scintillation Counting
	Soil	Not Applicable
	Other Matrices	Not Applicable
Curium-242	Water	Sequential Separation by Ion Exchange and Determination by Alpha Spectrometry
	Soil	Sample Digestion, Sequential Separation by Anion Exchange and Determination by Alpha Spectrometry
	Other Matrices	Sample Digestion, Sequential Separation by Anion Exchange and Determination by Alpha Spectrometry
Gamma Emitters Actinides, as applicable, Co-60, Cs-137, K-40, Mn-54, and other fission/activation products	Water	Direct Determination by Gamma Spectroscopy
	Soil	Direct Determination by Gamma Spectroscopy
	Vegetation	Direct Determination by Gamma Spectroscopy
Iodine 131	Water	Direct Determination by Gamma Spectroscopy or Separation by Ion Exchange and Determination by Gas Flow Proportional Bet Counting
	Soil	Direct Determination by Gamma Spectroscopy
	Other Matrices	Matrix Dependent

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TABLE OR-4-9
ITAS-OAK RIDGE LABORATORY
Radiological Methods
Continued

Analytical Parameters	Matrix	Method
Iron-55	Water	Separation by Ion Exchange and Determination by Liquid Scintillation Counting
	Soil	Not Applicable
	Other Matrices	Not Applicable
Lead-210	Water	Separation by Ion Exchange and Determination by Gas Flow Proportional Beta Counting of the Bi-210 Daughter
	Soil	Direct Determination by Gamma Spectroscopy
	Other Matrices	Not Applicable
Neptunium-237	Water	Sequential Separation by Ion Exchange and Determination by Alpha Spectrometry
	Soil	Sample Digestion, Sequential Separation by Ion Exchange and Determination by Alpha Spectrometry
	Other Matrices	Matrix Dependent
Promethium-147	Water	Organic Extraction and Determination by Gas Flow Proportional Beta Counting Organic Extraction and Determination by Liquid Scintillation Counting
	Soil	Not Applicable
	Other Matrices	Not Applicable
Plutonium-238,239/240	Water	Sequential Separation by Ion Exchange and Determination by Alpha Spectrometry
	Soil	Sample Digestion, Sequential Separation by Ion Exchange and Determination by Alpha Spectrometry
	Other Matrices	Matrix Dependent
Radium-226	Water	Sequential Determination of Ra-226,228 by Co-precipitation and Determination by Alpha Spectrometry
	Soil	Determination by Gamma Spectroscopy of Lead-214 and Bismuth-214 Daughters
	Other Matrices	Matrix Dependent
Radium-228	Water	Sequential Determination of Ra-226,228 by Co-precipitation and Determination by Gas Flow Proportional Beta Counting
	Soil	Determination by Gamma Spectroscopy of the Actinium-228 Daughter
	Other Matrices	Matrix Dependent
Strontium-89,90 and Total Strontium	Water	Precipitation and Determination by Gas Flow Proportional Beta Counting
	Soil	Sample Digestion, Precipitation and Determination by Gas Flow Proportional Beta Counting
	Other Matrices	Not Applicable
Technetium-99	Water	Organic Extraction and Determination by Gas Flow Proportional Beta Counting
	Soil	Sample Leach or Digestion, Organic Extraction and Determination by Gas Flow Proportional Beta Counting
	Other Matrices	Not Applicable

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TABLE OR-4-9
ITAS-OAK RIDGE LABORATORY
Radiological Methods
Continued

Analytical Parameters	Matrix	Method
Thorium-227,228,230,232	Water	Sequential Separation by Anion Exchange and Determination by Alpha Spectrometry
	Soil	Sample Digestion, Sequential Separation by Anion Exchange and Determination by Alpha Spectrometry
	Other Matrices	Not Applicable
Total Uranium	Water	ASTM:D5174-90; Determination by Pulsed-Laser Phosphorimetry
	Soil	Not Applicable
	Other Matrices	Not Applicable
Tritium	Water	Direct Determination by Liquid Scintillation Counting Cryogenic Distillation and Determination by Liquid Scintillation Counting Sample Distillation and Determination by Liquid Scintillation Counting
	Soil	Cryogenic Distillation and Determination By Liquid Scintillation Counting
	Other Matrices	Matrix Dependent
Uranium-233/234,235/236	Water	Separation by Anion Exchange and Determination by Alpha Spectrometry
	Soil	Sample Digestion, Separation by Anion Exchange and Determination by Alpha Spectrometry
	Other Matrices	Matrix Dependent
Uranium-238	Water	Separation by Anion Exchange and Determination by Alpha Spectrometry
	Soil	Direct Determination by Gamma Spectroscopy of Thorium-234 (Assumes secular equilibrium between ^{238}U and ^{234}Th)
	Other Matrices	Matrix Dependent

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APPENDIX

OAK RIDGE-5

PRACTICAL QUANTITATION LIMITS AND METHOD DETECTION LIMITS

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TABLE OR-5-1
ITAS-OAK RIDGE LABORATORY
Method Detection Limits for Wet Chemistry

PARAMETER	METHOD DETECTION LIMIT (mg/L)
Total Organic Carbon	1.00
Nitrate	0.10
Total Suspended Solids	1.00
Sulfide	0.50
Nitrite	0.10
Chloride	0.50
Total Dissolved Solids	1.00
Hexavalent Chromium	0.05
Total Phosphate	0.02
Sulfate	2.00
Total Kjeldahl Nitrogen	0.10
Total Organic Halogens	0.01
Ammonia	0.10
Cyanide	0.002
Total Organic Nitrogen	0.10
Phenol	0.01

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TABLE OR-5-2
ITAS-OAK RIDGE LABORATORY
ICAP Metals
Contract Required Detection Limits (CRDL),
Contract Laboratory Program (CLP)
Method Detection Limits (MDL),
and Practical Quantitation Limits (PQL)

Element	CAS Number	Water CRDL[1] (ug/L)	Soil CRDL[2] (mg/Kg)	Water MDL (ug/L)	Soil MDL (mg/Kg)	Water PQL (ug/L)	Soil PQL (mg/Kg)
Aluminum	7429-90-5	200	40	30	6	300	60
Antimony	7440-36-0	60	12	100	20	1000	200
Arsenic	7440-38-2	10	2	50	10	500	100
Barium	7440-39-3	200	40	5	1	50	10
Beryllium	7440-41-7	5	1	5	1	50	10
Boron	7440-42-8	**		60	12	600	120
Bismuth		**					
Cadmium	7440-43-9	5	1	5	1	50	10
Calcium	7440-70-2	5000	1000	25	5	250	50
Chromium	7440-47-3	10	2	12.5	2.5	125	25
Cobalt	7440-48-4	50	10	10	2	100	20
Copper	7440-50-8	25	5	25	5	250	50
Iron	7439-89-6	100	20	30	6	300	60
Lead	7439-92-1	3	0.6	50	10	500	100
Lithium	7439-93-2	*		100	20	1000	200
Magnesium	7439-95-4	5000	1000	50	10	500	100
Manganese	7439-96-5	15	3	10	2	100	20
Molybdenum	7439-98-7	*		10	2	100	20
Nickel	7440-02-0	40	8	25	5	250	50
Platinum	7440-06-4	N/A	N/A	N/A	N/A	N/A	N/A
Potassium	7440-09-7	5000	1000	1000	200	10000	2000
Selenium	7782-49-2	5	1	80	16	800	160
Silicon	7440-21-3	*		200	40	2000	4000
Silver	7440-22-4	10	2	10	2	100	20
Sodium	7440-22-4	5000	1000	100	20	1000	200

TABLE OR-5-2
OAK RIDGE LABORATORY
ICAP Metals
Contract Required Detection Limits (CRDL), Contract Laboratory Program (CLP) Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)

Element	CAS Number	Water CRDL[1] (ug/L)	Soil CRDL[2] (mg/Kg)	Water MDL (ug/L)	Soil MDL (mg/Kg)	Water PQL (ug/L)	Soil PQL (mg/Kg)
Thallium	7440-28-0	10	2	250	50	2500	500
Tin	7440-31-5	**					
Vanadium	7440-62-2	50	10	10	2	100	20
Zinc	7440-66-6	20	4	10	2	100	20

[1]Higher detection limits may be utilized under the following circumstances.

If the sample concentration exceeds five (5) times the detection limit of the instrument, the values may be reported even though the instrument detection limit may not equal the contract required detection limit.

[2]Estimated detection limit based on a one (1) gram sample diluted to two hundred (200) milliliters.

* Client-specific method, not CLP

** Due to instrument change, MDLs are in process of being determined

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TABLE-OR-5-3
ITAS-OAK RIDGE LABORATORY
GFAA Metals
Contract Required Detection Limits (CRDL)
Contract Laboratory Program (CLP),
Method Detection Limits (MDL), and
Practical Quantitation Limits (PQL)

Element	CAS Number	Water CRDL[1] (ug/L)	Soil CRDL[2] (mg/Kg)	Water MDL (ug/L)	Soil MDL (mg/Kg)	Water PQL (ug/L)	Soil PQL (mg/Kg)
Arsenic	7440-38-2	10	2	10	2	100	20
Lead	7439-92-1	3	0.6	4.5	0.9	45	9
Selenium	7782-49-2	5	1	7.5	1.5	75	15
Thallium	7440-28-0	10	2	5	1	50	10
Mercury[3]	7439-97-6	0.2	0.1	0.2	0.1	2	1

[1]Higher detection limits may be utilized under the following circumstances.

If the sample concentration exceeds five (5) times the detection limit of the instrument, the values may be reported even though the instrument detection limit may not equal the contract required detection limit.

[2]Estimated detection limit based on a one (1) gram sample diluted to two (2) hundred milliliters.

[3]Analyzed by Cold vapor AA.

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TABLE OR-5-4
ITAS-OAK RIDGE LABORATORY
CLP or Hazardous Substance List for Volatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[1,2] and Practical Quantitation Limits (PQL)[1,3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL (ug/Kg)	Water PQL (ug/L)	Soil PQL (ug/Kg)
Chloromethane	74-87-3	10	10	7.0	11.6	70	116
Bromomethane	74-83-9	10	10	3.3	4.0	33	40
Vinyl Chloride	75-01-4	10	10	5.2	9.6	52	96
Chloroethane	75-00-3	10	10	3.2	4.3	32	43
Methylene Chloride	75-09-2	10	10	3.4	7.8	34	78
Acetone	67-64-1	10	10	7.2	10	72	100
Carbon Disulfide	75-15-0	10	10	3.7	5.4	37	54
1,1-Dichloroethene	75-35-4	10	10	2.9	3.6	29	36
1,1-Dichloroethane	75-34-3	10	10	2.8	3.2	28	32
1,2-Dichloroethene (total)	540-59-0	10	10	3.1	2.5	31	25
Chloroform	67-66-3	10	10	3.0	2.7	30	27
1,2-Dichloroethane	107-06-2	10	10	3.2	2.3	32	23
2-Butanone	78-93-3	10	10	3.6	3.8	36	38
1,1,1-Trichloroethane	71-55-6	10	10	2.9	4.4	29	44
Carbon Tetrachloride	56-23-5	10	10	3.2	5.5	32	55
Vinyl Acetate		10	10	2.6	2.9	26	29
Bromodichloromethane	124-48-1	10	10	3.4	3.5	34	35
1,2-Dichloropropane	78-87-5	10	10	2.7	2.5	27	25
cis-1,3-Dichloropropene	10061-01-5	10	10	2.7	2.0	27	20
Trichloroethene	79-01-6	10	10	3.0	4.8	30	48
Dibromochloromethane	75-27-4	10	10	3.5	3.4	35	34
1,1,2-Trichloroethane	79-00-5	10	10	3.4	3.7	34	37
Benzene	71-43-2	10	10	3.0	4.8	30	48
trans-1,3-Dichloropropene	10061-02-6	10	10	2.6	1.7	26	17
Bromoform	75-25-2	10	10	3.5	4.9	35	49
4-Methyl-2-Pentanone	108-10-1	10	10	4.1	4.3	41	43
2-Hexanone	591-78-6	10	10	5.2	6.0	52	60
Tetrachloroethene	127-18-4	10	10	2.8	1.8	28	18
Toluene	108-88-3	10	10	3.3	4.2	33	42

TABLE OR-5-4
OAK RIDGE LABORATORY
CLP or Hazardous Substance List for Volatile Organics
with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[1,2] and
Practical Quantitation Limits (PQL)[1,3]
Continued

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL (ug/Kg)	Water PQL (ug/L)	Soil PQL (ug/Kg)
1,1,2,2-Tetrachloroethane	79-34-5	10	10	3.3	4.7	33	47
Chlorobenzene	108-90-7	10	10	3.0	2.8	30	28
Ethylbenzene	100-41-4	10	10	3.0	2.9	30	29
Styrene	100-42-5	10	10	3.2	3.1	32	31
Xylene (total)	1330-20-7	10	10	3.3	3.8	33	38

[1]Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

[2]The Method Detection Limit study was performed on 1/12/93 & 3/22/93.

[3]Practical Quantitation Limits were arrived at by 10 x MDL per CLP SOW OLM01.8

[4]Quantitation limits listed for soil are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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TABLE.OR-5-5
ITAS-OAK RIDGE LABORATORY
CLP or Hazardous Substance List for Semivolatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[1,2] and Practical Quantitation Limits (PQL)[1,3]

Analyte	CAS Number	Water CRQL (ug/L)	Soil CRQL[4] (ug/Kg)	Water MDL (ug/Kg)	Soil MDL (ug/Kg)	Water PQL (ug/L)	Soil PQL (ug/L)
Phenol	108-95-2	10	330	4.1	181	41	1810
bis(2-Chloroethyl)ether	111-44-4	10	330	3.4	180	34	1800
1,3-Dichlorobenzene	541-73-1	10	330	2.8	160	28	1600
1,4-Dichlorobenzene	106-46-7	10	330	2.7	172	27	1720
Benzyl Alcohol	100-51-6	10	330	3.2	367	32	3670
1,2-Dichlorobenzene	95-50-1	10	330	2.6	183	26	1830
2-Methylphenol	95-48-7	10	330	3.4	208	34	2080
bis(2-chloroisopropyl)ether	108-60-1	10	330	3.0	242	30	2420
4-Methylphenol	106-44-5	10	330	3.3	249	33	2490
n-Nitroso-di-n-Propylamine	621-64-7	10	330	3.5	169	35	1690
Hexachloroethane	67-72-1	10	330	2.5	206	25	2060
Nitrobenzene	98-95-1	10	330	5.2	140	52	1400
Isophorone	78-59-1	10	330	4.2	182	42	1820
2-Nitrophenol	88-75-5	10	330	3.3	186	33	1860
2,4-Dimethylphenol	150-67-9	10	330	3.8	175	38	1750
Benzoic Acid	65-85-0	10	330	9.7	491	97	4910
bis(2-Chloroethoxy) Methane	111-91-1	10	330	3.0	164	30	1640
2,4-Dichlorophenol	120-83-2	10	330	3.7	250	37	2500
1,2,4-Trichlorobenzene	120-82-1	10	330	3.0	228	30	2280
Naphthalene	91-20-3	10	330	2.7	203	27	2030
4-Chloroaniline	106-47-8	10	330	1.3	34	13	340
Hexachlorobutadiene	87-68-3	10	330	2.8	197	28	1970
4-Chloro-3-Methylphenol	59-50-7	10	330	3.5	258	35	2580
2-Methylnaphthalene	91-57-6	10	330	3.3	203	33	2030
2-Chlorophenol	95-57-8	10	330	3.6	212	36	2120
Hexachlorocyclopentadiene	77-47-4	10	330	N/A	152	N/A	1520
2,4,6-Trichlorophenol	88-06-2	10	330	3.8	238	38	2380
2,4,5-Trichlorophenol	95-95-4	25	800	4.0	243	40	2430
2-Chloronaphthalene	91-58-7	10	330	3.5	203	35	2030

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TABLE OR-5-5
ITAS-OAK RIDGE LABORATORY
CLP or Hazardous Substance List for Semivolatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[1,2] and Practical Quantitation Limits (PQL)[1,3]

Analyte	CAS Number	Water CRQL (ug/L)	Soil CRQL[4] (ug/Kg)	Water MDL (ug/Kg)	Soil MDL (ug/Kg)	Water PQL (ug/L)	Soil PQL (ug/L)
2-Nitroaniline	88-74-4	25	800	2.1	147	21	1470
Dimethyl Phthalate	31-11-3	10	330	2.4	207	24	2070
Acenaphthylene	208-96-8	10	330	3.0	205	30	2050
2,6-Dinitrotoluene	606-20-2	10	330	2.5	286	25	2860
3-Nitroaniline	99-09-2	25	800	1.7	149	17	1490
Acenaphthene	83-32-9	10	330	3.0	210	30	2100
2,4-Dinitrophenol	51-28-5	25	800	14	359	140	3590
4-Nitrophenol	100-02-7	25	800	7.5	276	75	2760
dibenzofuran	132-64-9	10	330	3.4	222	34	2220
2,4-Dinitrotoluene	121-14-2	10	330	2.9	219	29	2190
Diethylphthalate	84-66-2	10	330	2.1	187	21	1870
4-Chlorophenyl-phenylether	7005-72-36	10	330	2.7	201	27	2010
Fluorene	96-73-7	10	330	2.8	208	28	2080
4-Nitroaniline	100-01-6	25	800	2.0	223	20	2230
4,6-Dinitro-2-Methylphenol	534-52-1	25	800	13	375	130	3750
n-Nitrosodiphenylamine	96-30-6	10	330	2.7	239	27	2390
4-Bromophenyl-phenylether	101-55-3	10	330	2.1	188	21	1880
Hexachlorobenzene	118-74-1	10	330	2.1	203	21	2030
Pentachlorophenol	87-86-5	25	800	6.9	275	69	2750
Phenanthrene	85-01-8	10	330	1.7	257	17	2570
Anthracene	120-12-7	10	330	2.3	260	23	2600
Di-n-Butylphthalate	84-74-2	10	330	1.7	205	17	2050
Fluoranthene	206-44-0	10	330	21	227	210	2270
Pyrene	129-00-0	10	330	1.9	331	19	3310
Butylbenzylphthalate	85-68-7	10	330	2.0	192	20	1920
3,3'-Dichlorobenzidine	91-94-1	10	330	4.2	185	42	1850
Benzo(a)anthracene	56-55-3	10	330	2.1	262	21	2620
Chrysene	218-01-9	10	330	1.9	271	19	2710
bis(2-Ethylhexyl)phthalate	117-81-7	10	330	2.2	252	22	2520
Di-n-Octylphthalate	117-84-0	10	330	2.8	270	28	2700

TABLE OR-5-5
ITAS-OAK RIDGE LABORATORY
CLP or Hazardous Substance List for Semivolatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[1,2] and Practical Quantitation Limits (PQL)[1,3]

Analyte	CAS Number	Water CRQL (ug/L)	Soil CRQL[4] (ug/Kg)	Water MDL (ug/Kg)	Soil MDL (ug/Kg)	Water PQL (ug/L)	Soil PQL (ug/L)
Benzo(b)fluoranthene	205-99-2	10	330	2.4	172	24	1720
Benzo(k)fluoranthene	207-08-9	10	330	3.3	300	33	3000
Benzo(a)pyrene	50-32-8	10	330	2.2	248	22	2480
Indeno(1,2,3-cd)pyrene	193-39-5	10	330	2.4	265	24	2650
Dibenzo(a,h)anthracene	53-70-3	10	330	2.1	270	21	270
Benzo(g,h,i)perylene	191-24-2	10	330	1.8	242	18	2420

[1]Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

[2]The Method Detection Limit study was performed on 2/4/93 & 3/5/93.

[3]Practical Quantitation Limits were arrived at by MDL x 10 per CLP SOW OLM01.8

[4]Quantitation limits listed for soil are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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TABLE OR-5-6
ITAS-OAK RIDGE LABORATORY
CLP (3/90) or Hazardous Substance List for Pesticides and PCBs with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[1,2], and Practical Quantitation Limits (PQL)[1,3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL (ug/Kg)	Water PQL (ug/L)	Soil PQL (ug/Kg)
α-BHC	319-84-6	0.05	1.7	0.01	0.40	0.1	4
β-BHC	319-85-7	0.05	1.7	0.02	0.80	0.2	8
δ-BHC	319-86-8	0.05	1.7	0.02	1.1	0.2	4
γ-BHC (Lindane)	58-89-9	0.05	1.7	0.02	0.40	0.2	4
Heptachlor	76-44-8	0.05	1.7	0.02	0.60	0.2	6
Aldrin	309-00-2	0.05	1.7	0.01	0.80	0.1	8
Heptachlor Epoxide	1024-57-3	0.05	1.7	0.01	0.80	0.1	8
Endosulfan I	959-98-8	0.05	1.7	0.02	0.60	0.2	6
Dieldrin	60-75-1	0.10	3.3	0.02	1.2	0.2	12
4,4'-DDE	72-55-9	0.10	3.3	0.02	1.5	0.2	15
Endrin	72-20-8	0.10	3.3	0.02	1.4	0.2	14
Endosulfan II	33213-65-9	0.10	3.3	0.05	1.8	0.5	18
4,4'-DDD	72-54-8	0.10	3.3	0.02	0.80	0.2	8
Endosulfan sulfate	1031-07-8	0.10	3.3	0.07	3.7	0.7	37
4,4'-DDT	50-29-3	0.10	3.3	0.02	1.4	0.2	14
Methoxychlor	72-43-5	0.50	17	0.02	1.4	0.2	14
Endrin Ketone	53494-70-5	0.10	3.3	0.04	1.4	0.4	14
α-Chlordane	5103-71-9	0.05	1.7	0.02	1.3	0.2	13
γ-Chlordane	5103-74-2	0.05	1.7	0.01	1.0	0.1	10
Toxaphene	8001-35-2	5.0	170.0	0.80	54	8	540
Aroclor 1016	12674-11-2	1.0	33.0	0.12	32	1.2	320
Aroclor 1221	11104-28-2	2.0	67.0	0.29	36	2.9	360
Aroclor 1232	11141-16-5	1.0	33.0	0.28	12	2.8	120
Aroclor 1242	53469-21-9	1.0	33.0	0.31	31	3.1	310
Aroclor 1248	12672-29-6	1.0	33.0	0.52	27	5.2	270

TABLE 7.3-6
OAK RIDGE LABORATORY
CLP (3/90) or Hazardous Substance List for Pesticides and PCBs with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[1,2], and Practical Quantitation Limits (PQL)[1,3]
Continued

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL (ug/Kg)	Water PQL (ug/L)	Soil PQL (ug/Kg)
Aroclor 1254	11097-69-1	1.0	33.0	0.17	25	1.7	250
Aroclor 1260	11096-82-5	1.0	33.0	0.15	26	1.5	260

[1]Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

[2]The Method Detection Limit study was performed on 2/15/93 - 3/8/93.

[3]Practical Quantitation Limits were arrived at by MDL x 10 per CLP SOW OLM01.8.

[4]Quantitation limits listed for soil are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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FIGURE OR-5-1
ITAS-OAK RIDGE LABORATORY
Radiochemical Method Detection Limit Determinations

The minimum detectable activity for radiochemical analyses is given by:

$$MDA = \frac{4.65 * S_b + 2.71/T}{E}$$

where: MDA = minimum detectable activity (dpm)

S_b = the standard deviation in the count rate of a blank including all experimental variations as obtained by replicating the entire measurement of the appropriate blank, not just the Poisson component of the square root of the count.

T = count time

E = efficiency factor (cpm/dpm)

2.71 = Poisson factor

Detector characteristics, count time, sample volume and matrix effects that influence chemical yield affect the minimum detectable concentration. Count durations and sample volumes can be optimized in order to meet client required detection limits. Matrix effects, including high levels of other radionuclides in the sample, may cause the sample detection limit for the target radionuclide to exceed the required limit.

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APPENDIX

OAK RIDGE-6

PERFORMANCE EVALUATION STUDIES

TABLE OR-6-1
ITAS-Oak Ridge Laboratory
Performance Evaluation Studies

PE Sample Program Description	Analysis Performed	Frequency of Participation
USEPA Water Supply Performance Evaluation Study- Environmental Monitoring Systems Laboratory- Cincinnati	Metals, Nutrients, Demands, Classical chemistry, Purgeable Organics, Extractable Organics, Pesticides, PCBs, Herbicides, in Water.	Quarterly
USEPA Water Pollution Performance Evaluation Study - Environmental Monitoring Systems Laboratory - Cincinnati	Metals, Nutrients, Demands, Classical Chemistry, Purgeable organics, Extractable Organics, Pesticides, PCBs in Water.	Bi-Annually
USEPA Organic Quarterly Blind Performance Evaluation Samples - Environmental Monitoring Systems Laboratory - Las Vegas	Purgeable and Extractable Organic Compounds in Water. TCL[1]	Bi-Annually
USEPA Inorganic Performance Evaluation Study - Environmental Monitoring Systems Laboratory - Las Vegas	Metals in Water and Soil. TAL[2]	Quarterly
USEPA Environmental Radioactivity Laboratory Intercomparison Studies Program - Environmental Monitoring Systems Laboratory - Las Vegas	Gamma Emitters: ^{90}Sr, ^{226}Ra, ^{228}Ra, ^{238}U, and H_3 in water.	Monthly
Department of Energy Environmental Measurements Laboratory (DOE-EML) Office of Environmental Restoration and Waste Management, Quality Assessment Program - New York	Gamma Emitters: ^{90}Sr, ^{239}Pu, ^{241}Am, and U-Total in Air. Gamma Emitters: 90Sr, ^{239}Pu, ^{241}Am and U-Total in Soil. Gamma Emitters: ^{90}Sr, ^{239}Pu, ^{241}Am and U-Total in vegetation. H_3, ^{90}S, ^{239}Pu, ^{241}Am, and U-Total in Water.	Bi-Annually

[1] Target Compound List USEPA CLP 0LM01.8

[2] Target Analyte List USEPA CLP ILM02.1

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APPENDIX

OAK RIDGE-7

PREVENTIVE MAINTENANCE SCHEDULES

TABLE OR-7-1
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
Gas Chromatography[1]

As Needed	Semi-annually
Replace front portion of column packing or break off front portion of capillary columns. Replace column if this action fails to restore performance of the column or when column performance (*e.g.* peak tailing, poor resolution, high backgrounds, etc.) indicates it is required.	Perform ECD wipe test.
Change glass wool plug in injection port and/or replace injection port liner with cleaned liner when front portion of column packing is changed or front portion of capillary column is removed.	Replace carbon filters at instrument effluent sites.
Replace septum (usually approximately every 100 injections).	
Perform gas purity check (if high baseline indicates that impure carrier gas may be in use).	
Replace or repair flow controller if constant gas flow cannot be maintained.	
Change fuse when performance indicates fuse has blown.	
Reactivate external carrier gas dryers when blue indicator changes to pink.	
Clean detectors when baseline indicates contamination or when response is low.	
Reactivate flow controller filter dryers when presence of moisture is suspected.	
Tekmar purge and trap devices: replace traps and columns when poor response or disappearance of reactive or poorly trapped compounds.	

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE OR-7-2
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
Gas Chromatography/Mass Spectrometry (GC/MS)

As Needed	Daily	Bi-Weekly	Quarterly	Bi-Annualy
Remove, disassemble, clean source and rods	Change/clean/silanize injector port liner	Check fluid levels in Cool flow chillers and add glycol-water mix as needed	Clean or change all air filters	Change vacuum pump oil
Replace filaments	Check and change gas supply cylinder when tank pressure ≤ 500 psi main gauge			
Change guard column	Change gas flows in each GC			
Change column				
Change injection septa when opened				
Replace multiplier				
Change carrier gas dryer tube				

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TABLE OR-7-3
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
Mass Spectrometers[1]

Instrument	As Needed	Monthly	Annually
Mass Spectrometer	Check level of oil in mechanical pumps and diffusion pump if vacuum is insufficient. Add oil if needed between service contract maintenance.	Not Applicable	Not Applicable
	Electron multiplier: replace when the tuning voltage approaches the maximum and/or when sensitivity falls below required levels.		
	Clean Source, including all ceramics and lenses - the source cleaning is indicated by a variety of symptoms including inability of the analyst to tune the instrument to specifications, poor response, and high background contamination.		
Neslab Chiller	Check coolant level. Add coolant as required to maintain cooling.	Vacuum outside chiller to prevent dust from clogging filters	Clean on-line filter in Neslab

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations

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TABLE OR-7-4
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
Graphite Furnace Atomic Absorption[1]

Daily	Monthly	Semi-annually
Clean Optical Windows	Check coolant level in cooling unit. Add coolant if error message appears	Visual inspection
Inspect contact cylinders. Replace if contact surface is pitted or excessively worn.		Check power connections
		Sensitivity check
		General cleaning
		Check optics
		Inspect graphite rings and graphite tube
		Check power supply
		Check temperature calibration of HGA
		Check absorbance screens - calibrate if needed
		Check Zeeman phasing
Clean contact cylinders		Check gas flows
Check tubes and platform, replace if corroded, flaking, or if low absorbance results		
Check autosampler alignment		
Check fluid levels in rinsate bottles and refill if needed		
Check and change gas supply cylinder when tank pressure ≤ 100 psi main gauge		

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations

TABLE OR-7-5
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
Ion Chromatography[1]

As Needed	Daily	Weekly	Monthly	Semi-annually
Change column, check flow valve, washers and tubing if changes in chromatography are observed	Check plumbing	Check pump heads for leaks	Clean conductivity cell	Replace gradient pump piston seal
Change fuses when power problems occur	Check UV/VIS detector for leaks	Check filter (inlet)	Check conductivity cell for calibration	Clean high pressure valve
Change column when peak shape and resolution deteriorate or when retention time shortening indicates that exchange sites have become deactivated.			Check all air and liquid lines for discoloration and crimping, if indicated.	
Degas pump head when flow is erratic				

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE OR-7-6
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
ICP[1]

As Needed	Daily	Weekly	Monthly	Semi-annually
Check and clean nebulizer, mixing chamber and torch	Check the pump winding, replace if needed	Check torch assembly and clean if needed	Clean intelligence controller filters	Change vacuum pump oil
Check tuning and RF generator (by service engineer)	Check gas flows and change gas supply cylinder when tank pressure ≤ 100 psi main gauge	Check peristaltic pump assembly and tubing and replace as needed	Clean optical path windows	
Check torch alignment	Check coolant flow		Clean RF generator filters	
Check work coil	Check drain reservoir and empty when near full		Check the pump capillary tubing and auto sampler tubing, clean or replace if needed.	

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

TABLE OR-7-7
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
Total Organic Carbon Analyzer[1]

As Needed	Daily	Weekly	Bi-monthly
Repair of all TOC electronics and optical assemblies	Check oxygen supply	Check liquid-flow-rate-pump-tubing conditions	Change pump tubing
Replace combustion tube catalyst	Check persulfate supply	Check for moisture in LiOH tube.	
Replace combustion tube	Check acid supply	Check injection port septum.	
Replace UV lamp	Check printer paper.		
Change Sn and Cu.	Check Sn and Cu scrubber		
Replace tubing	Add a few drops of H_3PO_4 to GLS.		
	Check carrier gas flow rate (≈ 200 cc/min).		

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

TABLE OR-7-8
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
Total Organic Halide Analyzer[1]

As Needed	Daily	Weekly	Monthly	Annualy
Change quartz wool in exit tube.	Check exit tube and quartz wool.	Measure gas flow.	Check o-rings, replace if worn.	Perform electronic test.
	Check for gas bubbles in titration sidearm.			
	Check inlet area for GAC spills			
	Check electrolyte level, add if needed			
	Clean quartz boat.			
	Perform cell performance check.			

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE OR-7-9
ITAS-OAK RIDGE LABORATORY
Maintenance Schedule
Radiological Analysis Equipment[1]

Instrument	As Needed	Weekly	Monthly	Annually
Gas Flow Proportional Counters	As carrier gas is consumed, change P-10	Not Applicable	Not Applicable	Not Applicable
Germanium Gamma Detector	Not Applicable	Fill liquid nitrogen Dewars	Not Applicable	Not Applicable
Alpha Spectrometers	Not Applicable	Not Applicable	Check vacuum pump oil level, fill if necessary.	Change vacuum pump oil.
Liquid Scintillation Counter	Not Applicable	Not Applicable	Normalize PM tubes	Not Applicable

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations

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APPENDIX

OAK RIDGE-8

ADDITIONAL OPERATION-SPECIFIC INFORMATION

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TABLE OR-8-1
ITAS-OAK RIDGE LABORATORY
Summary of Radiological Instrument Calibrations

Detector	Type	Minimum Frequency	Criteria
Germanium Gamma Detectors	Initial Calibration	Annually	Efficiency spike total error within 5% of NIST established value for source
	Check Source	Daily	Within 3 standard deviations established from control chart
	Background	Daily	10 minute counts ± 3 Standard Deviations established from control chart
Gas Flow Proportional Counters	Initial Calibration	Annually	Efficiencies determined by counting standard at operating (plateau) voltage
	Self-Absorption Curves	Every 3 years	Determination of dependence of counting efficiency as a function of source weight over a range of weights representative of the analyses
	Self-Absorption Curve Check	Annually	Check curve at 3 points. Error of checks overlap error of curve.
	Check Source	Daily	±3 Standard Deviations established from Control Chart
	Background	Daily	±3 Standard Deviations established from Control Chart
Alpha Spectrometers	Initial Calibration	Quarterly	Determine efficiency at ^{234}U peak at minimum of 2000 counts
	Pulser Check	Daily	Peak Centroid within ± 30 KeV
	Energy Calibration	Quarterly	Peak Resolution at FWHM (Full Width at Half Maximum Height) ≤ 21 KeV
	Background	Weekly	1000 minute count < 100 counts over entire spectrum < 10 counts in any region
Liquid Scintillation Counters	Self Normalization	Daily	Pass or Fail against Instrument Internal System Check
	Count Reproducibility Check	Daily	± 3 Standard Deviations established from control charts
	Background	Daily	± 3 Standard Deviations established from control charts
	Quench Curve Check	Weekly	± 3 Standard Deviations established from control charts

TABLE OR-8-2
ITAS-OAK RIDGE LABORATORY
Kinetic Phosphorescent Analyzer Calibrations

Detector	Type	Minimum Frequency	Criteria
Kinetic Phosphorescent Analyzer	Initial Calibration	Daily	4 low and 4 high standards; $r^2 \geq 0.96$; lifetime between 100-340 μs
	Calibration Check	Daily	1 low and 1 high; must be within 2σ error
	Background	Daily	$r^2 \geq 0.96$; lifetime between 100-340 μs

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Operation-Specific
QUALITY ASSURANCE MANAGEMENT PLAN
IT ANALYTICAL SERVICES DIVISION

ST. LOUIS LABORATORY
APPENDIX

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APPENDIX

ST. LOUIS-0

LIST OF APPENDIX SECTIONS, TABLES, AND FIGURES

LIST OF APPENDIX SECTIONS

SECTION NO.	CONTENTS	COVER PAGE
St. Louis - 0	Lists of Appendix Sections, Tables, and Figures	2
St. Louis - 1	Organizational Chart	6
St. Louis - 2	Instrument List	8
St. Louis - 3	Standard Operating Procedure List	11
St. Louis - 4	Analytical Methods	18
St. Louis - 5	Method Detection Limits and Practical Quantitation Limits	57
St. Louis - 6	Performance Evaluation Studies	77
St. Louis - 7	Preventive Maintenance Schedules	79
St. Louis - 8	Additional Operation-Specific Information	92

94132B2.0666

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
SL-1-1	Organizational Chart	7

LIST OF TABLES

TABLE NO.	TITLE	PAGE
SL-2-1	Instrument List	9
SL-3-1	Standard Operating Procedure (SOP) List	12
SL-4-1	Inorganic Sample Preparation Methods	19
SL-4-2	Metals Sample Preparation Methods	31
SL-4-3	Organic Sample Preparation Methods	34
SL-4-4	Inductively Coupled Plasma Emission Spectroscopy Methods	38
SL-4-5	Flame Atomic Absorption Inorganic Methods	46
SL-4-6	Graphite Furnace Atomic Absorption Methods	47
SL-4-7	Cold Vapor Atomic Absorption Methods	50
SL-4-8	Organic Methods	51
SL-4-9	Radiological Methods	55
SL-5-1	Method Detection Limits for Wet Chemistry	58
SL-5-2	ICAP Metals: Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	60
SL-5-3	AA Metals: Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	62
SL-5-4	CLP or Hazardous Substance List for Volatile Organics with Contract Required Detection Limits (CRDL), Method Detection Limits (MDL) and Practical Quantitation Limits (PQL)	63
SL-5-5	CLP or Hazardous Substance List for Semivolatile Organics with Contract Required Detection Limits (CRDL), Method Detection Limits (MDL) and Practical Quantitation Limits (PQL)	65
SL-5-6	Pesticides and PCBs: Contract Required Detection Limits (CRDL), Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	68
SL-5-7	Chlorinated Herbicides: Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	70
SL-5-8	Organophosphorous Pesticides: Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	71
SL-5-9	Aromatic Volatiles by GC: Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	72
SL-5-10	Polynuclear Aromatic Hydrocarbons by HPLC: Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	73
SL-5-11	Polychlorinated Dioxins and Furans: Method Detection Limits (MDL), and Practical Quantitation Limits (PQL)	74
SL-5-12	Radiological Target Detection Limits	75
SL-6-1	Performance Evaluation Studies	78
SL-7-1	Maintenance Schedule for Gas Chromatograph	80
SL-7-2	Maintenance Schedule for Gel Permeation Chromatograph	81
SL-7-3	Maintenance Schedule for Mass Spectrometers	82
SL-7-4	Maintenance Schedule for Graphite Furnace Atomic Absorption	83
SL-7-5	Maintenance Schedule for Ion Chromatograph	84
SL-7-6	Maintenance Schedule for ICP	85
SL-7-7	Maintenance Schedule for Total Organic Carbon Analyzer	86

94113282.0667

LIST OF TABLES (continued)

TABLE NO.	TITLE	PAGE
SL-7-8	Maintenance Schedule for Total Organic Halide Analyzer	87
SL-7-9	Maintenance Schedule for TRAACS 800 Auto Analyzer	88
SL-7-10	Maintenance Schedule for Video 12E Cold Vapor Atomic Analyzer	89
SL-7-11	Maintenance Schedule for High Pressure Liquid Chromatography	90
SL-7-12	Maintenance Schedule for Radiological Analysis Equipment	91
SL-8-1	Summary of Radiological Instrument Calibrations	93
SL-8-2	Minimum Radiological Quality Control Samples	95

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APPENDIX

ST. LOUIS-1

ORGANIZATIONAL CHART

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FIGURE SL-1-1

INTERNATIONAL TECHNOLOGY CORPORATION
ANALYTICAL SERVICES
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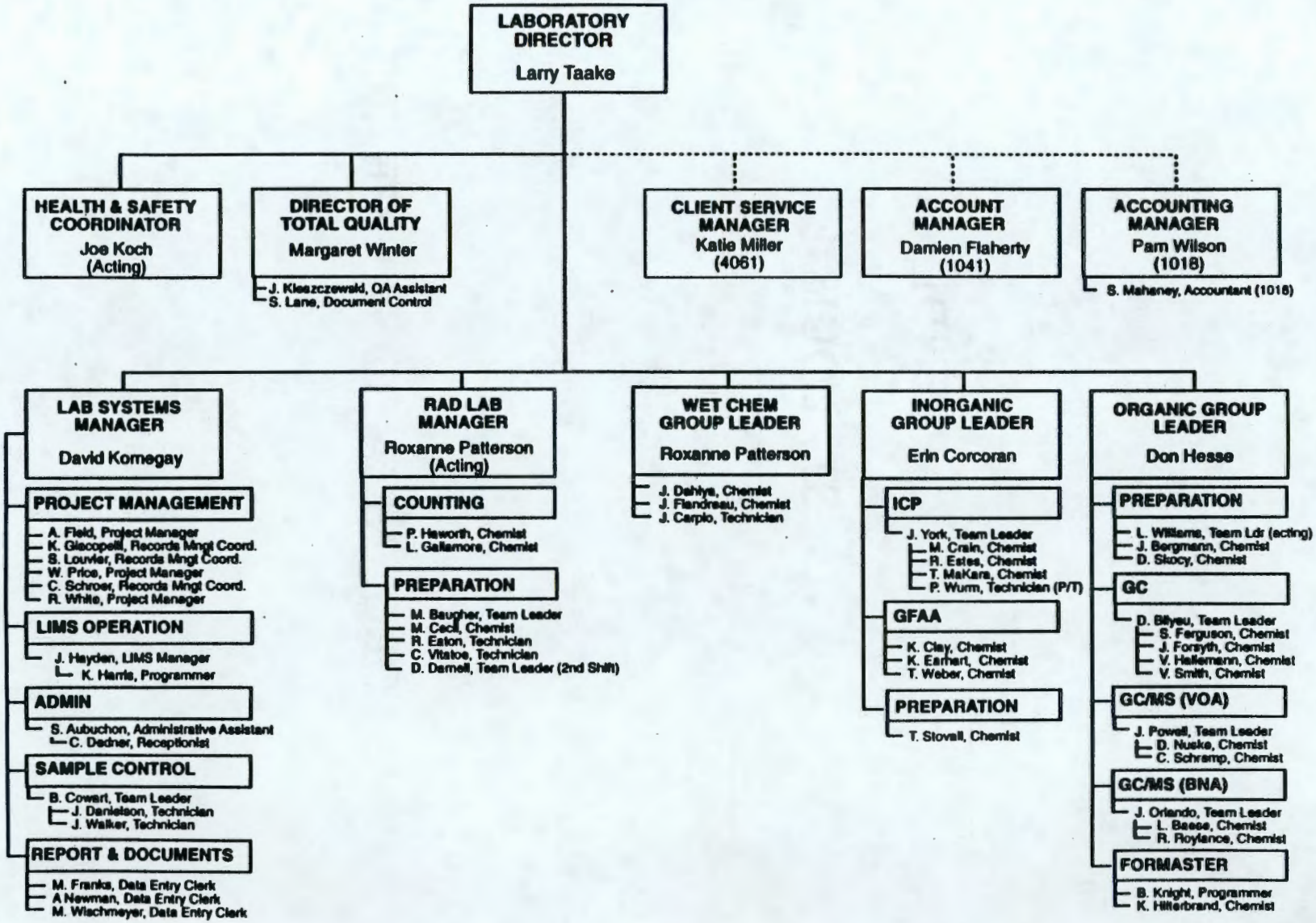

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APPENDIX

ST. LOUIS-2

INSTRUMENT LIST

TABLE SL-2-1
ITAS-ST. LOUIS LABORATORY
Instrument List
April, 1993

Instrument Type	Manufacturer (Number)	Model	Autosampler	Age (Yrs.)
Gas Chromatograph/Mass Spectrometer RTE Data System and Library (Wiley/NBS) 9-track magnetic tape Autosampler	Hewlett Packard (2)	5988A		5-7
	Hewlett Packard (6)	5970		7
Purge and Trap ALS/Heated Purge	Tekmar (5)	LSC2000		2-7
Gas Chromatograph Capillary/Packed Column Autoinjector, Autosampler	Hewlett Packard (7)	5890	HP7673A	4
	Hewlett Packard (1)	5880	HP7673A	7
Inductively-Coupled Argon Plasma Vacuum Spectrometer	Thermo Jarrell Ash (1)	1100		7
	Thermo Jarrell Ash (1)	9000		1
Atomic Absorption Spectrometer, Graphite Furnace	Perkin Elmer (2)	5100Z-PC		1
Atomic Absorption Spectrometer, Graphite Furnace/Flame	Perkin Elmer (1)	5100Z-PC		1
Atomic Absorption Spectrometer, Cold Vapor Assembly	Thermo Jarrell Ash (1)	12E		7
Total Organic Carbon Analyzer	Dohrmann-Xertex (1)	DC180		7
Total Organic Halogen Analyzer	Dohrmann-Xertex (1)	DX20A		7
Ion Chromatograph HPLC Module	Dionex (1)	4020i	Dionex	7
High-Pressure Liquid Chromatograph	Perkin Elmer (2)	410	PE ISS-100	7
	SSI (1)	220B	SGE LS3200	4
UV Spectrophotometer	Milton Roy (1)	601		7
Gel Permeation Chromatograph with UV Detector (GPC)	ABC Laboratories (1)	1002A		6

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TABLE SL-2-1
ITAS-ST. LOUIS LABORATORY
Instrument List
April, 1993

Instrument Type	Manufacturer (Number)	Model	Autosampler	Age (Yrs.)
IR Spectrophotometer, Ratio Recording	Perkin Elmer (1)	1420		6
Remote Microwave Digestion System	Floyd (1)	RMS 150		3
Gas Proportional Counter, Low Background, 16 Detectors	Tennelec (1)	LB4000		6
Gamma Spectrometer, Intrinsic Germanium Detectors	Princeton (1) Ortec (1) Canberra (1) Tennelec (1)	Multi-component system		1-6
Kinetic Phosphorescence Analyzer (KPA)	Chemchek (1)	Multi-component system		3
Scintillation Detector	Randam (4)	SC-5		3
Liquid Scintillation Detector	Packard (1)	2200CA		6
Alpha Spectrometer Counting System	EG&G Ortec (16) Canberra (4)	Multi-component system		6

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APPENDIX

ST. LOUIS-3

STANDARD OPERATING PROCEDURE LIST

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TABLE SL-3-1
ITAS-ST. LOUIS LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	SOP TITLE
0001	Standards Preparation
1001	Thermometer Calibration
1002	Automatic Pipetter Calibration
1003	Balance Calibration and the Use of Class S Weights
2001	Sample Receipt and Chain of Custody
2003	Release of Samples for Analysis Prior to Complete Login
3001	Cyanide Distillation
3003	Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by FLAA or ICAP
3004	Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by FLAA or ICAP
3005	Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by Graphite Furnace
3006	Acid Digestion of Sediments, Sludges and Soils
3007	Acid Digestion of Metals Samples (CLP Protocol)
3008	Distillation of Phenols
4001	Total Coliform
4002	Fecal Coliform
4003	Turbidity
4004	Cyanide Analysis of the Technicon TRAACS 800 Autoanalyzer
4005	Percent Solids Determination
4006	Extraction and Analysis of Chlorinated Herbicides
4007	The Analysis of 2,3,7,8-Tetrachlorinated Dibenzo-p-Dioxin
4008	Hardness
4009	Chemical Oxygen Demand (COD)
4011	The Analysis of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans
4012	Total Dissolved Solids Dried at 180°C (Filterable Residue)
4013	Total Solids Dried at 103-105°C (Non-Filterable Residue)
4014	Total Suspended Solids Dried at 103-105°C (Non-Filterable Residue)
4015	Oil and Grease (Partition-Gravimetric Method)

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TABLE SL-3-1
ITAS-ST. LOUIS LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	SOP TITLE
4018	Total Organic Halides (TOX)
4019	Analysis of pH in Water
4020	Analysis of Sulfide in Water
4024	Phosphorus, All Forms
4025	Analysis of Ammonia as Nitrogen
4026	Biochemical Oxygen Demand (BOD)
4027	Total Organic Carbon
4028	Phenolics, Total Recoverable
4029	Acidity of Water and Waste Water
4030	Alkalinity of Water and Waste Water
4031	Total Kjeldahl Nitrogen in Water and Waste Water
4032	The Analysis of Tetrachlorinated Dibenzo-P-Dioxins
4033	Analysis of pH in Soil
4034	Total Petroleum Hydrocarbons (TPH) by IR
4035	Nitrate/Nitrite Analysis by TRAACS 800 (Hydrazine Reduction)
4037	Conductivity in Water
4039	Flash Point by Pensky-Martins Closed Cup Tester
4040	Oil & Grease Recovery from Solids by Soxhlet Extraction
4041	Analysis of Anions by Ion Chromatography (Method 300.0)
4043	The Analysis of Volatile Organics by Gas Chromatography/Mass Spectroscopy, USEPA CLP, 2/88, Scope of Work
4045	Extraction and Analysis of Chlorinated Herbicides by EPA Method 615
4046	Headspace Analysis of Volatile Organics; Screening Method for Estimation of Concentration
4047	GC Analysis of Organochlorine Pesticides and PCBs by SW-846 Method 8080
4048	Extraction of Organophosphorus Pesticides
4049	GC Analysis of Organophosphorus Pesticides by SW-846 Method 8141
4050	The Analysis of Volatile Organics by Gas Chromatography/Mass Spectroscopy, USEPA CLP, 3/90, Scope of Work
4051	CLP GFAA Analysis

TABLE SL-3-1
ITAS-ST. LOUIS LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	SOP TITLE
4052	CLP ICP Analysis
4053	Extraction and Analysis of Semivolatile Organics by CLP 3/90
4055	Extractable Total Petroleum Hydrocarbons (TPH) by GC
4056	HPLC Analysis of Polynuclear Aromatic Hydrocarbons
4059	Analysis of Volatile Organics by Gas Chromatography/Mass Spectrometry, USEPA CLP, 2/88, Scope of Work
4060	Extraction of PCB's in Oil Samples
5001	Data Reports
5002	Data Packaging
5003	General Procedure for the Creation of Electronic Data Files
6001	Data Review and Verification
7001	Material Procurement and Control
7002	Personnel Training and Evaluation
7004	Software Development
7005	Evaluation of Analytical Accuracy & Precision through the use of Quality Control Charts
7006	Quality Assurance Summary
7007	IDL/MDL Determination
7008	QC Sample Tracking
7009	Quality and Operation Records Maintenance
7010	Autolab Sample Loading Verification
7011	Laboratory Logbook Control and Maintenance
7012	Internal Surveillances
8001	Off-Site Storage of Documentation
8002	Project Records and Document Control
9001	Preventive Maintenance
10001	Glassware Preparation for Organic and Dioxin Analyses
10002	Glassware Preparation for Inorganic and Trace Metal Analyses
10003	Temperature Monitoring
10004	Nonconformance and Corrective Action

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TABLE SL-3-1
ITAS-ST. LOUIS LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	SOP TITLE
10005	Preparation of PUF Plugs Prior to Air Sample Collection
10006	Water Monitoring
10007	Glassware Preparation for Radiochemistry and Radiological Screening Analyses
10008	Laboratory Security Systems
10009	Standard Operating Procedure Development and Control
10010	Preparation of Stainless Steel Planchet for Radiochemistry Analyses
12060	Monitoring Air Flow Rates
12313	Maintenance of Radiation Protection Records
12317	The ALARA Program
12323	Radiation Safety Training
12340	Dosimeter Program for Personnel and Area Monitoring
12350	Area Surveys and Radiation Monitoring
12352	Personnel Monitoring for Radioactive Contamination
12353	Radiation Work Permits
12380	Packaging and Storage of Radioactive Waste
12390	Emergencies Involving Radioactive Waste
12400	Personnel Decontamination
12410	Equipment and Area Decontamination
12420	Accountability of Licensed Radioactive Material
12430	Requisition of Licensed Materials
12440	Calibration and Maintenance of Radiation Survey Instruments
12450	Surveying Radioactive Material Shipments
12452	Receiving Packages with Greater than Type A Quantities of Radioactive Material
12460	Packaging and Transportation of Radioactive Materials
12501	Hazardous Waste Management Program
12502	Collection & Accumulation of Hazardous Waste
12503	Disposal of Samples After Analysis
12504	Hazardous Waste Sampling & Disposal

TABLE SL-3-1
ITAS-ST. LOUIS LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	SOP TITLE
12505	Guidelines for Disposal to Sewer
12506	Hazardous Waste Manifesting
12507	Safety Inspection of Storage Room
12508	Reporting to Regulatory Agencies
12509	Hazardous Waste Spill Response
12550	Treatability Studies for Waste Solidification
12710	Return of Samples to Client
12801	Contingency Plan
12820	Building Evacuation
12830	Fire Response
12840	Severe Weather/Power Failure Response
12850	Earthquake Response
12950	Lock Out/Tag Out of Hazardous Energy Sources
13001	Actinium 228 in Soil, Water and Other Media
13002	Gross Alpha/Beta
13003	Total Alpha Emitting Isotopes of Radium
13004	Preparation of Strontium 89 and 90
13005	Tritium in Water or other Fluids
13006	Preparation of Soil, Sludge and Filter Paper Samples for Radiochemical Analysis
13007	Sequential Determination of Isotopic Plutonium, Thorium and Uranium
13010	Radium 228 in Water
13012	Evaluation of the Sample Transmission Factor
13013	Operation and Calibration of the Alpha Spectrometer
13014	Calibration of Princeton Gamma Tech Intrinsic Germanium Gamma Spectrometer
13015	Screening Samples for the Presence of Radioactive Material
13016	Classifying Radioactive Samples
13017	Daily Calibration Verification and Maintenance of the Germanium Spectroscopy System
13018	Operation of the Germanium Spectroscopy System

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TABLE SL-3-1
ITAS-ST. LOUIS LABORATORY
Standard Operating Procedure (SOP) List

SOP NO.	SOP TITLE
13019	Calibration of the Low Background Gas Flow Proportional Counting System
13020	Daily Calibration Verification and Maintenance of the Low Background Gas Flow Proportional Counting System
13021	Operation of the Low Background Gas Flow Proportional Counting System
13022	Analysis of Total Uranium by Laser Induced Phosphorimetry
13023	Operation and Calibration of a Liquid Scintillation Counter
13026	Radiochemical Determination of Tritium in Soil, Vegetation and Other Biological Samples - Azeotropic Method
13027	Gross Alpha Radiation in Water Using Coprecipitation
13028	Preparation and Dissolution of Sediment and Soil by Microwave Digestion
13029	Drying and Grinding of Soil and Solid Samples
13030	Preparation of Samples for Gamma Spectroscopy
13031	Preparation of Vegetation and Tissue Samples
13032	Radium 226 and Radon 222 by Radon Emanation
13033	Determination of Plutonium and/or Americium in Small Soil and Fresh Water Sediment Samples

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APPENDIX

ST. LOUIS-4

ANALYTICAL METHODS

TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Acidity	Water	Method 305.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Alkalinity	Water	Method 310.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ammonia	Water	Method 350.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Bromide	Water	Method 300.0	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cation Exchange Capacity	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9081	Not Applicable	Not Applicable
Chloride	Water	Method 300.0[1] Method 325.3[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Conductivity	Water	Method 120.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Amenable)	Water	Method 335.1	Method 9010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 9010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Cyanide (Free)	Water	Not Applicable	Not Applicable	Not Applicable	Standard Methods 412 H
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Standard Methods 412 H

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Cyanide	Water	Method 335.2[2]	Method 9010	Method is CLP	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 1311 to obtain leachate Method 9010 for Leachate	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9010	Method is CLP	Not Applicable
Dissolved Organic Carbon (DOC)	Water	Method 415.1[3]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Flashpoint	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 1010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Fluoride	Water	Method 300.0[1] Method 340.2[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Hardness	Water	Method 130.2	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitrite (NO_2)	Water	Method 300.0[1] (non-preserved) Method 353.1[2] (preserved)	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Nitrate (NO_3)	Water	Method 300.0[1] (non-preserved) Method 353.1[2] (preserved)	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Nitrate plus Nitrite	Water	Method 353.1[3]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Oil and Grease	Water	Method 413.1	Method 9070	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 9071	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9071	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Ortho-phosphate	Water	Method 300.0[1] Method 365.1[1]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicab	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicab	Not Applicab	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
pH	Water	Method 150.1	Method 9040	Method CLP	Not Applicable
	Liquid	Not Applicable	Method 9040	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 9040	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method 9045	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 9045	Not Applicable	Not Applicable
Phenol	Water	Method 420.2[2]	Method 9066[2]	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

1690-2823 Rev

TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Phosphate (Total)	Water	Method 365.1[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Phosphorus (Total)	Water	Method 365.1[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Reactivity	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Section 7.3 Only Applicable to solid waste	Not Applicable	Not Applicable
	Soil	NA	Not Applicable	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Residual Chlorine	Water	Method 330.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not applicable
Sulfate (SO_4)	Water	Method 300.0[1]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sulfide (SO)	Water	Method 376.1[2]	Method 9030[4]	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Sulfite (SO_3)	Water	Method 377.1[5]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Organic Carbon (TOC)	Water	Method 415.1[2]	Method 9060[2]	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Organic Halides (TOX)	Water	Method 450.1[2]	Method 9020[6]	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Total Petroleum Hydrocarbons by IR	Water	Method 418.1	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Method 418.1-M
Total Solids	Water	Method 160.3[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Total Suspended Solids	Water	Method 160.2[2]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

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TABLE SL-4-1
ITAS-ST. LOUIS LABORATORY
Wet Chemistry Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Total Kjeldahl Nitrogen (TKN)	Water	Method 351.2	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Turbidity	Water	Method 180.1[4]	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Not Applicable	Not Applicable

[1]Includes drinking water, surface water and mixed (aqueous) industrial waste effluents.

[2]Includes drinking, surface and saline waters, aqueous domestic and industrial waste.

[3]Includes drinking and other waters wherein the carbonaceous matter is either soluble or has a particle size of 0.2 mm or less. Homogenizing a sample to reduce the particle size may cause loss of purgeable organic carbon, thus yielding erroneously low results.

[4]Includes drinking, surface and saline waters.

[5]Includes drinking and surface waters, sewage and aqueous industrial waste.

[6]Includes drinking and ground waters.

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TABLE SL-4-2
ITAS-ST. LOUIS LABORATORY
Metals Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Toxicity Characteristic Leaching Procedure (TCLP)	Water	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Not Applicable	Not Applicable	40 CFR Part 268
	Soil	Not Applicable	Not Applicable	Not Applicable	40 CFR Part 268
ICAP Metals	Water	Method 200.7	Method 3005 Method 3010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 3040	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3010	Not Ap[illegible]le	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Proper pretreatment is described in Section 9 of Method 200.7	Method 3050	Not Ap[illegible]	Not Applicable
	Soil	Not Applicable	Method 3050	Method CLP ILMO3.0	Not Applicable
CVAA Mercury	Water	Method 245.1	Method 7470	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Method 7470	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Method [illegible]	Not Applicable	Not Applicable
	Soil	Method 245.5	Method 7471	Method CLP ILMO3.0	Not Applicable

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TABLE SL-4-2
ITAS-ST. LOUIS LABORATORY
Metals Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Flame AA Metals	Water	Element Method Potassium 258.1	Element Method Potassium 3005 3010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Element Method Potassium 3040	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment	Not Applicable	Element Method Potassium 3050	Not Applicable	Not Applicable
	Soil	Not Applicable	Element Method Potassium 3050	Not Applicable	Not Applicable
GFAA Metals	Water	Element Method Arsenic 206.2 Antimony 204.2 Lead 239.2 Selenium 270.2 Silver 272.2 Thallium 279.2	Element Method Arsenic 3050 & 7060 Antimony 7041 Lead 3020 Selenium 3050 & 7740 Silver 7761 Thallium 3050 & 7841	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 3020	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3020	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solid, Sediment		Element Method Arsenic 3050 & 7060 Antimony 7041 Lead 3050 Selenium 3050 & 7740 Silver 7761 Thallium 3050 & 7841	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3050	Method CLP ILMO3.0	Not Applicable

TABLE SL-4-2
ITAS-ST. LOUIS LABORATORY
Metals Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other

[1]Includes drinking water, surface water and mixed (aqueous) industrial waste effluents.

[2]Includes drinking, surface and saline waters, aqueous domestic and industrial waste.

[3]Includes drinking and other waters wherein the carbonaceous matter is either soluble or has a particle size of 0.2 mm or less. Homogenizing a sample to reduce the particle size may cause loss of purgeable organic carbon, thus yielding erroneously low results.

[4]Includes drinking, surface and saline waters.

[5]Includes drinking and surface waters, sewage and aqueous industrial waste.

[6]Includes drinking and ground waters.

[7]Includes ground waters, drinking, surface and saline waters.

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TABLE SL-4-3
ITAS-ST. LOUIS LABORATORY
Organic Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Volatiles by GC/MS	Water	Method 624	Method 5030 Method 8240	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 5030 Method 8240	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 5030 Method 8240	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 5030 Method 8240	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 5030 Method 8240	Method CLP OLMO1.8	Not Applicable
Aromatic Volatiles by GC	Water	Method 602	Method 5030	Method CLP	Not Applicable
	Liquid	Not Applicable	Method 5030	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 5030	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 5030	Method CLP	Not Applicable
Semivolatiles by GC/MS	Water	Method 625	Method 3510 Method 3520	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3510 Method 3520	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3550 Method 3640	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3550 Method 3640	Method CLP OLMO1.8	Not Applicable

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TABLE SL-4-3
ITAS-ST. LOUIS LABORATORY
Organic Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Pesticides/ PCBs by GC	Water	Method 608	Method 3510 Method 3620	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3510 Method 3620	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3550 Method 3640 Method 3620	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3550 Method 3640 Method 3620	Method CLP OLMO1.8	Not Applicable
Dioxins/ Dibenzofurans by HRGC/LRMS[2]	Water	Method 613	Method 8280	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8280	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8280	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8280	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8280	Not Applicable	Not Applicable

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TABLE SL-4-3
ITAS-ST. LOUIS LABORATORY
Organic Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Nitroaromatics by HPLC	Water	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
	Liquid	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
	Soil	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038

TABLE SL-4-3
ITAS-ST. LOUIS LABORATORY
Organic Sample Preparation Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Total Petroleum Hydrocarbons by GC	Water	Not Applicable	Method 3510 Method 3520	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 3580	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 3510 Method 3520	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 3540 Method 3550	Not Applicable	Not Applicable
Herbicides by GC	Water	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8150	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8150	Not Applicable	Not Applicable

[1]Includes drinking, surface and saline water

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TABLE SL-4-4
ITAS-ST. LOUIS LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Aluminum	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Antimony	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Barium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable

[ ] This method is not recommend for this matrix.

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TABLE SL-4-4
ITAS-ST. LOUIS LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Beryllium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Bismuth	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not applicable	Not Applicable
Boron	Water	Method 200.7	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable

[ ] **This method is not recommend for this matrix.**

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TABLE SL-4-4
ITAS-ST. LOUIS LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Calcium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Cadmium	Water	Method 200.7[1]	Method 6010	Method CLP ILM03.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Cobalt	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable

[ ] **This method is not recommend for this matrix.**

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TABLE SL-4-4
ITAS-ST. LOUIS LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Chromium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Copper	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Iron	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable

[ ] **This method is not recommend for this matrix.**

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TABLE SL-4-4
ITAS-ST. LOUIS LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Magnesium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Manganese	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Molybdenum	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable

[ ] This method is not recommend for this matrix.

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TABLE SL-4-4
ITAS-ST. LOUIS LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Nickel	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Silicon	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable
Silver	Water	Method 200.7	Method 6010	CLP Method ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **4 Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable

This method is not recommend for this matrix.

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TABLE SL-4-4
ITAS-ST. LOUIS LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Sodium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Tin	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable
Titanium	Water	Method 200.7[1]	Method 6010	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Not Applicable	Not Applicable

This method is not recommend for this matrix.

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TABLE SL-4-4
ITAS-ST. LOUIS LABORATORY
Inductively Coupled Plasma Emission Spectroscopy Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Vanadium	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable
Zinc	Water	Method 200.7[1]	Method 6010	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 6010	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 6010	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 200.7 **Requires proper pretreatment**	Method 6010	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 6010	Method CLP ILMO3.0	Not Applicable

[1]Includes drinking, surface and saline water, domestic and industrial waste effluents.

The St. Louis Laboratory can recommend appropriate methodologies and can provide analysis for additional metals upon request.

This method is not recommend for this matrix.

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TABLE SL-4-5
ITAS-ST. LOUIS LABORATORY
Flame Atomic Absorption Inorganic Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Flame AA Metals	Water	Element Method Potassium 258.1	Element Method Potassium 7610	Not Applicable	Not Applicable
Potassium	Liquid	Not Applicable	Element Method Potassium 7610	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Element Method Potassium 7610	Not Applicable	Not Applicable
	Soil	Not Applicable	Element Method Potassium 7610	Not Applicable	Not Applicable

[1]Includes drinking water, surface water and mixed (aqueous) industrial waste effluents.

[2]Includes drinking, surface and saline waters, aqueous domestic and industrial waste.

[3]Includes drinking and other waters wherein the carbonaceous matter is either soluble or has a particle size of 0.2 mm or less. Homogenizing a sample to reduce the particle size may cause loss of purgeable organic carbon, thus yielding erroneously low results.

[4]Includes drinking, surface and saline waters

[5]Includes drinking nd surface waters, sewage and aqueous industrial waste.

[6]Includes drinking and ground waters

[7]Includes ground waters, drinking, surface and saline waters.

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TABLE SL-4-6
ITAS-ST. LOUIS LABORATORY
Graphite Furnace Atomic Absorption Methods

Parameter	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Antimony	Water	Method 204.2[1]	Method 7041	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 7041	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 7041	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 204.2 **Requires proper pretreatment.**	Method 7041	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7041	Method CLP ILMO3.0	Not Applicable
Arsenic	Water	Method 206.2[1]	Method 7060	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 7060	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 7060	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 206.2 **Requires proper pretreatment**	Method 7060	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7060	Method CLP ILMO3.0	Not Applicable

This method is not recommend for this matrix.

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TABLE SL-4-6
ITAS-ST. LOUIS LABORATORY
Graphite Furnace Atomic Absorption Methods

Parameter	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Lead	Water	Method 239.2[1]	Method 7421	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 74214	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 7421	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 239.2 **Requires proper pretreatment**	Method 7421	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7421	Method CLP ILMO3.0	Not Applicable
Selenium	Water	Method 270.2[1]	Method 7740	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 77404	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 7740	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 270.2 **Requires proper pretreatment**	Method 7740	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7740	Method CLP ILMO3.0	Not Applicable

This method is not recommend for this matrix.

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TABLE SL-4-6
ITAS-ST. LOUIS LABORATORY
Graphite Furnace Atomic Absorption Methods

Parameter	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Silver	Water	Method 272.2	Not Applicable	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 270.2 **Requires proper pretreatment**	Not Applicable	Not Applicable	Not Applicable
	Soil	Not Applicable	Not Applicable	Method CLP ILMO3.0	Not Applicable
Thallium	Water	Method 279.2[1]	Method 7841	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Method 7841	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 7841	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Method 279.2 **Requires proper pretreatment**	Method 7841	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 7841	Method CLP ILMO3.0	Not Applicable

[1]Includes drinking, surface and saline waters

This method is not recommend for this matrix.

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TABLE SL-4-7
ITAS-ST. LOUIS LABORATORY
Cold Vapor Atomic Absorption Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
CVAA Mercury	Water	Method 245.1	Method 7470	Method CLP ILMO3.0	Not Applicable
	Liquid	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	TCLP Extract	Not Applicable	Method 7470	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 7471	Not Applicable	Not Applicable
	Soil	Method 245.5	Method 7471	Method CLP ILMO3.0	Not Applicable

[1]Includes drinking water, surface water and mixed (aqueous) industrial waste effluents.

[2]Includes drinking, surface and saline waters, aqueous domestic and industrial waste.

[3]Includes drinking and other waters wherein the carbonaceous matter is either soluble or has a particle size of 0.2 mm or less. Homogenizing a sample to reduce the particle size may cause loss of purgeable organic carbon, thus yielding erroneously low results.

[4]Includes drinking, surface and saline waters

[5]Includes drinking nd surface waters, sewage and aqueous industrial waste.

[6]Includes drinking and ground waters

[7]Includes ground waters, drinking, surface and saline waters.

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TABLE SL-4-8
ITAS-ST. LOUIS LABORATORY
Organic Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Volatiles by GC/MS	Water	Method 624	Method 8240	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 8240	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8240	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8240	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8240	Method CLP OLMO1.8	Not Applicable
Aromatic Volatiles by GC	Water	Method 602	Method 8020	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8020	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8020	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8020	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8020	Not Applicable	Not Applicable
Semivolatiles by GC/MS	Water	Method 625	Method 8270	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 8270	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8270	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8270	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8270	Method CLP OLMO1.8	Not Applicable

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TABLE SL-4-8
ITAS-ST. LOUIS LABORATORY
Organic Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Pesticides/ PCBs by GC	Water	Method 608	Method 8080	Method CLP OLMO1.8	Not Applicable
	Liquid	Not Applicable	Method 8080	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8080	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8080	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8080	Method CLP OLMO1.8	Not Applicable
Dioxins/ Dibenzofurans by HRGC/LRMS[2]	Water	Method 613	Method 8280	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8280	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8280	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8280	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8280	Not Applicable	Not Applicable

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TABLE SL-4-8
ITAS-ST. LOUIS LABORATORY
Organic Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Nitroaromatics by HPLC	Water	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
	Liquid	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
	TCLP Leachate	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
	Soil	Not Applicable	Not Applicable	Not Applicable	ITAS St. Louis Developed Method SOP SL4038
Total Petroleum Hydrocarbons by GC	Water	Not Applicable	Method 8015-M	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8015-M	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8015-M	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8015-M	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8015-M	Not Applicable	Not Applicable

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TABLE SL-4-8
ITAS-ST. LOUIS LABORATORY
Organic Methods

Analytical Parameters	Matrix	Methods			
		NPDES	RCRA (SW846)	CLP	Other
Herbicides by GC	Water	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Liquid	Not Applicable	Method 8150	Not Applicable	Not Applicable
	TCLP Leachate	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Domestic Waste, Industrial Waste, Sludge, Solids, Sediment	Not Applicable	Method 8150	Not Applicable	Not Applicable
	Soil	Not Applicable	Method 8150	Not Applicable	Not Applicable

[1]Includes drinking, surface and saline water

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TABLE SL-4-9
ITAS-ST. LOUIS LABORATORY
Radiological Methods

Analytical Parameters	Matrix	Method
Gross Alpha/Beta	Water	EPA[1] 900.0
	Soil, Vegetation, Filter	Standard Methods[2], Method 7110
Radium-228	Water	EPA 904.0
Tritium	Water, Filters	EPA 906.0
	Soil, Vegetation	EPA EERF[3] H-01
Total Uranium	Water	ASTM[4], Method D5174-91 (KPA)
	Soil	HASL-300[5], 4.5.2.3 (Gamma)
Isotopic Uranium U-238, U-234, U-235	Water, Soil, Vegetation, Filters	NAS-NS-3050[6]
Isotopic Plutonium Pu-239/240, Pu-238	Water, Soil, Vegetation, Filters	NAS-NS-3058
Isotopic Thorium Th-228, Th-230, Th-232	Water, Soil, Vegetation, Filters	NAS-NS-3004
Technetium	Water, Soil, Vegetation, Filters	HASL-300, Tc-01
Gross Alpha by Coprecipitation	Water	EERF, 00-02
Americium-241	Water, Soil, Vegetation, Filters	NAS-NS-3006
Total Alpha Emitting Isoptopes of Radium	Water, Filters	EPA 903.0
Lead Pb-210	Water, Soil, Filters	EERF Pb-01
Polonium-210	Water	HASL-300, Po-02
Strontium-89,90 and Total Strontium	Water, Filters	NAS-NS-3010
Radium-226/228	Soil	HASL-300, 4.5.2.3 (Gamma)
Radium-226 Radon-222 (Emanation)	Water	EPA 903.1
Gamma Emitters Actinides, as applicable, Co-60, Cs-137, K-40, Mn-54, and other fission/activation products	Water, Soil, Vegetation, Filters	HASL-300, 4.5.2.3

TABLE SL-4-9
ITAS-ST. LOUIS LABORATORY
Radiological Methods

Analytical Parameters	Matrix	Method
[1]USEPA, Prescribed Procedures for Measurement of Radioactivity in Drinking Water, No. EPA-600/4-80-032, Cincinnati, Ohio, 1980.		
[2]Standard Methods, 18th Edition, 1992.		
[3]USEPA, Eastern Environmental Radiation Facility Radiochemistry Procedures Manual, No. 520/5-84-006, 1984.		
[4]Annual Book of American Society for Testing Materials (ASTM) Standards.		
[5]HASL, Environmental Measurements Laboratory Procedures Manual, No. HASL-300.		
[6]National Academy of Sciences, Nuclear Science Series		

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APPENDIX

ST. LOUIS-5

METHOD DETECTION LIMITS AND PRACTICAL QUANTITATION LIMITS

TABLE SL-5-1
ITAS-ST. LOUIS LABORATORY
Practical Quantitation Limits for
Wet Chemistry

Parameter	Method	PQL (ppm except as noted))
Alkalinity	310.1	5.0
Ammonia	350.1	0.050
BOD	405.1	1
CBOD	SM-5210	1
Bromide	300.0	0.25
Chloride	300.0	0.25
Chlorine, Total Residual	330.3	0.1
COD	410.4	5
Conductivity	120.1	1 umhos/cm
Cyanide	335.2/9010	0.005
Cyanide, amenable	335.1/9010	0.005
Flashpoint	1010	amb temp
Fluoride	340.2 300.0	0.1 0.1
Hardness	130.2	1
Nitrate	300.0	0.03
Nitrate/Nitrite	353.1	0.050
Nitrite	300.0	0.08
TKN	351.2	0.05
Oil & Grease	413.1/9070/9071	1
Orthophosphate	300.0 365.1	1 0.05
Paint Filter Test	9095	N/A
TPH	418.1	2.5
pH	150.1/9040/9045	0.01 units
Phenols	420.2	0.05
Sulfate	300.0	1.0
Sulfide	376.1/9030	1

TABLE SL-5-1
ITAS-ST. LOUIS LABORATORY
Practical Quantitation Limits for Wet Chemistry

Parameter	Method	PQL (ppm except as noted))
TDS	160.1	5
Total Solids	160.3	0.1
TSS	160.2	1
TOC	415.1/9060	1.0
TOX	450.1/9020	0.005
Turbidity	180.1	0.9 NTU

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TABLE SL-5-2
ST. LOUIS LABORATORY
ICAP Metals
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Element	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (mg/Kg)	Water MDL (ug/L)	Soil MDL[4] (mg/Kg)	Water PQL (ug/L)	Soil PQL[4] (mg/Kg)
Aluminum	7429-90-5	200	40	23.7	3.03	75	7.5
Antimony	7440-36-0	60	12	56.1	7.82	200	20
Arsenic	7440-38-2	10	2	222	44.9	500	50
Barium	7440-39-3	200	40	3.14	0.78	10	1
Beryllium	7440-41-7	5	1	4.42	0.57	10	1
Boron	7440-42-8			84.3	5.19	100	10
Bismuth	7440-69-9			48.7		500	50
Cadmium	7440-43-9	5	1	7.44	1.16	10	1
Calcium	7440-70-2	5000	1000	81.1	4.13	100	10
Chromium	7440-47-3	10	2	9.48	2.03	25	2.5
Cobalt	7440-48-4	50	10	7.23	0.91	20	2
Copper	7440-50-8	25	5	5.57	1.74	20	2
Iron	7439-89-6	100	20	41.6	6.16	50	5
Lead	7439-92-1	3	0.6	148	26.1	150	15
Lithium	7439-93-2			58.7	33.4	200	20
Magnesium	7439-95-4	5000	1000	17.2	2.43	100	10
Manganese	7439-96-5	15	3	4.01	1.22	10	1
Molybdenum	7439-98-7			22.7	9.16	50	5
Nickel	7440-02-0	40	8	72.4	16.9	75	7.5
Potassium	7440-09-7	5000	1000	1300	447	5000	500
Selenium	7782-49-2	5	1	315	43.5	500	50
Silicon	7440-21-3			448		450	45
Silver	7440-22-4	10	2	3.21	1.01	20	2
Sodium	7440-22-4	5000	1000	565	4.74	1000	100
Strontium	7440-24-6			1.61		50	5
Tellurium	13494-80-9			176	32.0	200	20
Thallium	7440-28-0	10	2	52.1	77.5	500	50
Thorium	7440-29-1			26.6	2.49	750	75
Tin	7440-31-5			224	12.9	2000	200

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TABLE SL-5-2
ST. LOUIS LABORATORY
ICAP Metals
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Element	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (mg/Kg)	Water MDL (ug/L)	Soil MDL[4] (mg/Kg)	Water PQL (ug/L)	Soil PQL[4] (mg/Kg)
Titanium	7440-32-6			87.7		1000	100
Uranium	7440-62-2			88.4	27.0	500	50
Vanadium	7440-62-2	50	10	17.7	0.93	20	2
Zinc	7440-66-6	20	4	3.88	1.26	20	2

1 CRDLs apply to work performed according to the USEPA Scope of Work ILM03.0 and its revisions.

2 Method detection limits were performed using SW-846 Method 6010 on 9/2/92 and 3/24/93 for waters. Soil MDLs were run using Method 6010 on 9/2/92.

3 PQLs were estimated from the results of water MDL determinations.

4 Soil detection limits are based on wet weight of sample, and will be higher when converted to a dry weight basis.

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TABLE SL-5-3
ST. LOUIS LABORATORY
AA Metals
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Element	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (mg/Kg)	Water MDL (ug/L)	Soil MDL[4] (mg/Kg)	Water PQL (ug/L)	Soil PQL[4] (mg/Kg)
Arsenic	7440-38-2	10	2	1.7	0.091	3	0.3
Lead	7439-92-1	3	0.6	1.9	0.098	3	0.3
Selenium	7782-49-2	5	1	0.50	0.023	3	0.3
Thallium	7440-28-0	10	2	2.38	0.204	3	0.3
Antimony	7440-36-0	60	12	4.5	0.36	6	0.6
Silver	7440-22-4	10	2	6.4	0.64	8	0.8
Mercury[5]	7439-97-6	0.2	0.1	0.175	0.013	0.2	0.1

1 CRDLs apply to analyses performed under the Scope of Work of the USEPA Scope of work of Work ILM03.0 and its revisions.

2 Method detection limits for furnace metals were determined between 2/12/93 and 4/2/93. Water MDLs for mercury were determined on 9/9/92. Soil MDLs for mercury were determined on 6-22-93.

3 PQLs are estimated from the method detection limit studies for water samples.

4 Soil detection limits are based on wet weight of sample; detection limits will be higher when corrected for percent solids.

5 Mercury is performed by cold vapor atomic absorption. The other elements are performed by graphite furnace techniques.

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TABLE SL-5-4
ST. LOUIS LABORATORY
CLP or Hazardous Substance List for Volatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2] and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/Kg)
Chloromethane	74-87-3	10	10	2.1	1.2	10	10
Bromomethane	74-83-9	10	10	1.6	1.7	10	10
Vinyl Chloride	75-01-4	10	10	2.1	1.2	10	10
Chloroethane	75-00-3	10	10	2.1	2.4	10	10
Methylene Chloride	75-09-2	10	10	0.50	0.44	5	5
Acetone	67-64-1	10	10	2.8	6.0	100	100
Carbon Disulfide	75-15-0	10	10	1.2	0.47	5	5
1,1-Dichloroethene	75-35-4	10	10	1.0	0.50	5	5
1,1-Dichloroethane	75-34-3	10	10	0.47	0.41	5	5
1,2-Dichloroethene (total)	540-59-0	10	10	0.82	0.82	5	5
Chloroform	67-66-3	10	10	0.44	0.28	5	5
1,2-Dichloroethane	107-06-2	10	10	0.19	0.19	5	5
2-Butanone	78-93-3	10	10	3.8	2.2	100	100
1,1,1-Trichloroethane	71-55-6	10	10	0.79	0.50	5	5
Carbon Tetrachloride	56-23-5	10	10	0.85	0.53	5	5
Vinyl Acetate		NA	NA	0.97	2.0	50	50
Bromodichloromethane	75-27-4	10	10	0.35	0.31	5	5
1,2-Dichloropropane	78-87-5	10	10	0.35	0.53	5	5
cis-1,3-Dichloropropene	10061-01-5	10	10	0.28	0.50	5	5
2-chloroethylvinylether	110-75-8	NA	NA	1.1	1.5	10	10
Trichloroethene	79-01-6	10	10	0.53	0.85	5	5
Dibromochloromethane	124-48-1	10	10	0.22	0.31	5	5
1,1,2-Trichloroethane	79-00-5	10	10	0.44	0.28	5	5
Benzene	71-43-2	10	10	0.31	0.22	5	5
trans-1,3-Dichloropropene	10061-02-6	10	10	0.44	0.38	5	5
Bromoform	75-25-2	10	10	0.31	0.44	5	5
4-Methyl-2-Pentanone	108-10-1	10	10	2.0	2.3	50	50
2-Hexanone	591-78-6	10	10	1.3	3.3	50	50
Tetrachloroethene	127-18-4	10	10	0.66	0.50	5	5

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TABLE SL-5-4
ST. LOUIS LABORATORY
CLP or Hazardous Substance List for Volatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2] and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/Kg)
Toluene	108-88-3	10	10	0.50	0.57	5	5
1,1,2,2-Tetrachloroethane	79-34-5	10	10	0.53	1.2	5	5
Chlorobenzene	108-90-7	10	10	0.38	0.44	5	5
Ethylbenzene	100-41-4	10	10	0.47	0.47	5	5
Styrene	100-42-5	10	10	0.44	0.41	5	5
Xylene (total)	1330-20-7	10	10	0.72	0.38	5	5

[1] CRDLs apply to analyses performed under the USEPA CLP Scope of Work OLMO1.0 and its revisions only.

[2]The Method Detection Limit study for water was performed on 6-10-93 and 6-11-93. The MDL study for soil was performed on 6-10-93. Both studies were run by SW-846 Method 8240.

[3]Practical Quantitation Limits are taken from SW-846 Method 8240.

[4]Quantitation limits listed for soil are based on wet weight. The quantitation limits based on dry weight as required, will be higher.

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TABLE SL-5-5
ST. LOUIS LABORATORY
CLP or Hazardous Substance List for Semivolatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2] and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/L)
Phenol	108-95-2	10	330	3.4	115	10	330
bis(2-Chloroethyl)ether	111-44-4	10	330	1.3	117	10	330
2-Chlorophenol	95-57-8	10	330	6.2	102	10	330
1,3-Dichlorobenzene	541-73-1	10	330	2.4	64	10	330
1,4-Dichlorobenzene	106-46-7	10	330	2.6	44	10	330
Benzyl Alcohol	100-51-6	NA	NA	3.7	83	20	670
1,2-Dichlorobenzene	95-50-1	10	330	2.3	83	10	330
2-Methylphenol	95-48-7	10	330	6.0	78	10	330
bis(2-chloroisopropyl)ether	108-60-1	10	330	2.1	163	10	330
4-Methylphenol	106-44-5	10	330	5.4	171	10	330
n-Nitroso-di-n-Propylamine	621-64-7	10	330	1.6	166	10	330
Hexachloroethane	67-72-1	10	330	3.0	104	10	330
Nitrobenzene	98-95-1	10	330	1.1	181	10	330
Isophorone	78-59-1	10	330	1.2	204	10	330
2-Nitrophenol	88-75-5	10	330	1.6	98	10	330
2,4-Dimethylphenol	105-67-9	10	330	5.3	84	10	330
Benzoic Acid	65-85-0	NA	NA		345	50	1600
bis(2-Chloroethoxy) Methane	111-91-1	10	330	1.5	67	10	330
2,4-Dichlorophenol	120-83-2	10	330	6.1	34	10	330
1,2,4-Trichlorobenzene	120-82-1	10	330	2.3	51	10	330
Naphthalene	91-20-3	10	330	2.3	49	10	330
4-Chloroaniline	106-47-8	10	330	1.6	232	20	670
Hexachlorobutadiene	87-68-3	10	330	2.8	106	10	330
4-Chloro-3-Methylphenol	59-50-7	10	330	5.6	151	20	670
2-Methylnaphthalene	91-57-6	10	330	3.7	122	10	330

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TABLE SL-5-5
ST. LOUIS LABORATORY
CLP or Hazardous Substance List for Semivolatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2] and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/L)
Hexachlorocyclopentadiene	77-47-4	10	330	1.9	82	10	330
2,4,6-Trichlorophenol	88-06-2	10	330	7.2	87	10	330
2,4,5-Trichlorophenol	95-95-4	25	800	6.0	100	10	330
2-Chloronaphthalene	91-58-7	10	330	2.5	109	10	330
2-Nitroaniline	88-74-4	25	800	1.3	94	50	1600
Dimethyl Phthalate	131-11-3	10	330	3.6	74	10	330
Acenaphthylene	208-96-8	10	330	1.9	55	10	330
2,6-Dinitrotoluene	606-20-2	10	330	1.4	82	10	330
3-Nitroaniline	99-09-2	25	800	1.8	271	50	1600
Acenaphthene	83-32-9	10	330	2.4	32	10	330
2,4-Dinitrophenol	51-28-5	25	800	50	67	50	1600
4-Nitrophenol	100-02-7	25	800	31	158	50	1600
Dibenzofuran	132-64-9	10	330	1.9	89	10	330
2,4-Dinitrotoluene	121-14-2	10	330	0.92	133	10	330
Diethylphthalate	84-66-2	10	330	2.1	207	10	330
4-Chlorophenyl-phenylether	7005-72-36	10	330	2.2	176	10	330
Fluorene	86-73-7	10	330	2.0	188	10	330
4-Nitroaniline	100-01-6	25	800	2.2	94	50	1600
4,6-Dinitro-2-Methylphenol	534-52-1	25	800	23	86	50	1600
n-Nitrosodiphenylamine	86-30-6	10	330	1.4	74	10	330
4-Bromophenyl-phenylether	101-55-3	10	330	2.1	114	10	330
Hexachlorobenzene	118-74-1	10	330	2.0	208	10	330
Pentachlorophenol	87-86-5	25	800	11	77	50	1600
Phenanthrene	85-01-8	10	330	1.2	34	10	330
Anthracene	120-12-7	10	330	1.2	37	10	330

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TABLE SL-5-5
ST. LOUIS LABORATORY
CLP or Hazardous Substance List for Semivolatile Organics with Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2] and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/L)
Carbazole	86-74-8	10	330	NA	60	10	330
Di-n-Butylphthalate	84-74-2	10	330	1.4	263	10	330
Fluoranthene	206-44-0	10	330	1.4	181	10	330
Pyrene	129-00-0	10	330	1.2	160	10	330
Butylbenzylphthalate	85-68-7	10	330	1.7	192	10	330
3,3'-Dichlorobenzidine	91-94-1	10	330	1.6	175	20	670
Benzo(a)anthracene	56-55-3	10	330	2.8	19	10	330
Chrysene	218-01-9	10	330	2.1	31	10	330
bis(2-Ethylhexyl)phthalate	117-81-7	10	330	3.3	92	10	330
Di-n-Octylphthalate	117-84-0	10	330	1.4	106	10	330
Benzo(b)fluoranthene	205-99-2	10	330	1.9	93	10	330
Benzo(k)fluoranthene	207-08-9	10	330	1.3	100	10	330
Benzo(a)pyrene	50-32-8	10	330	1.2	44	10	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	330	1.4	184	10	330
Dibenzo(a,h)anthracene	53-70-3	10	330	0.85	203	10	330
Benzo(g,h,i)perylene	191-24-2	10	330	1.8	167	10	330

1 CRDLs apply to analyses performed under the USEPA CLP Scope of Work OLM01.0 and its revisions only.

2 The Method Detection Limit for water was performed by SW-846 Method 8270 on 7-16-93. The MDL study for soil was performed by SW-846 Method 8270 on 1-20-93 and 2-3-93.

3 Practical Quantitation Limits are taken from SW-846 Method 8270; soil detection limits are based on wet weight, and are the same with and without GPC cleanup.

4 Quantitation limits listed are for low soil procedure, and are based on wet weight. The quantitation limits based on dry weight as required, will be higher. The quantitation limits for medium level soil procedures will be higher by a factor of 30 than the low soil limits.

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TABLE SL-5-6
ST. LOUIS LABORATORY
Pesticides and PCBs
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/Kg)
α-BHC	319-84-6	0.05	1.7	0.017	1.36	0.03	0.99
β-BHC	319-85-7	0.05	1.7	0.035	0.32	0.06	2.0
δ-BHC	319-86-8	0.05	1.7	0.032	0.37	0.09	3.0
γ-BHC (Lindane)	58-89-9	0.05	1.7	0.023	1.5	0.04	1.3
Heptachlor	76-44-8	0.05	1.7	0.013	1.4	0.03	0.99
Aldrin	309-00-2	0.05	1.7	0.029	0.33	0.04	1.3
Heptachlor Epoxide	1024-57-3	0.05	1.7	0.030	0.36	0.83	27
Endosulfan I	959-98-8	0.05	1.7	0.014	1.5	0.14	4.6
Dieldrin	60-57-1	0.10	3.3	0.029	2.8	0.02	0.66
4,4'-DDE	72-55-9	0.10	3.3	0.056	0.67	0.04	1.3
Endrin	72-20-8	0.10	3.3	0.033	2.8	0.06	2.0
Endosulfan II	33213-65-9	0.10	3.3	0.061	2.1	0.04	1.3
4,4'-DDD	72-54-8	0.10	3.3	0.030	3.3	0.11	3.6
Endosulfan sulfate	1031-07-8	0.10	3.3	0.050	3.2	0.66	22
4,4'-DDT	50-29-3	0.10	3.3	0.029	3.0	0.12	4.0
Methoxychlor	72-43-5	0.50	17.0	0.17	15	1.8	59
Endrin Aldehyde	7421-93-4	0.10	3.3	0.045	0.66	0.23	7.6
Endrin Ketone	53494-70-5	0.10	3.3	0.052	0.72	NA	NA
α-Chlordane	5103-71-9	0.05	1.7	0.029	0.33	NA	NA
γ-Chlordane	5103-74-2	0.05	1.7	0.028	0.34	NA	NA
Chlordane (Tech)	57-74-9	NA	NA	0.05	2.6	0.14	4.6
Toxaphene	8001-35-2	5.0	170.0	2.2	ND0	2.4	79
Aroclor 1016	12674-11-2	1.0	33.0	0.30	16.7	1.0	33
Aroclor 1221	11104-28-2	2.0	67.0	0.59	37.2	1.0	33
Aroclor 1232	11141-16-5	1.0	33.0	0.50	15.6	1.0	33
Aroclor 1242	53469-21-9	1.0	33.0	0.79	10.2	1.0	33
Aroclor 1248	12672-29-6	0.50	33.0	0.83	7.4	1.0	33
Aroclor 1254	11097-69-1	1.0	33.0	0.45	3.7	1.0	33

TABLE SL-5-6
ST. LOUIS LABORATORY
Pesticides and PCBs
Contract Required Detection Limits (CRDL)[1], Method Detection Limits (MDL)[2], and Practical Quantitation Limits (PQL)[3]

Analyte	CAS Number	Water CRDL (ug/L)	Soil CRDL[4] (ug/Kg)	Water MDL (ug/L)	Soil MDL[4] (ug/Kg)	Water PQL (ug/L)	Soil PQL[4] (ug/Kg)
Aroclor 1260	11096-82-5	1.0	33.0	0.32	18	1.0	33

1 CRDLs apply to analyses performed under the USEPA Scope of Work OLM01.0 and its revisions.

2 The Method Detection Limit studies for pesticides/PCBs were performed on 1/18/93 and on 2/4/93 using Method 8080.

3 Practical Quantitation Limits are taken from SW-846 method 8080.

4 Quantitation limits listed for soil are based on wet weight. The quantitation limits based on dry weight as required. will be higher.

NA = Not Applicable
ND = Not Determined

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TABLE SL-5-7
ST. LOUIS LABORATORY
Chlorinated Herbicides
Method Detection Limits (MDL)[1], and
Practical Quantitation Limits (PQL)[2]

Analyte	CAS Number	Water MDL (ug/L)	Soil MDL[3] (ug/Kg)	Water PQL (ug/L)	Soil PQL[3] (ug/Kg)
Dalapon	75-99-0	9.48	320	58	1160
Dicamba	1918-00-9	0.28	31.3	2.7	54
MCPA	94-74-6	97.2	8120	2490	49800
MCPP	93-65-2	122	5960	1920	38400
Dichlorprop	120-36-5	1.05	87.0	6.5	130
2,4-D	94-75-7	2.15	158	12	240
2,4,5-TP (Silvex)	93-72-1	0.19	14.9	1.7	35
2,4,5-T	93-76-5	0.21	15.1	2.0	40
Dinoseb	88-85-7	0.14	1.98	0.7	14
2,4-DB	94-82-6	1.20	84.2	9.1	182

1 MDLs were determined on 1/14/93, using SW-846 Method 8150.

2 PQLs are taken from SW-846 Method 8150. The soil detection limits reflect the dilution factor obtained from a 50 gram sample taken to a volume of 10 mls.

3 Soil detection limits are based on 50 g. wet weight. Detection limits corrected for percent solids will be higher.

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TABLE SL-5-8
ST. LOUIS LABORATORY
Organophosphorous Pesticides
Method Detection Limits (MDL)[1], and
Practical Quantitation Limits (PQL)[2]

Analyte	CAS Number	Water MDL (ug/L)	Soil MDL[3] (ug/Kg)	Water PQL (ug/L)	Soil PQL[3] (ug/Kg)
Demeton	8065-48-3	0.55	5.21	1.2	40
Diazinon	333-41-5	0.13	7.63	2.0	67
Disulfoton	298-04-4	0.12	7.02	0.70	23
Methyl Parathion	298-00-0	0.11	8.19	1.2	40
Malathion	121-75-5	0.12	11.0	1.1	37
Ethyl Parathion	56-38-2	0.10	6.77	0.60	20
Ethion	563-12-2	0.09	7.26	(0.60)	(20)
Azinphos Methyl	86-50-0	0.43	22.6	1.0	33
EPN	2104-64-5	0.56	9.69	0.40	13

1 MDLs for water analyses were determined on 2/3/93, and for soils on 12/23/92, both using SW-846 Method 8140.

2 PQLs are taken from SW-846 Method 8141A, except for Ethion, for which PQLs are assigned according to the similarity of the MDL values to Ethyl Parathion.

3 Soil detection limits are based on 30 g. wet weight. Detection limits corrected for percent solids will be higher.

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TABLE SL-5-9
ST. LOUIS LABORATORY
Aromatic Volatiles by GC
Method Detection Limits (MDL)[1], and
Practical Quantitation Limits (PQL)[2]

Analyte	CAS Number	Water MDL (ug/L)	Soil MDL[3] (ug/Kg)	Water PQL (ug/L)	Soil PQL[3] (ug/Kg)
Benzene	71-43-[illegible]	0.09	0.06	2.0	2.0
Chlorobenzene	108-9[illegible]	0.16	0.22	2.0	2.0
1,4-Dichlorobenzene	106-4[illegible]	0.38	0.75	3.0	3.0
1,3-Dichlorobenzene	541-73-1	0.25	0.38	4.0	4.0
1,2-Dichlorobenzene	95-50-1	0.35	0.69	4.0	4.0
Ethylbenzene	100-41-4	0.16	0.19	2.0	2.0
Toluene	108-88-3	0.16	0.38	2.0	2.0
m,p-Xylene		0.19	0.44	2.0	2.0
o-Xylene	95-47-6	0.19	0.94	2.0	2.0

1 MDLs were determined on 8/27/93 for water and on 8/19/93 for soil samples using SW-846 Method 8020.

2 PQLs are taken from SW-846 Method 8020, with the exception of the PQLs for xylenes, which are determined by comparison to the other PQLs.

3 Soil detection limits are based on 5 g. wet weight. Detection limits corrected for percent solids will be higher.

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TABLE SL-5-10
ST. LOUIS LABORATORY
Polynuclear Aromatic Hydrocarbons by HPLC
Method Detection Limits (MDL)[1], and
Practical Quantitation Limits (PQL)[2]

Analyte	CAS Number	Water MDL (µg/L)	Water PQL (µg/L)
Naphthalene	91-20-3	1.2	18
Acenaphthylene	208-96-8	1.5	23
Acenaphthene	83-32-9	1.6	18
Fluorene	86-73-7	0.24	2.1
Phenanthrene	85-01-8	0.29	6.4
Anthracene	120-12-7	1.2	6.6
Fluoranthene	206-44-0	0.22	2.1
Pyrene	129-00-0	0.33	2.7
Benzo(a)anthracene	56-55-3	0.063	0.13
Chrysene	218-01-9	0.062	1.5
Benzo(b)fluoranthene	205-99-2	0.057	0.18
Benzo(k)fluoranthene	207-08-9	0.11	0.17
Benzo(a)pyrene	50-32-8	0.048	0.23
Dibenzo(ah)anthracene	53-70-3	0.16	0.30
Benzo(ghi)perylene	191-24-2	0.099	0.76
Indeno(123-cd)pyrene	193-39-5	0.10	0.43

[1] MDLs for water analyses were determined on 8/10/93, using SW-846 Method 8310.

[2] PQLs are taken from SW-846 Method 8310.

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TABLE SL-5-11
ST. LOUIS LABORATORY
Polychlorinated Dioxins and Furans
Method Detection Limits (MDL)[1], and
Practical Quantitation Limits (PQL)[2]

Analyte	CAS Number	Water MDL (ng/L)	Soil MDL[3] (ug/Kg)	Water PQL (ng/L)	Soil PQL[3] (ug/Kg)
2378-TCDD	1746-01-6	6.05	0.27	10	1.0
12378-PeCDD	40321-76-4	1.77	0.42	25	2.5
123478-HxCDD	39227-28-6	3.57	0.54	25	2.5
123678-HxCDD	57653-85-7	2.62	0.64	25	2.5
123789-HxCDD	19408-74-3	2.36	0.70	25	2.5
2378-TCDF	51207-31-9	0.78	0.13	10	1.0
12378-PeCDF	57117-41-6	3.07	0.49	25	2.5
23478-PeCDF	57117-31-4	2.42	0.38	25	2.5
123478-HxCDF	70648-26-9	6.96	0.44	25	2.5
123678-HxCDF	57117-44-9	6.90	0.38	25	2.5
234678-HxCDF	60851-34-5	2.15	0.38	25	2.5
123789-HxCDF	72918-21-9	1.85	0.38	25	2.5
1234678-HpCDD	35822-46-9	7.22	0.19	25	2.5
OCDD	3268-87-9	29.0	0.19	50	5.0
1234678-HpCDF	67562-39-4	8.75	0.42	25	2.5
1234789-HpCDF	55673-89-7	2.56	0.14	25	2.5
OCDF	39001-02-0	16.2	0.84	50	5.0

1 MDLs for water analyses were determined on 7/26/93, and for soils on 3/22/93, both using SW-846 Method 8280.

2 PQLs are taken from the USEPA CLP Statement of Work for Analysis of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans, Document Number DFLM01.1.

3 Soil detection limits are based on 10 g. wet weight. Detection limits corrected for percent solids will be higher.

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FIGURE SL-5-12
ITAS-ST. LOUIS LABORATORY
Radiochemical Target Detection Limits

Analytical Parameters	Matrix	Detection Limit[1]
Total Uranium	Water	1 μg/L (KPA)
	Soil	20 μg/g (gamma)
Radium-228	Water	3 pCi/L
Tritium	Water	500 pCi/L
	Soil	500 pCi/L
Gross Alpha	Water	5 pCi/L[2]
	Soil, Vegetation	25 pCi/g
	Filter	1 pCi/filter
Gross Beta	Water	4 pCi/L
	Soil, Vegetation	25 pCi/g
	Filter	2 pCi/filter
Total Alpha Emitting Isotopes for Radium	Water, Vegetation	1 pCi/unit volume
Radium-226/228 by Gamma	Soil	1 pCi/g (Ra-226)
		3 pCi/g (Ra-228)
Isotopic Americium, Uranium, Plutonium, Thorium	Water	1 pCi/L
	Soil	1 pCi/g
	Vegetation	1 pCi/g
	Filter	1 pCi/filter
Technetium-99	Water, Filter	3 pCi/L
	Soil, Vegetation	2 pCi/g
Strontium-89/90	Water, Filter	1 pCi/L
	Soil, Vegetation	1 pCi/g
Polonium-210	Water	1 pCi/L
Lead-210	Water	1 pCi/L
Gamma	Water, Filter	20 pCi/L (based on Cs-137)
	Soil, Vegetation	2 pCi/g (based on Cs-137)
Ra-226/Rn-222 by Emanation	Water	0.2 pCi/L

FIGURE SL-5-12
ITAS-ST. LOUIS LABORATORY
Radiochemical Target Detection Limits

Analytical Parameters	Matrix	Detection Limit[1]

[1]Count durations for all samples will be optimized so that client required detection limits can be achieved. Interferences, contaminants, and other matrix problems may cause the sample detection limit to exceed the desired detection limit.

[2]Achievable only when dissolved solids <500 ppm.

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APPENDIX

ST. LOUIS-6

PERFORMANCE EVALUATION STUDIES

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TABLE SL-6-1
ITAS-ST. LOUIS Laboratory
Performance Evaluation Studies

PE Sample Program Description	Analysis Performed	Frequency of Participation
USEPA Water Supply Performance Evaluation Study- Environmental Monitoring Systems Laboratory- Cincinnati	Trace Metals, Minerals, Nutrients, Demands, PCBs, Pesticides, Volatile Halocarbons, Volatile Aromatics and Miscellaneous Parameters, in Water	Bi-Annually
USEPA Water Pollution Performance Evaluation Study - Environmental Monitoring Systems Laboratory - Cincinnati	Trace Metals, Nitrate/Nitrite/Fluoride, Trihalomethanes, Volatile Organics and Miscellaneous Parameters, in Water	Bi-Annually
USEPA Inorganic Performance Evaluation Study - Environmental Monitoring Systems Laboratory - Las Vegas	Metals in Water and Soil. TAL[1]	Quarterly
USEPA Environmental Radioactivity Laboratory Intercomparison Studies Program - Environmental Monitoring Systems Laboratory - Las Vegas	U-Total, $^{226/228}$Ra, Gross α/β, $^{89/90}$Sr, ^{239}Pu, and ^{3}H in Water. Gamma Emitters in Water. Blind Samples A & B in Water. Gross α/β, ^{90}Sr, ^{137}Cs in Filters.	Monthly
Department of Energy Environmental Measurements Laboratory (DOE-EML) Office of Environmental Restoration and Waste Management, Quality Assessment Program - New York	Gamma Emitters, ^{90}Sr, $^{238/239}$Pu, ^{241}Am, $^{234/238}$U, and U-Total in Filters. Gamma Emitters, ^{90}Sr, ^{239}Pu, ^{241}Am, and $^{234/238}$U in Soil. Gamma Emitters, ^{90}Sr, $^{238/239}$Pu and ^{241}Am in Vegetation. Gamma Emitters, ^{90}Sr, $^{238/239}$Pu, ^{241}Am, $^{234/238}$U and U-Total in Water.	Bi-Annually

[1] Target Analyte List USEPA CLP ILM03.0

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APPENDIX

ST. LOUIS-7

PREVENTIVE MAINTENANCE SCHEDULES

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TABLE SL-7-1
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Gas Chromatography[1]

As Needed	Semi-annually
Replace front portion of column packing or break off front portion of capillary columns. Replace column if this action fails to restore performance of the column or when column performance (*e.g.* peak tailing, poor resolution, high backgrounds, etc.) indicates it is required.	Perform ECD wipe test.
Change glass wool plug in injection port and/or replace injection port liner with cleaned liner when front portion of column packing is changed or front portion of capillary column is removed.	Replace carbon filters at instrument effluent sites.
Replace septum (usually approximately every 100 injections).	
Perform gas purity check (if high baseline indicates that impure carrier gas may be in use).	
Replace or repair flow controller if constant gas flow cannot be maintained.	
Change fuse when performance indicates fuse has blown.	
Reactivate external carrier gas dryers when blue indicator changes to pink.	
Clean detectors when baseline indicates contamination or when response is low.	
Reactivate flow controller filter dryers when presence of moisture is suspected.	
Tekmar purge and trap devices: replace traps and columns when poor response or disappearance of reactive or poorly trapped compounds.	

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

TABLE SL-7-2
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Gel Permeation Chromatograph (GPC)[1]

As Needed	Daily	Monthly	Semi-annually	Annually
Replace column packing material and filter membranes when column performance does not meet method specifications	None	None	Oil the electric motor on the pump every 1500-2000 hours of use.	None
Backflush loops if pressure exceeds 15-psi (due to a small particle clogging the valve)				

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE SL-7-3
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Mass Spectrometers[1]

Instrument	As Needed	Monthly	Annually
Mass Spectrometer	Check level of oil in mechanical pumps and diffusion pump if vacuum is insufficient. Add oil if needed between service contract maintenance.	Not Applicable	Not Applicable
	Electron multiplier: replace when the tuning voltage approaches the maximum and/or when sensitivity falls below required levels.		
	Clean Source, including all ceramics and lenses - the source cleaning is indicated by a variety of symptoms including inability of the analyst to tune the instrument to specifications, poor response, and high background contamination.		
Neslab Chiller	Check coolant level. Add coolant as required to maintain cooling.	Vacuum outside chiller to prevent dust from clogging filters	Clean on-line filter in Neslab

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations

TABLE SL-7-4
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Graphite Furnace Atomic Absorption[1]

Daily	Monthly	Semi-Annually	Annually
Clean Optical Windows	Check coolant level in cooling unit. Add coolant if error message appears	Replace contact cylinders	Notify service representative to perform cleaning of optics
Clean Contact Cylinders			
Check tubes and platform, replace if corroded, flaking or if low absorbance results			

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations

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TABLE SL-7-5
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Ion Chromatography[1]

As Needed	Daily	Weekly	Monthly	Semi-annually
Clean micromembrane suppressor when decreases in sensitivity are observed	Check plumbing	Check pump heads for leaks	Clean conductivity cell	Replace gradient pump piston seal
Change fuses when power problems occur	Check UV/VIS detector for leaks	Check filter (inlet)	Check conductivity cell for calibration	Clean high pressure valve
Change column when peak shape and resolution deteriorate or when retention time shortening indicates that exchange sites have become deactivated.			Check all air and liquid lines for discoloration and crimping, if indicated.	
Degas pump head when flow is erratic				

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

TABLE SL-7-6
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
ICP[1]

Daily	Monthly	Semi-annually
Check the pump winding, replace if needed.	Clean intelligence controller filters	Change vacuum pump oil
	Check and clean nebulizer, mixing chamber and torch	
	Check the pump capillary tubing, clean or replace if needed	
	Clean optical path windows	
	Clean RF generator filters	

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE SL-7-7
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Total Organic Carbon Analyzer[1]

Daily	Weekly	Bi-monthly	Monthly
Check oxygen supply	Check liquid flow rate pump tubing conditions	Change pump tubing	Change Sn and Cu
Check persulfate supply	Check for moisture in LiOH tube		
Check acid supply	Check injection port septum		
Check printer paper			
Check Sn and Cu scrubber			
Add a few drops of H_3PO_4 to GLS			
Check carrier gas flow rate (≈200 cc/min.)			

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE SL-7-8
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Total Organic Halide Analyzer[1]

Daily	Weekly	Monthly
Check exit tube and quartz wool	Change quartz wool in inlet liner and exit tube	Examine and clean pyrolysis tube
Check for gas bubbles in titration sidearm	Measure gas flow	Clean titration cell
Check inlet area for GAC spills	Perform cell performance check	Perform electronic test
Check electrolyte level, add if needed		Check O-rings, replace if worn
Clean quartz boat		

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE SL-7-9
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
TRAACS 800 Auto Analyzer[1]

As Needed	Daily	Monthly	Semi-annually	Annually
Replace air filter when progressive loss of air pressure is observed	Check air pressure gauge (22 ± 2 psi)	Change all pump tubes (or after 200 hours of pumping time)	(or after 1000 hours of pumping time) Replace pump platens	Lightly lubricate the Linear Sample Rails (use semi-fluid lubricant)
Replace air valve tubing when occlusion in tubing is observed	Use recommended washout procedure (at end of analysis operations)	Clean sample probe shaft		Replace colorimeter lamp (or after 2500 hours of use)

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

TABLE SL-7-10
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Video 12E Cold Vapor Atomic Analyzer[1]

Daily	Weekly	Monthly	Annually
Clean sample aspirator by flushing with DI water	Clean windows with methanol	Clean cell in aqua regia	Notify service representative to perform cleaning of optics
Check flow rate of stannous chloride			
Check tubing and replace if needed			
[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.			

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TABLE SL-7-11
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
High Pressure Liquid Chromatography[1]

As Needed
Column change: Columns are replaced when peak shape and resolution indicate that the chromatographic performance of the column is below method requirements
Filters are cleaned every time a column change takes place
The slides on the auto sampler are oiled when the sample does not advance as required
[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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TABLE SL-7-12
ITAS-ST. LOUIS LABORATORY
Maintenance Schedule
Radiological Analysis Equipment[1]

Instrument	As Needed	Weekly	Monthly	Annually
Gas Flow Proportional Counters	As carrier gas is consumed, change P-10	Not Applicable	Not Applicable	Not Applicable
Germanium Gamma Detector	Not Applicable	Fill liquid nitrogen Dewars	Not Applicable	Not Applicable
Alpha Spectrometers	Not Applicable	Not Applicable	Check vacuum pump oil level, fill if necessary	Change vacuum pump oil
Liquid Scintillation Counter	Not Applicable	Not Applicable	Normalize PM tubes	Not Applicable

[1]Refer to manufacturer's instructions for each instrument to perform maintenance operations.

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APPENDIX

ST. LOUIS-8

ADDITIONAL OPERATION-SPECIFIC INFORMATION

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TABLE SL-8-1
ITAS-ST. LOUIS LABORATORY
Summary of Radiological Instrument Calibrations

Detector	Type	Minimum Frequency	Criteria
Gas Proportional Counter	Initial Calibration	Every 3 years	±10% of NIST traceable standard
	Self-Absorption	Every 3 years	Alpha mass thickness < 10 mg/cm^2 Beta mass thickness < 10 mg/cm^2
	Check Source	Daily	±3 Standard Deviations from Control Chart
	Background	Daily	±3 Standard Deviations from Control Chart
Alpha Spectrometry	Initial Calibration	Annually	10,000 counts
	Pulser Check	Daily	±100 KeV of true value
	Energy Calibration Check	Weekly	Peak Resolution at FWHM (Full Width at Half Maximum Height) ≤100 KeV
	Efficiency Check	Weekly	Minimum 10,000 counts; uncertainty ≤2%
	Background	Monthly	4,000 minutes
KPA	Initial Calibration	Per Batch	5 low and 5 high standards; $r^2 \geq 0.96$; lifetime between 100-340 μs
	Calibration Check	Per Batch	1 low and 1 high; must be within 2σ error
	Background	Per Batch	1 low and 1 high standard, $r^2 \geq 0.96$; lifetime between 100-340 μs
Radon Emanation Counter	Check Source	Per Batch	±3 Standard Deviations from Control Chart
	Cell Efficiency	Annually	> 1000 counts
	Background	Per Batch	≥ sample count time

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TABLE SL-8-1
ITAS-ST. LOUIS LABORATORY
Summary of Radiological Instrument Calibrations

Detector	Type	Minimum Frequency	Criteria
Gamma Spectrometer	Inital Calibration	Annually	± 10% of NIST source
	Check Source	Daily	±3 Standard Deviations from Control Chart
	Background	Monthly	≥ 24 hours
Liquid Scintillation	Initial Calibration	Monthly	Per manufacturer Quench curves ≥ 100,000 counts
	Check Source	Per Batch	≥ 100,000 counts
	Background	Per Batch	±3 Standard Deviations from Control Chart
	Efficiency	Per Batch	±3 Standard Deviations from Control Chart
	Quench Curve Check	Per Batch	Per manufacturer

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TABLE SL-8-2
ITAS-ST. LOUIS LABORATORY
Minimum Radiological Quality Control Samples

Analytical Parameters	QC Sample	Quality Control
Gross Alpha/Beta	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
Radium-228	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample. blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria
Tritium	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
Total Uranium	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation

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TABLE SL-8-2
ITAS-ST. LOUIS LABORATORY
Minimum Radiological Quality Control Samples

Analytical Parameters	QC Sample	Quality Control
Isotopic Uranium U-238, U-234, U-235	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria
Isotopic Plutonium Pu-239/240, Pu-238	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria

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TABLE SL-8-2
ITAS-ST. LOUIS LABORATORY
Minimum Radiological Quality Control Samples

Analytical Parameters	QC Sample	Quality Control
Isotopic Thorium Th-228, Th-230, Th-232	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria
Technetium	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
Gross Alpha by Coprecipitation	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation

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TABLE SL-8-2
ITAS-ST. LOUIS LABORATORY
Minimum Radiological Quality Control Samples

Analytical Parameters	QC Sample	Quality Control
Americium-241	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria
Total Alpha Emitting Isoptopes of Radium	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria

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TABLE SL-8-2
ITAS-ST. LOUIS LABORATORY
Minimum Radiological Quality Control Samples

Analytical Parameters	QC Sample	Quality Control
Lead Pb-210	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria
Polonium-210	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria

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TABLE SL-8-2
ITAS-ST. LOUIS LABORATORY
Minimum Radiological Quality Control Samples

Analytical Parameters	QC Sample	Quality Control
Strontium-89,90 and Total Strontium	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria
Radium-226/228	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
	Carrier	Frequency: Tracer added to each sample, blank and QC sample Criteria: Tracer recovery shall be 20-110% Corrective Action: Reanalyze analytical batch if yield for blank or LCS is outside acceptance criteria. Reanalyze samples with yield outside acceptance criteria

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TABLE SL-8-2
ITAS-ST. LOUIS LABORATORY
Minimum Radiological Quality Control Samples

Analytical Parameters	QC Sample	Quality Control
Radium-226 Radon-222 (Emanation)	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation
Gamma Emitters Actinides, as applicable, Co-60, Cs-137, K-40, Mn-54, and other fission/activation products	Method Blank	Frequency: 1 per analytical batch of ≤ 20 samples of the same matrix Criteria: Activity is ≤ Contract Detection Limit Corrective Action: Evaluate data; reanalyze blank and associated sample batch
	Laboratory Control Sample	Frequency: 1 per analytical batch of ≤ 20 samples of the sample matrix Criteria: ± 3σ of the mean recovery as determined by control tables Corrective Action: Evaluate data; reanalyze LCS and associated sample batch
	Duplicate Sample	Frequency: 1 per batch of ≤ 20 samples of the same matrix within a 14-day period Criteria: 1.5 x 2σ error of the sample Corrective Action: Flag data for client evaluation