Quality Assurance Plan
Tables, Figures & Appendices

Items below are linked – click on a heading to proceed to that section

Table 1a
Anatek Labs - Moscow
Equipment List

October 2022

Type	Description	Manufacturer	Model
API 4000	LC	SHIMADZU	LC-20AD
API 4000	LC	SHIMADZU	LC-20AD
API 4000	HPLC/MS/MS	APPLIED BIOSYSTEMS	API 4000
API 4000	AUTOSAMPLER	SHIMADZU	SIL-20A HT
API 4000	COLUMN OVEN	SHIMADZU	CTO-20A
API 4000	DEGASSING UNIT	SHIMADZU	DGU-20A 5R
API 5500+	MS	SCIEX	API 5500+
API 5500+	ION SOURCE	SCIEX	API 5500+
API 5500+	HPLC-CONTROLLER	SCIEX	API 5500+
API 5500+	HPLC-PUMP A/B/C	SCIEX	API 5500+
API 5500+	HPLC-AUTOSAMPLER	SCIEX	API 5500+
API 5500+	HPLC-COLUMN OVEN	SCIEX	API 5500+
API 5500+	HPLC-DEGASSER	SCIEX	API 5500+
ASE	1	DIONEX	200
ASE	2	DIONEX	200
ASE	3	DIONEX	200
CONDUCTIVITY CELL	Conductivity Probe	ORION	013005MD
CONDUCTIVITY PH METER	Probe 03	ORION	STAR A215
ECD1	TOWER	HP	7683
ECD1	GC SYSTEM	HP	HP6890
ECD1	AUTOSAMPLER	HP	7683
ECD2	TOWER A	AGILENT	7683
ECD2	TOWER B	AGILENT	7683
ECD2	GC SYSTEM	HP	HP6890
ECD2	AUTOSAMPLER	HP	HP7683
ECD3	GC SYSTEM	AGILENT	7890B
ECD3	GC SYSTEM	AGILENT	7693
FIA	ANALYZER	OI ANALYTICAL	FS 3000
FIA	AUTOSAMPLER	OI ANALYTICAL	FS 3000
FIA	PUMP	ISMATEC	ISM938E
FIA	ANALYZER	Seal	A500
FIA	Autosampler	Seal	AS2V002
FID1	TOWER	HP	18593B
FID1	GC SYSTEM	HP	6890
FID1	AUTOSAMPLER	HP	18596C
FID2	TOWER	AGILENT	7683B
FID2	GC SYSTEM	AGILENT	6890N
FID2	AUTOSAMPLER	AGILENT	7683
FLASHPOINT		PRECISION SCIENTIFIC	
GCMSMS	GC SYSTEM	AGILENT	7890B
GCMSMS	MS/MS	AGILENT	7012A
GCMSMS	AUTOSAMPLER	AGILENT	G1513A
HEAT-STIR PLATE	HEAT-STIR PLATE	CORNING	PC-620
HPLC #2	COM MODULE	SHIMADZU	CBM 20A
HPLC #2	PUMP	SHIMADZU	L20AT
HPLC #2	PUMP	SHIMADZU	LC20AT
HPLC #2	FLUORESCENCE DETECTOR	SHIMADZU	RF20A

Anatek Labs - Moscow
Equipment List

October 2022

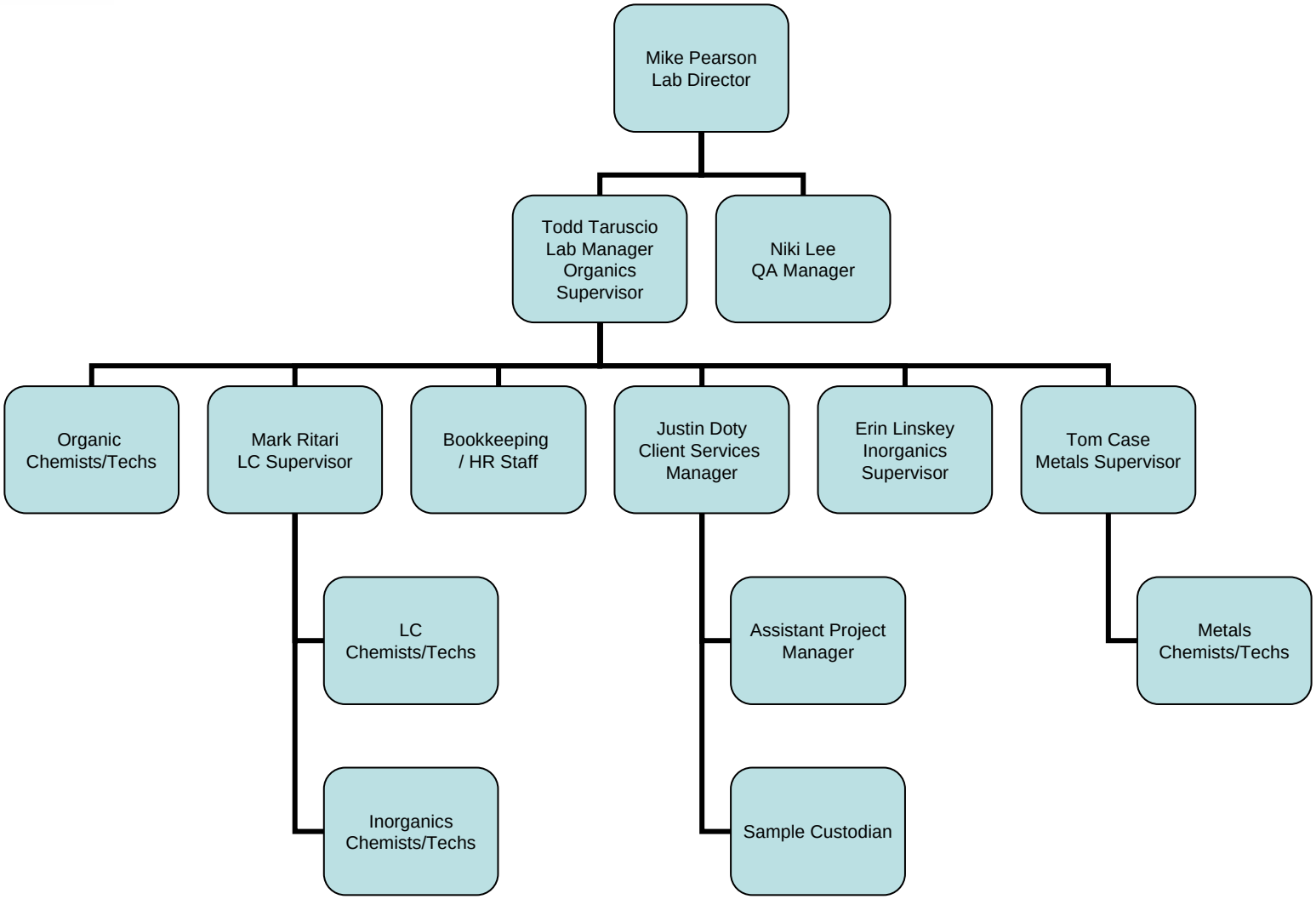
Type	Description	Manufacturer	Model
HPLC #2	DIODE ARRAY DETECTOR	SHIMADZU	SPD M20A
HPLC #2	AUTOSAMPLER	SHIMADZU	SIL 20A HT
HPLC #2	PCX	PICKERING	PINNACLE PCX
HPLC #2	DEGASSER	SHIMADZU	DGU-20A3
ICP-MS	ICP-MS 7850	AGILENT	G8422A
ICP-MS	AUTOSAMPLER SPS4	AGILENT	G8410A
ICP-MS	CHILLER	AGILENT	G8496-24000
ICP-OES	ICP-OES	AGILENT	G8015A
ICP-OES	ICP AUTOSAMPLER	AGILENT	G8410A
ICP-OES	ICP CHILLER	AGILENT	G8481-80003
IONS	COMPACT IC	METROHM	761
IONS	AUTOSAMPLER	METROOHM	788
IONS	COMPACT IC PLUS	METROOHM	882
IONS	AUTOSAMPLER	METROOHM	766
Mercury Analyzer	Hg Analyzer	CETAC	M8000
Mercury Analyzer	Autosampler	CETAC	ASX-520
MSD2	TOWER	AGILENT	7683B
MSD2	MSD	AGILENT	5973N
MSD2	GC SYSTEM	AGILENT	6890N
MSD2	AUTOSAMPLER	AGILENT	7683
MSD3	GC SYSTEM	AGILENT	7890B
MSD3	MSD	AGILENT	5977B
MSD3	AUTOSAMPLER	AGILENT	7693
MSD4	GC SYSTEM	AGILENT	7890A
MSD4	GC SYSTEM	AGILENT	5975
MSD4	TRAY	AGILENT	64514A
MSD4	TOWER	AGILENT	64513A
OIL & GREASE	EXTRACTOR	HORIZON	3000XL
OIL & GREASE	CONTROLLER	HORIZON	3000
SATURN 2100	Velocity XPT	Tekmar/Dohrmann	14-8900-00T
SATURN 2100	GC/MS	Varian	2100T
SATURN 2100	P&T Austosampler	Varian	Archon
SPEC-20		MILLION ROYLON	
TOC ANALYZER	TOC ANALYZER	SHIMADZU	TOC-Vcsh
TOC ANALYZER	TOC AUTOSAMPLER	SHIMADZU	ASI-V
TURBIDITY METER	TURBIDITY METER	HACH	TL2300
VARIAN 1200	GC	VARIAN	CP-3800
VARIAN 1200	QUADRUPOLE MS/MS	VARIAN	1200
VARIAN 4000	MS/MS	VARIAN	4000
VOC1	GC	Agilent	6890N
VOC1	MS	Agilent	5975
VOC1	Sample Concentrator	Tekmar	
VOC1	Autosampler	Tekmar	
VOC2	GC	Agilent	6890N
VOC2	MS	Agilent	5975
VOC2	P&T	ENCON	EVOLUTION
VOC2	AUTOSAMPLER	CENTURION	AUTOSAMPLER

Type	Description	Manufacturer	Model
Alkalinity Robot		SEAL Analytical	AR6 pH-EC-Turb-Alk V001
Autoclave		Market Forge Sterilmatic	STM-EL
BOD	BOD Robot	SEAL Analytical	ML2000
BOD	pH Probe	SI Analytics	pH Elektrode BlueLine
BOD	Meter	Hach	HQ40d
BTU	Oxygen Bomb Calorimeter	Parr	1341EB
BTU	Motor Assembly	Parr	A50MEB
COD	Reactor	HACH	45600-00
Coliform	Sealer	IDEXX Quanti-tray 2X	89-10894-00
Conductivity	Meter	ThermoScientific	OrionStar A212 Benchtop
Conductivity	Probe	ThermoScientific	013005MD (COND-4)
Conductivity	Probe	HACH	CDC401
Density meter	Excellence D5 Density Meter	Mettler Toledo	D5
Density meter cell	D5 Cell		Mettler Toledo
ELISA		Stat Fax	2600 MicroPlate Washer
ELISA		Stat Fax	2100 MicroPlate Reader
Endotoxin PTS Reader	PTS Reader	Charles River	
FIA	Analyzer	FIAlab	FIAlyzer Flex
FIA	TKN Digestor Block	Lachet	BD-40
FIA	Cyanide Distillation System	Lachet	65454
Food Micro - MDS	3M Molecular Detection System	3M	MDS100
GC/ECD	GC	Hewlett Packard	5890 SERIES II
GC/FID	GC	Hewlett Packard	5890 SERIES II
GC/FID	GC	Hewlett Packard	6890 SERIES II
GC/MS 6890	Purge and Trap	EST	EST Evolution2
GC/MS 6890	GC	Hewlett Packard	6890 SERIES PLUS
GC/MS 6890	MS		5973 MSD
GC/MS 8890	GC	Agilent	Agilent 8890 GC System
GC/MS 8890	MS	Agilent	5977C Inert Plus MSD Turbo EI Bundle
GC/MS 8890	Purge and Trap	EST	EST Evolution2
Gross α and β counter	Windowless Gas Flow Proportional Counter	Protean Instrument	IPC 650
IC	Ion Chromatographer	Metrohm	930 Compact IC Flex
ICPMS	ICPMS	Agilent	7800
ICPMS	ICPMS	Agilent	7850
ICPMS	Metals Digestion Block	CPI International ModBlock	70 ml
ICPMS	Metals Digestion Block	CPI International ModBlock	70 ml
Mercury Analyzer	Analyzer	Cetac	M-7600
pH meter	Hach meter HQ 40d multi	Hach	HQ40d mulit
pH meter	HQ430d flex	Hach	HQ430d flexi
pH meter	HQ440d pH Meter	Hach	HQ440d
Resistivity	Soil Resistance Box	M. C. Miller	Miller 400D S.M.R.
Spectrophotometer	Analyzer	HACH	DR 6000
Spectrophotometer	Analyzer	BIO-RAD	SmartSpec 3000
TOX	Analyzer	analytikjena	multi X 2500
TOX	AOX Sample Preparator	analytikjena	APU sim 450.900.300
Turbidimeter	Analyzer	HACH	2100N
Turbidimeter	Analyzer	HACH	TU5200
Ultra Low Level Gross α and β counter	Ultra Low Level Gross alpha & beta counter	Protean Instrument	MPC 9604
Water Acitivity	Wateractivity Meter	Aqua Lab	4TE

Table 1c
Anatek Labs - Yakima
Equipment List
January 2024

Item	Brand	Model
Micro Incubator	VWR	Incubator F Air 13.4CF
Micro Spore Incubator	VWR	Digital Incubator 115V
Micro Waterbath	Thermo Scientific	Precision 35L Circulating Bath
Micro Waterbath	Thermo Scientific	Precision 89L Circulating Bath
Micro Quanti-Tray Sealer	IDEXX	Quanti-Tray Sealer PLUS
Micro UV Lamp	UV Beast	UV Beast V1
Micro Autoclave	Market Forge	STM-EL
Micro Media Dispensor Pump	Brand Tech	Dispensette S Digital
Magnifying Glass with Light	NZQXJXZ	JXZ-1
Micro Media Scale	VWR	VWR-602P2
Micro Pipettor Purple	Integra	Pipetteboy
Micro Pipettor Green	Integra	Pipetteboy 2
Sample Receiving Fridge	GE Appliances	GTS22KYNCRFS
Courier Fridge	Avantco	178SS2RHC
Sample Retain Fridge 1	Avantco	178SS2RHC
Sample Retain Fridge 2	Avantco	178SS2RHC
Ice Pack Freezer	Avantco	178SS2FHC
Timer 1	Fisherbrand	06-662-51
Timer 2	Fisherbrand	06-662-51
Timer 3	Fisherbrand	06-662-51
Timer 4	Fisherbrand	06-662-51
Timer 5	Fisherbrand	06-662-51
Timer 6	Fisherbrand	06-662-51
Pump		
Chemistry Oven 180	VWR	Oven GR Con 3.7CF
Chemistry Oven 108	VWR	Oven GR Con 3.7CF
Chemistry Incubator	Thermo Scientific	TFFU2065FWA
Chemistry TNT Mini-Fridge	Magic Chef	HMAR45HCSE
Chemistry BOD Fridge	GE Appliances	GTS22KYNCRFS
Chemistry TNT Reactor	Hach	DRB200-20
Chemistry Spectrophotometer	Hach	DR6000 UV/VIS
Chemistry pH Meter	Hach	HQ40D
Chemistry Desicator	-	-
Chemistry Turbidimeter	Hach	TU5200 (EPA)
Chemistry Balance	VWR	VWR-310TC.N
Chemistry Balance	VWR	VWR-602P2
Chemistry Pipette 10-100µL	VWR	Finpipette F2
Chemistry Pipette 100-1000µL	VWR	Finpipette F2
Chemistry Pipette 1-10mL	VWR	Finpipette F2
Reference Weights	TROEMNER	ASTM Weight Set
Glass Thermometers		
Barometer	Control Company	Digital Barometer
pH Probe	Hach	PHC281
Conductivity Probe	Hach	CDC401
BOD/DO Probe	Hach	LBOD101
Residual Chlorine Meter	Hach	LPG445.99.00000
DI Water System		
Infrared Thermometer	Sper Scientific	800101

Anatek Labs, Inc. Organizational Chart

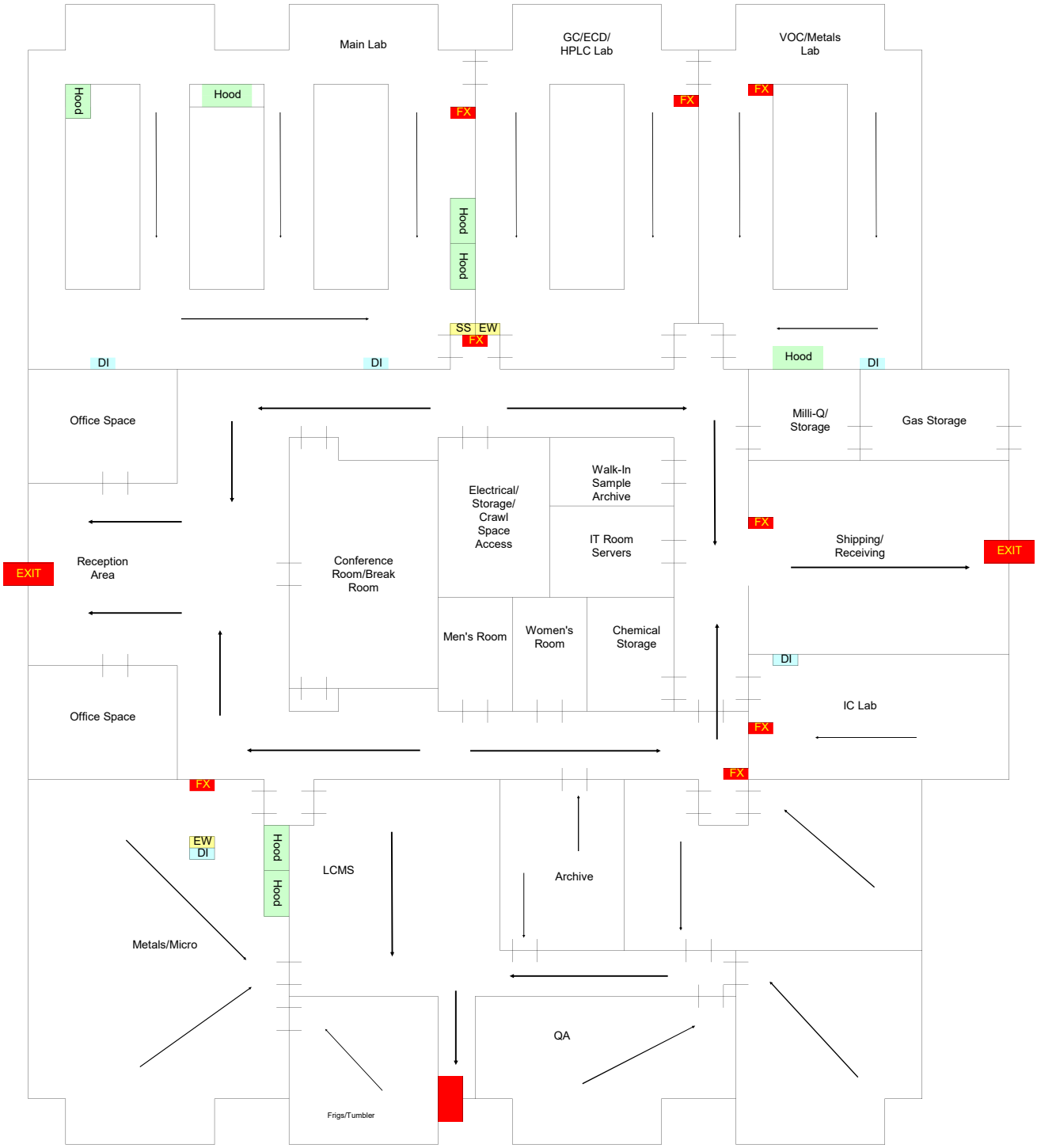


May 2025

Figure 2

Anatek Labs, Moscow Personnel

Position	Employee	Degree
Laboratory Director	Mike Pearson	B.S Elec. Eng.
Laboratory Manager	Todd Taruscio	Ph.D. Zoophysiology
Inorganics/LC Supervisor	Mark Ritari	B.S. Chemistry
Organics Supervisor	Tom Case	B.S. Soil Science
Chemist	Mark Havrilla	B.S. Chemistry
Chemist	Brandon McGovern	B.S. Science Microbiology
Chemist	Zach Warren	B.S. Environmental Science
Chemist	Brianne Peterson	B.S. Chemistry
Chemist	Tyler Zonneveld	B.S. Chemistry
Chemist	Maddy Corbitt	B.S. Biology
Chemist	Christian Conlon	B.S. Biology
Chemist	Drew Anderst	B.S. Biology
Chemist	Lucas Gueller	B.S. Chemistry
Chemist	Bryden Matoon	B.S. Chemistry
Chemist	Isabel Badillo	B.S. Chemistry
Chemist	Elijah Oelke	B.S. Biochemistry
QA Manager	Niki Lee	Ph.D. Crop Sciences
QC Officer - Metals/Inorganics	Erin Linskey	B.S. Biology
Client Services/Project Manager	Justin Doty	
Customer Service	Cheyenne Garrett	
Sample Custodian	Sara Minor	
Sample Custodian	Taissa Berezovskiy	
Bookkeeper	Cheri Price	

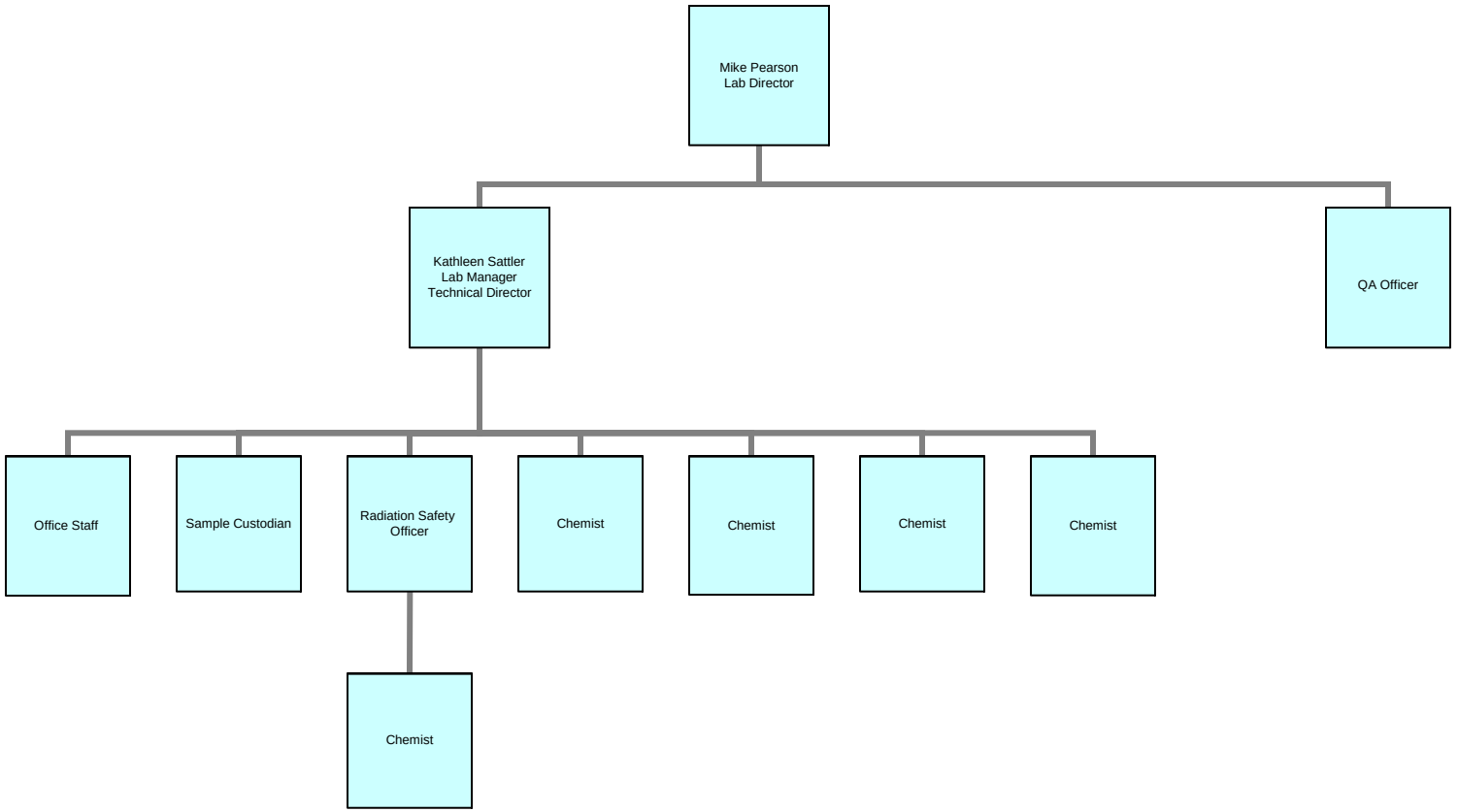


In case of EMERGENCY use nearest available EXIT

DI - Deionized Water	EW - Eyewash Station
SS - Safety Shower	FX - Fire Extinguisher

Anatek Labs Floor Plan
Apr 2017

Anatek Labs Organizational Chart - Spokane, Inc.



February 2017

Figure 5

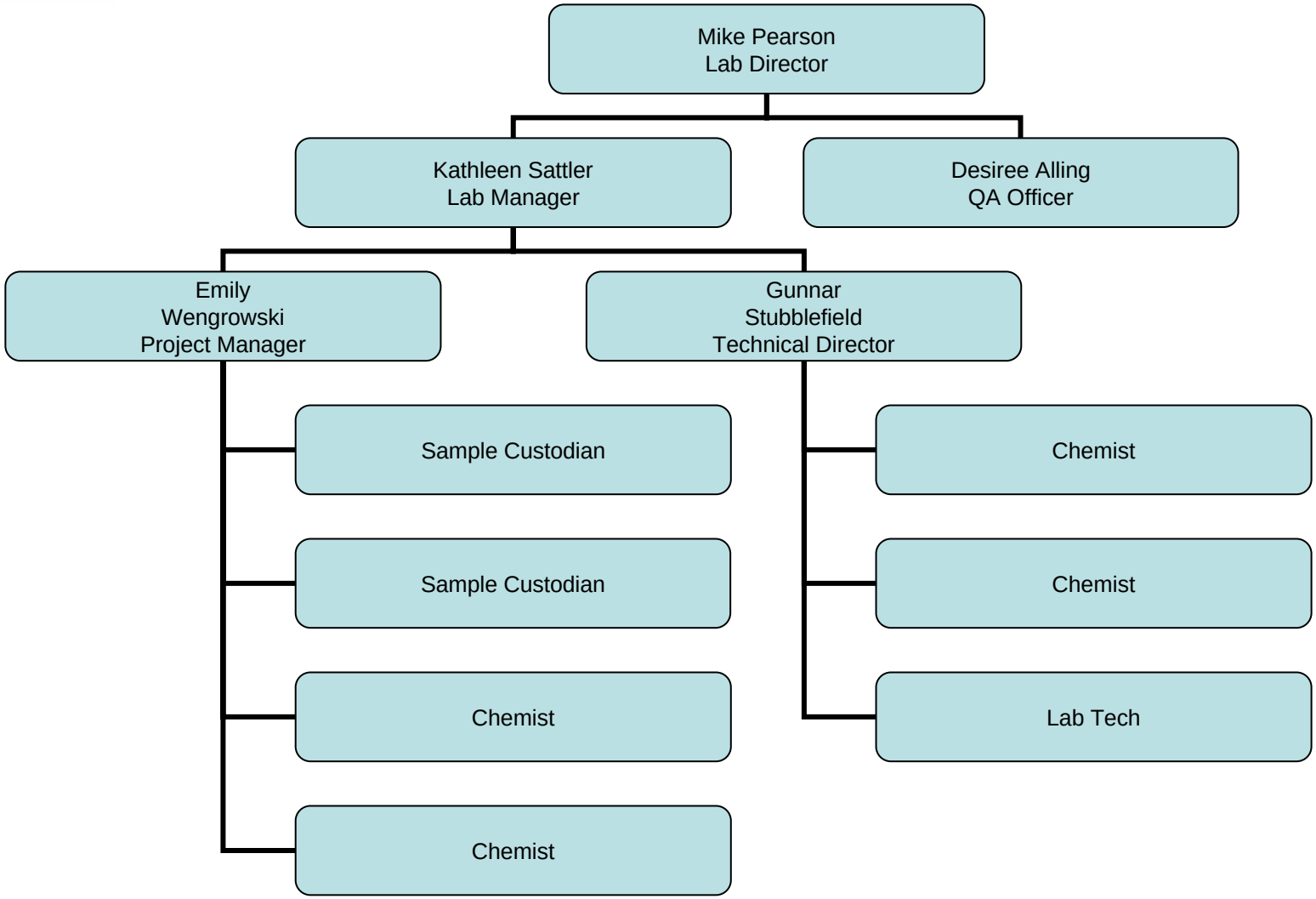
Anatek Labs, Spokane
Personnel

Position	Employee	Degree
Laboratory Director	Mike Pearson	B.S. Electrical Engineering
Laboratory Manager	Kathleen Sattler	B.S. Microbiology
QA Officer	Leah Clappes	B.S. Biology/Environmental Studies
Chemist III/RSO	Aunna Younger	B.S. Bioengineering
Chemist II	Tracy Martinez	B.S. Chemistry
Chemist III	Jeff Greenlund	B.S. Chemistry
Chemist II	Abbigail Cox	B.S. Biochemistry
Chemist I	Jared Stommes	B.A. Biology
Customer Service Manager	Karice Scott	
Project Manager	Brock Gerger	B.S. Chemistry
Sample Custodian	Joseph Pippin	
Lab Technician III	Erica Gardner	
Lab Technician I	Sophie Stillwell	
Rad Chemist	Brittany Ackerman	B.S. Environmental Science

Anatek Labs, Spokane Floor Plan and Safety Plan

Figure 6

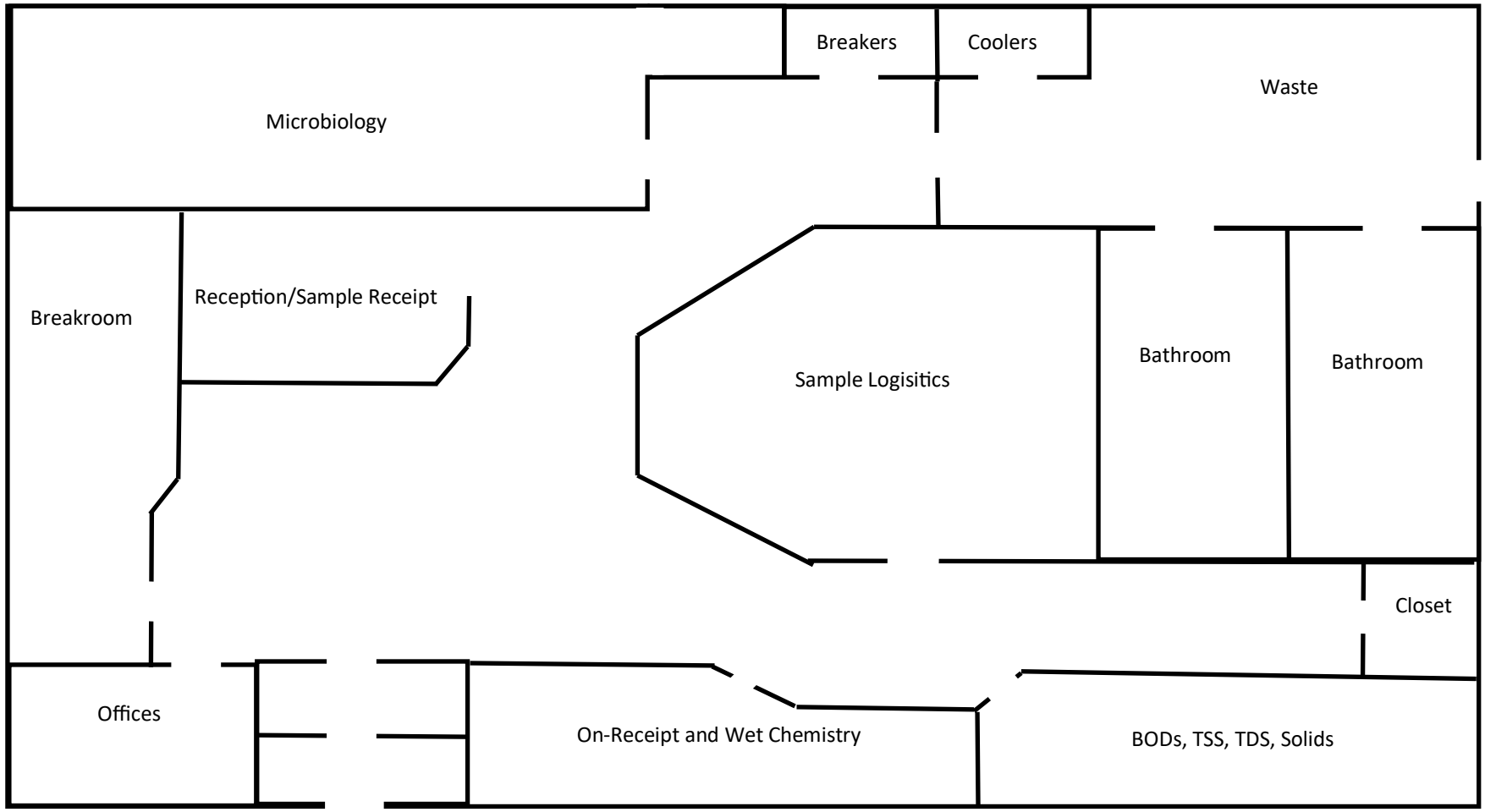
Anatek Labs, Inc. – Yakima
Organizational Chart



Type	Description	Manufacturer	Model
Alkalinity Robot		SEAL Analytical	AR6 pH-EC-Turb-Alk V001
Autoclave		Market Forge Sterilmatic	STM-EL
BOD	BOD Robot	SEAL Analytical	ML2000
BOD	pH Probe	SI Analytics	pH Elektrode BlueLine
BOD	Meter	Hach	HQ40d
BTU	Oxygen Bomb Calorimeter	Parr	1341EB
BTU	Motor Assembly	Parr	A50MEB
COD	Reactor	HACH	45600-00
Coliform	Sealer	IDEXX Quanti-tray 2X	89-10894-00
Conductivity	Meter	ThermoScientific	OrionStar A212 Benchtop
Conductivity	Probe	ThermoScientific	013005MD (COND-4)
Conductivity	Probe	HACH	CDC401
Density meter	Excellence D5 Density Meter	Mettler Toledo	D5
Density meter cell	D5 Cell		Mettler Toledo
ELISA		Stat Fax	2600 MicroPlate Washer
ELISA		Stat Fax	2100 MicroPlate Reader
Endotoxin PTS Reader	PTS Reader	Charles River	
FIA	Analyzer	FIAlab	FIAlyzer Flex
FIA	TKN Digestor Block	Lachet	BD-40
FIA	Cyanide Distillation System	Lachet	65454
Food Micro - MDS	3M Molecular Detection System	3M	MDS100
GC/ECD	GC	Hewlett Packard	5890 SERIES II
GC/FID	GC	Hewlett Packard	5890 SERIES II
GC/FID	GC	Hewlett Packard	6890 SERIES II
GC/MS 6890	Purge and Trap	EST	EST Evolution2
GC/MS 6890	GC	Hewlett Packard	6890 SERIES PLUS
GC/MS 6890	MS		5973 MSD
GC/MS 8890	GC	Agilent	Agilent 8890 GC System
GC/MS 8890	MS	Agilent	5977C Inert Plus MSD Turbo EI Bundle
GC/MS 8890	Purge and Trap	EST	EST Evolution2
Gross α and β counter	Windowless Gas Flow Proportional Counter	Protean Instrument	IPC 650
IC	Ion Chromatographer	Metrohm	930 Compact IC Flex
ICPMS	ICPMS	Agilent	7800
ICPMS	ICPMS	Agilent	7850
ICPMS	Metals Digestion Block	CPI International ModBlock	70 ml
ICPMS	Metals Digestion Block	CPI International ModBlock	70 ml
Mercury Analyzer	Analyzer	Cetac	M-7600
pH meter	Hach meter HQ 40d multi	Hach	HQ40d mulit
pH meter	HQ430d flex	Hach	HQ430d flexi
pH meter	HQ440d pH Meter	Hach	HQ440d
Resistivity	Soil Resistance Box	M. C. Miller	Miller 400D S.M.R.
Spectrophotometer	Analyzer	HACH	DR 6000
Spectrophotometer	Analyzer	BIO-RAD	SmartSpec 3000
TOX	Analyzer	analytikjena	multi X 2500
TOX	AOX Sample Preparator	analytikjena	APU sim 450.900.300
Turbidimeter	Analyzer	HACH	2100N
Turbidimeter	Analyzer	HACH	TU5200
Ultra Low Level Gross α and β counter	Ultra Low Level Gross alpha & beta counter	Protean Instrument	MPC 9604
Water Acitivity	Wateractivity Meter	Aqua Lab	4TE

Anatek Labs - Yakima
Floor Plan

Drive-Thru



Parking Lot

Table 2

Summary of Analytical Parameters, Method, Sample Containers, Preservation Methods, and Holding Times

Analysis	Method	Container/Preservative	Hold Time (days)
Drinking Water - Inorganics			
Alkalinity/Carbonate/Bicarb	SM 2320 B	P 250mL	14
Ammonia	SM 4500-NH3 G	P 125mL H2SO4	28
Anions (Cl, Fl, SO4)	EPA 300.0	P 125mL	28
Anions (NO3, NO2, PO4)	EPA 300.0	P 125mL	2
Asbestos	EPA 100.2	P 1000mL	180
COD	EPA 410.4	P 125mL H2SO4	28
Color	SM 2120 B	P 125mL	2
Conductivity	SM 2510 B	P 125mL	28
Cyanide EPA 335.4	EPA 335.4	P 250mL NaOH	14
Cyanide SM 4500 CN	SM 4500-CN E	P 250mL NaOH	14
Hex Chrom	EPA 218.6	P 250mL Hex Chrom	0
NO3/NO3 FIA	SM 4500-NO3 F	P 125mL H2SO4	28
Odor	SM 2150 B	P 1000mL	1
OrthoP/Total P FIA	SM 4500-P F	P 125mL	2
Oxidation- Reduction Potential	SM 2580 B	P 125mL	10
Perchlorate 331.0	EPA 331.0	Nalgene 250mL	28
pH	SM 4500-H-B	P 125mL	0.01
Phenolics	EPA 420.1	G 1000mL H2SO4	28
Solids-TDS	SM 2540 C	P 1000mL	7
Solids-TSS	SM 2540 D	P 1000mL	7
Sulfide	SM 4500-S2 F	P 125mL NaOH	10
Surfactants	SM 5540 C	G 1000mL	2
TKN	SM 4500-Norg C	P 125mL H2SO4	28
TOC/DOC	SM 5310 B	G 44mL HCl	28
Total Residual Chlorine	SM 4500-Cl G	G 44mL No Headspace x2	1
Turbidity	EPA 180.1	P 125mL	2
Drinking Water - Metals			
Dissolved Metals	EPA 200.8	P 250mL (preserve after filtration - field or lab)	180
Hardness	SM 2340 C	P 250mL HNO3	180
Hg 245.7	EPA 245.7	G 44mL HCl	28
Hg 245.7 Dissolved	EPA 245.7	G 44mL HCl (preserve after filtration - field or lab)	90
Metals	EPA 200.7	P 250mL HNO3	180
Metals	EPA 200.8	P 250mL HNO3	180
Drinking Water - Microbiology			
Anaerobic Bacteria	SM 9215 B	Bacteria--P 150mL NaThio	1
Bacteria	SM 9223 B	Bacteria--P 150mL NaThio	1.25
Bacteria HPC Simplate	Simplate	P 50ml Q-tip	1
Bacteria QT	SM 9223 B	Bacteria--P 150mL NaThio	1.25
Bacteria Tube Fecal	SM 9221 E	Bacteria--P 150mL NaThio	1
Bacteria Tube Total Coliform	SM 9221 B	Bacteria--P 150mL NaThio	1
E. coli	SM 9221 F	Bacteria--P 150mL NaThio	1
Fecal DW/NPW/SCM	SM 9221 E	Bacteria--P 150mL NaThio	1.25
Fecal MF	SM 9222 D	Bacteria--P 150mL NaThio	1
HPC	SM 9215 B	Bacteria--P 150mL NaThio	1
HPC Simplate	SM 9215 E	Bacteria--P 150mL NaThio	1
HPC Spread	SM 9215 C	Bacteria--P 150mL NaThio	1
Iron Bacteria	IRB-BART	Bacteria--P 150mL NaThio	180
Sulfur Reducing Bacteria	SRB-BART	Bacteria--P 150mL NaThio	180
Total Coliform	SM 9221 B	Bacteria--P 150mL NaThio	1

Analysis	Method	Container/Preservative	Hold Time (days)
Drinking Water - Radiochemistry			
Gross Alpha	EPA 900.0	P 1000mL HNO3	180
Gross Beta	EPA 900.0	P 1000mL HNO3	180
Radium 226	EPA 903.0	P 1000mL HNO3	180
Radium 228	EPA 904.0	P 1000mL HNO3	180
Drinking Water - SVOC			
1,4-Dioxane	EPA 522	G 60 mL Na Sulfite+Na Hydrogen Sulfate x2	28
Acrylamide	EPA 8321B	G 1000mL Sodium Thiosulfate	28
Artificial sweeteners	EPA 8321B	G 1000mL Sodium Thiosulfate	14
Carbamates	EPA 531.2	G 44mL Sodium Thiosulfate+Citrate	28
Diquat	EPA 549.2	P 500mL Sodium Thiosulfate	7
EDB/DBCP	EPA 504.1	G 44mL Sodium Thiosulfate x2	14
Endothall	EPA 548.1	G 125mL Sodium Thiosulfate	7
Explosives	EPA 8330B	G 1000mL Sodium Thiosulfate	7
Glyphosate	EPA 547	G 44mL Sodium Thiosulfate	14
HAA5	SM 6251 B	G 44mL NH4Cl x2	14
HEM	EPA 1664B	G 1000mL HCl	28
Herbicides 515	EPA 515.4	G 250mL Sodium Sulfite	14
Herbicides LCMSMS	EPA 8321B	G 1000mL Sodium Thiosulfate	28
Pesticides 505	EPA 505	G 44mL Sodium Thiosulfate x2	14
PFAS 14 - EPA 537	EPA 537	P 250mL Trizma x3	14
PFAS 18 - EPA 537.1	EPA 537.1	P 250mL Trizma x3	14
PFCs by 533	EPA 533	P 250mL Ammonium Acetate x3	28
SU Herbicides	EPA 8321B	G 1000mL Sodium Thiosulfate	28
SVOC 525 DW	EPA 525.2	G 1000mL Sodium Sulfite+HCl x2	14
SVOC LC/MS/MS	EPA 8321B	G 1000mL Sodium Thiosulfate	28
Drinking Water - VOC			
THM - Moscow	EPA 524.3	G 44mL MA/AA x3	14
THM - Spokane	EPA 524.2	G 44mL Sodium Thiosulfate x2	14
TPH-G WA	NWTPH-Gx	G 44mL HCl x2	14
VOC - Spokane	EPA 524.2	G 44mL HCl x2	14
VOC - Moscow	EPA 524.3	G 44mL MA/AA x3	14
Food/Beverage - Various			
E. Coli O157 by MDS	AOAC 2017.01	Client Container	1
Listeria By MDS	AOAC 2016.07	Client Container x2	1
Salmonella by MDS	AOAC 2016.01	Client Container	1
Aerobic Plate Count, Beer	WLD Agar	Client Container	180
Alcohol ABV	ASBC Beer-4	Client Container	180
Alcohol ABW	ASBC Beer-4	Client Container	180
Anaerobic Plate Count, Beer	WLD Agar	Client Container	180
Appearance	Visual	Client Container	180
Calorie	ASBC Beer-23A	Client Container	180
Color (Beer)	ASBC Beer-10	Client Container	180
Diacetyl	ASBC Beer-25	Client Container	180
IBU	ASBC Beer-23A	Client Container	180
pH (Beer)	ASBC Beer-9	Client Container	180
Plato	ASBC Beer-2	Client Container	180
Real Extract	ASBC Beer-5	Client Container	180
Specific Gravity Beer	ASBC Beer-2	Client Container	180

Analysis	Method	Container/Preservative	Hold Time (days)
Solid - Inorganics			
Alkalinity	SM 2320 B	G 4oz	2
Ammonia	SM 4500-NH3 G	G 4oz	28
Anions (Cl, Fl, SO4)	EPA 300.0	G 4oz	28
Anions (NO3, NO2, PO4)	EPA 300.0	G 4oz	2
Cation Exchange Capacity	EPA 9081	G 4oz	28
Conductivity	SM 2510 B	G 8oz	0
Cyanide EPA 335.4/4500CN/9012B	EPA 335.4/4500-CNE/9012B	G 4oz	14
Hex Chrom	SM 3500-Cr B	G 4oz	1
NO3/NO3 FIA	SM 4500-NO3 F	G 4oz	28
OrthoP/Total P FIA	SM 4500-P F	G 4oz	2
Perchlorate 6850	EPA 6850	G 4oz	28
pH	SM 4500-H-B	G 4oz	0.01
Phenolics	EPA 9065	G 4oz	28
Solids-Total	SM 2540 B	G 4oz	7
Sulfide	SM 4500-S2 F	G 4oz	7
Surfactants	SM 5540 C	G 4oz	2
TCLP Cn	EPA 9012B	G 4oz	0
TCLP Ext Metals	EPA 1311	G 8oz	14
TKN	SM 4500-Norg C	G 4oz	28
TOC	SM 5310 B	G 4oz	28
Solid - Metals			
Hg 7471	EPA 7471B	G 4oz	180
Metals	EPA 6010D/6020B	G 4oz	180
SPLP Metals	EPA 6020B	G 4oz	180
TCLP Ext Metals	EPA 1311	G 4oz	14
TCLP Metals	EPA 6010D/6020B	G 4oz	180
Solid - Microbiology			
Bacteria HPC Swab/Solid	Swab Test	Client Container	14
E. coli	SM 9221 F	G 4oz	1
E. Coli O157 by MDS	AOAC 2017.01	Client Container	1
Fecal DW/NPW/SCM	SM 9221 E	G 4oz	1
Fecal EPA SCM	EPA 1680	Client Container	1
Listeria By MDS	AOAC 2016.07	Client Container x2	1
Salmonella 1682 SCM	EPA 1682	G 4oz	1
Salmonella by MDS	AOAC 2016.01	Client Container	1
Total Coliform	SM 9221 B	Bacteria--P 150mL NaThio	1

Analysis	Method	Container/Preservative	Hold Time (days)
Solid - SVOC			
1,4-Dioxane by EPA 8270D	EPA 8270D SIM	G 1000mL Sodium Thiosulfate	14
Alcohols	EPA 8015D	G 4oz	14
Artificial sweeteners	EPA 8321B	G 4oz	14
Carbamate & Urea Pesticides	EPA 632	G 4oz	14
Explosives	EPA 8330B	G 4oz	14
Glycols	EPA 8015D	G 4oz	14
Glyphosate Soil	EPA 8321B	Client Container	28
HEM	EPA 1664B	G 4oz	28
Herbicides 8151	EPA 8151A	G 4oz	14
Herbicides LCMSMS	EPA 8321B	G 4oz	28
Herbicides-Misc-GCMSMS	GC/MS/MS	Plastic Bag	14
OC Pesticides 8081A	EPA 8081B	G 4oz	14
OP Pesticides 8141	EPA 8141B	G 4oz	14
PAH 8270D	EPA 8270D	G 4oz	14
PCB Oil	EPA 8082A	G 4oz	14
PCB Soil	EPA 8082A	G 4oz	14
PFAS 14 - EPA 537	EPA 537	G 4oz	28
PFAS 18 - EPA 537.1	EPA 537.1	G 4oz	28
PFCs by 533	EPA 533	G 4oz	28
SU Herbicides	EPA 8321B	G 4oz	28
SVOC 8270D	EPA 8270D	G 4oz	14
SVOC 8270D AppIX	EPA 8270D	G 4oz	14
SVOC 8270D MISC	EPA 8270D	G 4oz	14
SVOC 8270D OC Pest	EPA 8270D	G 4oz	14
SVOC LC/MS/MS	EPA 8321B	G 4oz	14
TCLP Ext Herb	EPA 1311	G 8oz	14
TCLP Ext SVOC	EPA 1311	G 8oz	14
TCLP PCB	EPA 8082A	G 4oz	14
TCLP SVOC	EPA 8270D	G 4oz	14
TPH-Dx WA	NWTPH-Dx	G 4oz	14
Solid - VOC			
BTEX	EPA 8260C/8021B	G 4oz	14
TCLP VOC	EPA 8260D	G 4oz	14
TOX Soil	EPA 9023	G 4oz	28
TPH-G WA	NWTPH-Gx	G 4oz	14
VOC 8260	EPA 8260C	G 4oz	13

Analysis	Method	Container/Preservative	Hold Time (days)
Water - Inorganics			
Alkalinity/Carbonate/Biccarb	SM 2320 B	P 250mL	14
Ammonia	SM 4500-NH3 G	P 125mL H2SO4	28
Anions (Cl, Fl, SO4)	EPA 300.0	P 125mL	28
Anions (NO3, NO2, PO4)	EPA 300.0	P 125mL	28
Asbestos	EPA 100.2	P 1000mL	180
BOD/CBOD	SM 5210 B	P 1000mL	2
COD	EPA 410.4	P 125mL H2SO4	28
Color	SM 2120 B	P 125mL	2
Conductivity	SM 2510 B	P 125mL	28
Cyanide EPA 335.4/4500CN/9012B	EPA 335.4/4500-CNE/9012B	P 250mL NaOH	14
Flashpoint	EPA 1010	P 250mL	180
Hardness 130.2	EPA 130.2	P 250mL HNO3	14
Hex Chrom	SM 3500-Cr B	P 250mL	1
Hex Chrom	EPA 218.6	P 250mL Hex Chrom	28
NO3/NO3 FIA	SM 4500-NO3 F	P 125mL H2SO4	28
Odor	SM 2150 B	P 1000mL	1
OrthoP/Total P FIA	SM 4500-P F	P 125mL	2
Perchlorate 331.0	EPA 331.0	Nalgene 250mL	28.5
Perchlorate 6850	EPA 6850	Nalgene 250mL	28
pH	SM 4500-H-B	P 125mL	0.01
Phenolics	EPA 420.1	G 1000mL H2SO4	28
Solids-SSC	ASTM D3977 B	P 1000mL	7
Solids-TDS	SM 2540 C	P 1000mL	7
Solids-Total	SM 2540 B	P 1000mL	7
Solids-TSS	SM 2540 D	P 1000mL	7
Specific Gravity (Hydrometer)	ASTM D3142-05	P 250mL	28
Sulfide	SM 4500-S2 F	P 125mL NaOH	7
Surfactants	SM 5540 C	G 1000mL	2
TCLP Ext Metals	EPA 1311	P 250mL HNO3	14
TKN	SM 4500-Norg C	P 125mL H2SO4	28
TOC/DOC	SM 5310 B	G 44mL HCl	28
Total Organic Nitrogen Manual	Calculation	P 125mL H2SO4	28
Total Residual Chlorine	SM 4500-Cl G	G 44mL No Headspace x2	1
Turbidity	EPA 180.1	P 125mL	2
Water - Metals			
Dissolved Metals	EPA 200.8	P 250mL (preserve after filtration - field or lab)	180
Hardness	SM 2340 C	P 250mL HNO3	180
Hg 1631	EPA 1631 E	F 250mL BrCl	28
Hg 1631 D	EPA 1631 E	F 250mL BrCl	28
Hg 245.1 - Spokane	EPA 245.1	P 125mL HCl	28
Hg 245.1 Dissolved - Spokane	EPA 245.1	P 250mL HNO3	28
Hg 245.7 - Moscow	EPA 245.7	G 44mL HCl	28
Hg 245.7 Dissolved - Moscow	EPA 245.7	G 44mL HCl (preserve after filtration - field or lab)	90
Metals	EPA 200.7/200.8	P 250mL HNO3	180
Metals	EPA 6010D/6020B	P 250mL HNO3	180
SPLP Metals	EPA 6020B	P 250mL HNO3	180
TCLP Ext Metals	EPA 1311	G 4oz	14
TCLP Metals	EPA 6020B	P 250mL HNO3	180

Analysis	Method	Container/Preservative	Hold Time (days)
Water - Microbiology			
Anaerobic Bacteria	SM 9215 B	Bacteria--P 150mL NaThio	1
Bacteria	SM 9223 B	Bacteria--P 150mL NaThio	1.25
Bacteria QT	SM 9223 B	Bacteria--P 150mL NaThio	1.25
Bacteria Tube E. coli	SM 9221 F	Bacteria--P 150mL NaThio	1
Bacteria Tube Fecal	SM 9221 E	Bacteria--P 150mL NaThio	1
Bacteria Tube Total Coliform	SM 9221 B	Bacteria--P 150mL NaThio	1
E. coli	SM 9221 F	Bacteria--P 150mL NaThio	1
Fecal DW/NPW/SCM	SM 9221 E	Bacteria--P 150mL NaThio	1
Fecal MF	SM 9222 D	Bacteria--P 150mL NaThio	1
Fungi	Plate assay	Bacteria--P 150mL NaThio	4
HPC	SM 9215 B	Bacteria--P 150mL NaThio	1
HPC Simplate	SM 9215 E	Bacteria--P 150mL NaThio	1
Iron Bacteria	IRB-BART	Bacteria--P 150mL NaThio	180
Pseudomonas	Plate assay	Bacteria--P 150mL NaThio	1
Salmonella NPW	SM 9260 D	P 1000mL	1
Sulfur Reducing Bacteria	SRB-BART	Bacteria--P 150mL NaThio	180
Total Coliform	SM 9221 B	Bacteria--P 150mL NaThio	1
Total Coliform MF EPA	EPA 9132	Bacteria--P 150mL NaThio	1
Water - Radiochemistry			
Gross Alpha	EPA 900.0	P 1000mL HNO3	180
Gross Beta	EPA 900.0	P 1000mL HNO3	180
Radium 226	EPA 903.0	P 1000mL HNO3	180
Radium 228	EPA 904.0	P 1000mL HNO3	180

Analysis	Method	Container/Preservative	Hold Time (days)
Water - SVOC			
1,4-Dioxane by EPA 8270D	EPA 8270D SIM	G 1000mL	7
Acrylamide	EPA 8321B	G 1000mL	28
Alcohols	EPA 8015D	G 44mL	14
Artificial sweeteners	EPA 8321B	G 1000mL	14
Endothall	EPA 548.1	G 125mL	7
Explosives	EPA 8330B	G 1000mL	7
Glycols	EPA 8015D	G 44mL	14
HEM	EPA 1664B	G 1000mL HCl	28
HEM Non-Polar	EPA 1664B	G 1000mL HCl	28
Herbicides 615	EPA 615	G 125mL	7
Herbicides 8151	EPA 8151A	G 1000mL	7
Herbicides 8151-GCMSMS	EPA 8151A	G 250mL	14
Herbicides LCMSMS	EPA 8321B	G 1000mL	28
OC Pesticides 608	EPA 608.3	G 250mL	7
OC Pesticides 8081A	EPA 8081B	G 1000mL	7
OP Pesticides 614	EPA 614.1	G 1000mL	7
OP Pesticides 8141	EPA 8141B	G 1000mL	7
PAH 8270D	EPA 8270D	G 1000mL	7
PCB Soil	EPA 8082A	G 1000mL	7
PCB Water	EPA 8082A	G 1000mL	7
PFAS 14 - EPA 537	EPA 537	P 250mL Trizma x3	14
PFAS 18 - EPA 537.1	EPA 537.1	P 250mL Trizma x3	14
PFCs by 533	EPA 533	P 250mL Ammonium Acetate x3	28
SU Herbicides	EPA 8321B	G 1000mL	28
SVOC 625	EPA 625.1	G 1000mL x2	7
SVOC 8270D	EPA 8270D	G 1000mL	7
SVOC 8270D AppIX	EPA 8270D	G 1000mL	7
SVOC 8270D MISC	EPA 8270D	G 1000mL	7
SVOC 8270D OC Pest	EPA 8270D	G 1000mL	7
SVOC LC/MS/MS	EPA 8321B	G 1000mL	120
TCLP SVOC	EPA 8270D	G 1000mL	14
TPH-Dx WA	NWTPH-Dx	G 1000mL HCl	14
Water - VOC			
BTEX	EPA 624.1	G 44mL HCl x2	14
BTEX 8021	EPA 8021B	G 44mL HCl x2	14
BTEX 8260	EPA 8260C	G 44mL HCl x3	14
THM - Moscow	EPA 524.3	G 44mL MA/AA x2	13
THM - Spokane	EPA 524.2	G 44mL Sodium Thiosulfate x2	14
TOX NPW	EPA 9020B	G 1000mL H2SO4	28
TPH-G	EPA 8015D	G 44mL HCl x2	14
TPH-G WA	NWTPH-Gx	G 44mL HCl x2	14
VOC 524.3	EPA 524.3	G 44mL MA/AA x3	13
VOC 624	EPA 624.1	G 44mL HCl x2	13
VOC 8260	EPA 8260C	G 44mL HCl x3	13
VOC EPA 1666	EPA 1666	G 44mL HCl	13

Anatek Labs - Moscow ID
Matrix of Accredited Methods - by State

Method	Description	WS	WS	WS	WS	WS	WS	WS	WS	WS	WP	WP	WP	WP	WP	WP	RCRA	RCRA	RCRA
EPA 1311-TCLP	TCLP																	NV	
EPA 1312-SPLP	SPLP																	NV	
EPA 160.4	TVS											WA							
EPA 180.1	Turbidity	FL	WA	ID	NM	OR	NV	MT			FL	WA	OR	NV					
EPA 200.7	ICP	FL	WA	ID	NM	OR	NV	MT	WY		FL	WA	OR	NV					
EPA 200.8	ICP-MS	FL	WA	ID	NM	OR	NV	MT	WY		FL	WA	OR	NV					
EPA 245.7	Hg										FL	WA	OR	NV	AZ				
EPA 300	Ions	FL	WA	ID	NM	OR	NV	MT	WY		FL	WA	OR	NV			WA		
EPA 331	Perchlorate	FL	WA			OR	NV					WA		NV					
EPA 335.4	Cyanide	FL	WA	ID	NM	OR	NV		WY		FL	WA	OR	NV			WA		
EPA 420.1	Phenolics										FL	WA	OR	NV			WA		
EPA 504.1	EDB/DBCP	FL	WA	ID	NM	OR	NV	MT	WY										
EPA 505	Pesticides	FL	WA	ID	NM	OR	NV	MT	WY										
EPA 515.4	Herbicides	FL	WA	ID	NM	OR	NV	MT	WY										
EPA 524.3	VOCs	FL	WA	ID	NM	OR	NV	MT	WY	AZ									
EPA 525.2	SOCs	FL	WA	ID	NM	OR	NV	MT	WY										
EPA 531.2	Carbamates	FL	WA	ID	NM	OR	NV	MT	WY										
EPA 533	PFAS/PFCs	FL	WA		NM	OR		MT	WY		FL		OR						
EPA 537	PFOA/PFOS	FL	WA		NM	OR		MT	WY		FL		OR						
EPA 547	Glyphosate	FL	WA	ID	NM	OR	NV	MT	WY										
EPA 548.1	Endothall	FL	WA	ID	NM	OR	NV	MT	WY										
EPA 549.2	Diquat	FL	WA	ID	NM	OR	NV	MT	WY										
EPA 608.3	Pesticides										FL	WA	OR	NV					
EPA 624.1	VOCs										FL	WA	OR	NV	AZ				
EPA 625.1	SVOCs										FL	WA	OR	NV	AZ				
EPA 1631E	Hg Trace										FL	WA	OR	NV	AZ	SC			
EPA 1664B	FOG					OR					FL	WA	OR	NV		SC			
EPA 6010B/C	ICP										FL		OR	NV			WA	NV	
EPA 6020A/B	ICP-MS										FL		OR	NV			WA	NV	
EPA 6850	Perchlorate										FL	WA	OR						
EPA 8015B	Diesel - Gas													NV				NV	AZ
EPA 8081	Pesticides										FL		OR	NV			WA	NV	
EPA 8082	PCBs										FL		OR	NV			WA	NV	AZ
EPA 8141	OCPests													NV			WA	NV	
EPA 8151	Herbicides										FL		OR	NV			WA	NV	
EPA 8260c	VOCs										FL		OR	NV			WA	NV	AZ
EPA 8270d	SVOCs										FL		OR	NV			WA	NV	AZ
EPA 8330b	Explosives													NV			WA		
EPA 9012B	pH																		

Anatek Labs - Moscow ID
Matrix of Accredited Methods - by State

Method	Description	WS	WS	WS	WS	WS	WS	WS	WS	WS	WP	WP	WP	WP	WP	WP	RCRA	RCRA	RCRA
NWTPH-DX	Diesel																WA		
NWTPH-GX	Gas																WA		
SM 2120B	Color	FL	WA		NM	OR	NV	MT											
SM 2320B	Alkalinity	FL	WA		NM	OR	NV				FL	WA	OR	NV					
SM 2340B	Hardness	FL	WA		NM	OR	NV				FL	WA	OR	NV					
SM 2510B	Conductivity	FL	WA		NM	OR	NV				FL	WA	OR	NV					
SM 2540C	TDS	FL	WA		NM	OR	NV	MT			FL	WA	OR	NV					
SM 2540D	TSS										FL	WA	OR	NV					
SM 4500CLG	Chlorine													NV					
SM 4500CNE	Cyanide			ID			NV							NV			WA		
SM 4500CNG	Cyanide Amenable						NV					WA		NV			WA		
SM 4500CNI	Cyanide WAD													NV					
SM 4500H+B	pH	FL	WA		NM	OR	NV				FL	WA	OR	NV					
SM 4500NH3-G	Ammonia										FL	WA	OR	NV			WA		
SM 4500NO3F	NO2/NO3	FL	WA	ID	NM	OR	NV		WY		FL	WA	OR	NV					
SM 4500NORGC	TKN										FL	WA	OR	NV			WA		
SM 4500P-F	Ortho/Total P										FL	WA	OR	NV			WA		
SM 5310B	TOC	FL	WA		NM	OR	NV	MT			FL		OR	NV					
SM 5530D	Phenolics											WA		NV					
SM 5540C	MBAS	FL	WA		NM	OR	NV	MT											
SM 6251B	HAA	FL	WA	ID	NM	OR	NV	MT	WY										
SM 9221B+E1+C	Total/Fecal-count											WA							
SM 9221B+F+C	Total Coli/Ecoli-count											WA							
SM 9223B-MPN	Coli - count		WA	ID															
SM 9223B-PA	Coli - detect		WA	ID															

Anatek Labs - Spokane WA
Matrix of Accredited Methods - by State

Method	Description	WS						WP	RCRA
EPA 180.1	Turbidity	WA	MT	ID				WA	
EPA 200.8	ICP-MS	WA	MT	ID	FL-U	NM-U	NV-U	WA - FL - NV-U	
EPA 245.1	LL Hg							WA	
EPA 300	Ions	WA	MT	ID				WA	WA
EPA 335.4	Cyanide	WA	MT	ID				WA	WA
EPA 410.4 (5220D)	COD							WA - FL	
EPA 524.2	VOCs	WA	MT	ID					
EPA 624	VOCs							WA	
EPA 900	Gross A/B	WA	FL	ID	NV	NM		FL - NV	
EPA 903.0	Radium 226	WA	MT	ID	NV	NM	FL	FL - NV	
EPA 904.0	Radium 228	WA	MT		NV	NM	FL	FL	
EPA 1664B	HEM, HEM-SGT							WA	
EPA 1680	Fecal-count								WA
EPA 1682	Salmonella								WA
EPA 6020B	ICP-MS							WA - FL	WA
EPA 7471	Mercury in soil								WA
EPA 8021B	BTEX								WA
EPA 8082	PCBs								WA
EPA 8260D	VOCs								WA
EPA 9020B	TOX							WA - NV	WA
EPA 9023	EOX								WA
EPA 9045D	pH								WA
EPA 9076	Chloride								WA
NWTPH-DX	Diesel								WA
NWTPH-GX	Gas								WA
SM 2120B	Color	WA	MT						
SM 2320B	Alkalinity	WA	MT					WA	
SM 2340B/C (130.2)	Hardness	WA	MT					WA - FL	
SM 2510B	Conductivity	WA	MT					WA	
SM 2540C	TDS	WA	MT					WA	
SM 2540D (160.2)	TSS							WA - FL	
SM 2540G	TVS							WA	WA
SM 3500Cr-B	Hexavalent Chromium							WA	
SM 4500CNE	Cyanide	WA	MT	ID				WA	WA
SM 4500H+B	pH	WA	MT					WA	
SM 4500NH3-H	Ammonia							WA	WA
SM 4500NO3F	NO2/NO3							WA	WA
SM 4500NORGC	TKN							WA	WA
SM 4500P-F	Ortho/Total P	WA	MT						WA
SM 4500P-G	Orthophosphate							WA	
SM 4500P-H	Total Phosphate							WA	
SM 5210B	BOD/CBOD							WA	
SM 5310C	TOC/DOC	WA	MT					WA	
SM 9215B	Heterotrophic Plate Count	WA	MT	ID				WA	
Simplate	Heterotrophic Plate Count	WA	MT	ID				WA	
SM 9221B+E1	Total/Fecal-detect	WA	MT						
SM 9221B+E1 + C	Total/Fecal-count	WA	MT	ID				WA	
SM 9221B+F	Total Coli/Ecoli-detect	WA	MT						
SM 9221B+F+C	Total Coli/Ecoli-count	WA	MT	ID				WA	
SM 9221E2+C	Fecal-count			ID				WA	WA
SM 9222D	Fecal-count	WA	MT	ID				WA	
SM 9223B-MPN	Coli - count	WA	MT	ID				WA	
SM 9223B-PA	Coli - detect	WA	MT						
SM 9260D	Salmonella							WA	

Figures

Anatek Labs, Inc.

Appendices

Appendix A

Index of Standard Operating Procedures

Moscow Index is followed by Spokane Index

Anatek Labs, Inc.
Standard Operating Procedures

Laboratory Director:
Mike Pearson

29 Apr 2025

The SOP's contained herein are for the use of Anatek Labs Employees and are not to be removed from the premises without the prior approval of the Lab Director or Lab Manager. Original signed copies are maintained by the QA Officer. Any changes should be submitted to the QA Officer for implementation.

SOP Number	Effective Date	SOP Name
General		
ALI-01.06:	1 Feb 2019	Preparing and Maintaining Standard Operating Procedures
ALI-02.07:	24 Apr 2020	Sample Login, Handling and Custody
ALI-03.03:	28 Jan 2022	Glassware Cleaning
ALI-04.09:	25 Jan 2021	Waste Disposal
ALI-05.04:	11 Jan 2016	Data Entry
ALI-06.03:	14 Jan 2013	Complaints
ALI-07.07:	17 Mar 2017	Corrective Action Reports and Non-Conformance Forms
ALI-08.10:	11 Mar 2024	Standards and Reagents – Labeling, Logging, Storage, and Expiration Dates
ALI-09.11:	11 Oct 2019	Instrument Maintenance and Calibration
ALI-10.11:	11Jan 2021	Laboratory Safety
ALI-11.05:	1 Feb 2015	Data Handling
ALI-12.03:	1 Feb 2015	Laboratory Blind Samples
ALI-13.03:	14 Jan 2013	Personnel Training Records
ALI-14.15:	1 Dec 2021	Data Archiving
ALI-15.02:	14 Jan 2013	Instrument Activities Logbooks & Laboratory Notebooks
ALI-16.07:	7 Jan 2020	Internal Inspections and Reporting
ALI-17.04:	23 Feb 2015	Procedure for QA Audits of Instrument Activity Logs, IDC's & MDL's
ALI-18.19:	24 Apr 2020	Sample Receiving
ALI-19.11:	11 Jan 2021	Temperature Monitoring and Thermometer Calibrations
ALI-20:	Not in use	
ALI-21.07:	11 Apr 2025	Customer & Regulator Notification
ALI-22.04:	1 Mar 2024	Training
ALI-23:	Not in use	

ALI-24.03:	23 Feb 2015	Performing Records Inspections
ALI-25.08:	28 May 2021	Performance of IDCs, MDLs, and PQLs
ALI-26.08:	24 Jan 2025	Data Reporting
ALI-27.06:	10 Jun 2024	IT Systems Documentation
ALI-28.02:	1 Feb 2024	QC Acceptance Ranges & Control Charts
ALI-29.09:	10 Jan 2024	PT Reporting
ALI-30.05:	24 Mar 2023	Authorized Signatures
ALI-31.00:	1 Aug 2015	Master List of Quality Systems Documents
ALI-32.00:	13 Mar 2017	Preventive Action Reports
ALI-33.03:	7 Dec 2023	Foreign Soil Handling Procedures
ALI-34.00:	22 Apr 2022	Preservative Preparation
ALI-35.00:	3 Apr 2024	Autosampler Vial Volume Verification
Office Manual		
ALI-OM-01.02:	13 Jan 2010	Customer Service
ALI-OM-02.03:	19 Jan 2024	Custodial Services
ALI-OM-03:	Not in use	
ALI-OM-04.03:	11 Jan 2021	Telephone Systems Procedures
ALI-OM-05.04:	11 Jan 2021	Mail Handling
ALI-OM-06.05:	15 Feb 2023	Purchasing
ALI-OM-07.08:	11 Jan 2021	Shipping
ALI-OM-08.04:	15 Feb 2023	Office Equipment
ALI-OM-09.09:	25 Jan 2021	Accounting
ALI-OM-10.04:	11 Jan 2021	Credit Accounts
ALI-OM-11.04:	19 Jan 2015	Employees
ALI-OM-12.02:	1 Feb 2025	Website Maintenance
Analytical		
Drinking Water (100)		
ALI-A-101.20:	26 Jan 2024	EDB/DBCP/1,2,3-TCP Analysis by EPA Method 504.1
ALI-A-102.27:	11 Feb 2022	Haloacetic Acids Analysis by SM 6251B
ALI-A-103.18:	6 Nov 2023	Organochlorine Pesticides and PCB's by EPA Method 505
ALI-A-104.20:	15 Nov 2021	Herbicides Analysis by EPA Method 515.4
ALI-A-105:	Not in use	
ALI-A-106.21:	7 Nov 2022	Semi-volatiles Analysis by EPA Method 525.2
ALI-A-107.18:	17 Jun 2024	Carbamates Analysis by EPA Method 531.2
ALI-A-108.16:	12 Feb 2024	Glyphosate Analysis by EPA Method 547
ALI-A-109.15:	1 Nov 2020	Endothall Analysis by EPA Method 548.1
ALI-A-110.14:	11 Feb 2022	Diquat/Paraquat Analysis by EPA Method 549.2
ALI-A-111:	Not in use	
ALI-A-112:	Not in use	
ALI-A-113:	Not in use	
ALI-A-114:	Not in use	
ALI-A-115:	Not in use	

ALI-A-116.07:	6 Nov 2023	Volatile Organic Analysis by EPA Method 524.3
ALI-A-117.01:	15 Mar 2019	1,4-Dioxane by EPA Method 522
ALI-A-118:	Not in use	
ALI-A-119:	Not in use	
ALI-A-120:	Not in use	
ALI-A-121:	Not in use	
ALI-A-122:	Not in use	
ALI-A-123:	Not in use	
ALI-A-124.02	1 Nov 2022	PFCs by EPA Method 533
ALI-A-125.04	1 Feb 2025	PFAS by EPA Method 537.1
Non Drinking Water Organic (200)		
ALI-A-201.07:	15 Mar 2019	Pressurized Fluid Extraction By EPA Method 3545
ALI-A-202:	Not in use	
ALI-A-203.15:	11 Mar 2024	Pesticides/PCB's by EPA Method 608.3
ALI-A-204.04:	1 Feb 2021	Carbamates/Urea Pesticide Analysis by HPLC-UV by EPA Method 8321B & EPA Method 632
ALI-A-205.15:	1 Jun 2020	Herbicides by EPA Method 8151A/615
ALI-A-206.19:	30 May 2022	Semivolatile Organic Compounds Analysis by GC/MS by EPA Method 8270E
ALI-A-207.12:	30 May 2022	Volatile Organic Analysis by EPA Method 8260D
ALI-A-208.12:	1 Jun 2021	Volatile Organic Analysis by EPA Method 624.1
ALI-A-209.05:	1 Feb 2025	Explosives and Explosive By-products by EPA Method 8330B
ALI-A-210:	Not in use	
ALI-A-211.11:	7 May 2018	Organophosphorus Pesticide Analysis by GC/MS by EPA Method 8141B Modified/614/614.1
ALI-A-212.14:	13 Jul 2020	Pesticides/PCB's by EPA Method 8081B/8082A
ALI-A-213.09:	1 May 2020	Soil Herbicides by EPA Method 8151A Modified
ALI-A-214:	Not in use	
ALI-A-215:	Refer to	See SOP ALI-A-340
ALI-A-216:	Not in Use	
ALI-A-217:	Not in Use	
ALI-A-218.03:	22 Mar 2024	Triclopyr and 2,4-D by HPLC/MS/MS by EPA Method 8321A
ALI-A-219.01:	27 Jan 2020	Closed Purge-and-Trap Extraction for VOCs by EPA Method 5035A
ALI-A-220.01:	6 Feb 2017	Continuous Liquid-Liquid Extraction by EPA Method 3520C
ALI-A-221.00:	16 Feb 2016	PCBs in Oil and Soil by EPA Method 8082A
ALI-A-222.01:	14 Jun 2018	Salicylic Acid by EPA Method 8321
ALI-A-223.01:	14 Jun 2018	IBA by EPA Method 8321
ALI-A-224.00:	1 Jun 2020	Semivolatile Organic Compounds Analysis by GC/MS by EPA Method 625.1
ALI-A-225.01:	14 April 2023	DCOIT in Water by GC/MS-SIM
ALI-A-226.00:	15 Dec 2022	Nonylphenol by ASTM D7065
ALI-A-227.00:	1 Nov 2024	PFAS in Water by EPA 1633

ALI-A-228.00:	1 Jun 2021	Organonitrogen Pesticides by EPA Method 625 Modified
Inorganic and Wet Chemistry (300)		
ALI-A-301.14:	1 Mar 2024	Orthophosphate/Total Phosphorus (SM4500P-F/G/H/I & EPA 365.4) Flow Injection Analysis
ALI-A-302:	Not in use	
ALI-A-303.13:	15 Mar 2024	Phenolics by Manual Colorimetry by EPA Method 420.1/SM5530C/EPA 9065
ALI-A-304.12:	9 Sept 2022	Ammonia Nitrogen (SM4500NH3-G/I/EPA 350.1) and TKN (SM4500NorgC) by Flow Injection Analysis
ALI-A-305.03:	22 Jan 2024	Cation Exchange Capacity of Soils by EPA Method 9081
ALI-A-306.03:	1 Sep 2020	Residual Chlorine by SM 4500Cl-G
ALI-A-307:	Not in use	
ALI-A-308.12:	1 Mar 2024	Cyanide (Total, Amenable, and Weak Acid Dissociable) by Semi-Automated Colorimetry SM 4500-CN-N-E-G-I
ALI-A-309.15:	1 Mar 2024	Total Cyanide by Semi-Automated Colorimetry by EPA Method 335.4/9012B
ALI-A-310.10:	20 Nov 2020	pH by EPA Method 150.1 & SM4500 H+B & EPA Method 9045D
ALI-A-311.13:	4 Apr 2025	Alkalinity by EPA Method 310.1/SM 2320B
ALI-A-312.13:	8 Feb 2021	Conductivity by EPA Method SM 2510B (and Resistivity by ASTM G57a)
ALI-A-313.04:	25 Jan 2021	Hardness by SM 2340B
ALI-A-314.18:	10 Mar 2023	Trace Metal Analysis by EPA Method 200.8
ALI-A-315.17:	10 Mar 2023	Trace Metal Analysis by EPA Method 6020B
ALI-A-316:	Not in use	
ALI-A-317:	Not in use	
ALI-A-318.19:	20 Feb 2023	Trace Mercury Analysis by EPA Method 1631/245.7
ALI-A-319.13:	21 Feb 2025	Nitrate/N and Nitrite/N (SM4500NO3-F/Iz & EPA 353.2) Flow Injection Analysis
ALI-A-320.19:	21 Feb 2025	Ions (Nitrate, Nitrite, Chloride, Sulfate, Fluoride, Phosphate, Bromide) By EPA Method 300.0
ALI-A-321.04:	22 Jan 2018	No longer in use
ALI-A-322.13:	1 Feb 2025	Turbidity by EPA Method 180.1
ALI-A-323.16:	1 Jul 2024	TSS by SM 2540-D and TDS by SM 2540-C
ALI-A-324.08:	1 Jun 2022	Color (Platinum-Cobalt Method) by SM 2120B
ALI-A-325.05:	23 Aug 2019	Total Volatile Solids by EPA Method 160.4/SM 2540E/G & Total Fixed Solids (%Ash) by EPA Method 1684 and Total Solids
ALI-A-326.02:	1 Mar 2012	Total Volatile Acids by SM 5560 C
ALI-A-327.04:	13 Sept 2023	Anionic Surfactants by Method 5540 C
ALI-A-328.05:	1 Mar 2017	Tannin and Lignin by SM 5550 B
ALI-A-329:	Not in use	
ALI-A-330.09:	1 Dec 2023	Toxicity Characteristic Leaching Procedure by SW 846 Method 1311
ALI-A-331:	Not in use	

ALI-A-332.07:	14 Jun 2021	Sulfide (SM4500-S2 F) Iodometric Titration
ALI-A-333:	Not in use	
ALI-A-334:	Not in use	
ALI-A-335:	Not in use	
ALI-A-336:	Not in use	
ALI-A-337.05:	24 Mar 2023	Synthetic Precipitation Leaching Procedure by SW-846 Method 1312
ALI-A-338.17:	10 Mar 2023	Trace Metals Analysis by EPA Method 200.7
ALI-A-339.09:	10 Mar 2023	Trace Metals Analysis by EPA Method 6010D
ALI-A-340.07:	5 Feb 2024	Perchlorate by EPA Method 331.0 (HPLC/ESI/MS)
ALI-A-341.06:	5 Feb 2024	Perchlorate by EPA Method 6850
ALI-A-342.04:	9 Sept 2022	TOC/DOC by SM5310B
ALI-A-343:	Not in use	
ALI-A-344.02:	11 Jan 2016	Acid Digestion of Sediments, Sludges, and Soils by EPA Method 3050B
ALI-A-345.01:	1 Jul 2020	Odor by SM 2150B
ALI-A-346:	Not in use	200.8 – UCMR4
ALI-A-347.00:	15 May 2020	Langlier Index - Corrosivity
ALI-A-348.01:	13 Aug 2021	Trace Metals Analysis by EPA Method 200.7 – UCMR5 Analysis
ALI-A-349.00:	24 Jun 2022	Sodium Adsorption Ratio
UST Petroleum Methods (400)		
ALI-A-401:	Not in use	
ALI-A-402:	Not in use	
ALI-A-403:	Not in use	
ALI-A-404.12:	22 Feb 2021	Gasoline Analysis by NWTPHG(x)/EPA Method 8260C/EPA Method 8015 (Modified)/NW TPHG(X)
ALI-A-405.19:	1 Oct 2024	TPH-D & HCID-NW TPH-D & NW TPH-HCID – EPA 8015D
ALI-A-406:	Not in use	
ALI-A-407.13:	10 Jan 2020	Hexane Extractable Material (FOG) by EPA Method 1664B
ALI-A-408:	Not in use	
ALI-A-409:	Not in use	
ALI-A-410:	Not in use	
ALI-A-411.03:	9 Mar 2018	Flashpoint by EPA Method 1010
ALI-A-412:	Not in use	C10-C32 Hydrocarbons in Soil by 8015AZ
ALI-A-413.05:	1 Jul 2020	Glycols by EPA 8015D
ALI-A-414.01:	4 Oct 2019	Ignitability by EPA 1030
Coliform and Bacteria (500)		
ALI-A-501.08:	1 Dec 2017	SM 9223B-MPN (Quanti-tray) Procedure
ALI-A-502.14:	6 May 2024	SM 9223B-PA Procedure
ALI-A-503.04:	1 Mar 2017	Heterotrophic Plate Count by Method 9215 B
ALI-A-504:	Not in use	
ALI-A-505.05:	1 Feb 2025	SM 9221E2+C-A1/MPN Fecal Coliform and E. coli Count by Multiple Tube Fermentation

ALI-A-506.07:	1 Feb 2025	SM9221B-E-F-LTP/MPN Total Coliform, Fecal Coliform, and E. coli Count by Multiple Tube Fermentation
ALI-A-507:	Not in use	
Special (600)		
ALI-A-601:	Not in Use	See ALI-A-213
ALI-A-602.07:	15 May 2023	Determination of Methamphetamine from Wipe Samples and Other Matrices
ALI-A-603.00:	26 Nov 2012	Glyphosate and AMPA in Soil & Solids
ALI-A-604.00:	25 Mar 2019	Acesulfame K and Sucralose in Water – LC/MS/MS
ALI-A-605.00	22 May 2022	Aminopyralid by LC/MS/MS
ALI-A-606.00	26 Aug 2022	Fungicides in Wood by LC/MS/MS
ALI-A-607.01	29 Sept 2023	6PPD-Q by LC/MS/MS
ALI-A-608.00	20 Mar 2021	SU Herbicides by LC/MS/MS
ALI-A-609.00	1 Jan 2025	Pesticides by LC/MS/MS

Anatek Labs, Inc.
Spokane Laboratory

Standard Operating Procedures

Laboratory Director:
Mike Pearson

17 Oct 2023

The SOP's contained herein are for the use of Anatek Labs Employees and are not to be removed from the premises without the prior approval of the Lab Director or Lab Manager. Original signed copies are maintained by the QA Officer. Any changes should be submitted to the QA Officer for implementation.

SOP Number	Effective Date	SOP Name
General (00)		
ALI-01.03	10 Feb 2019	Preparing and Maintaining Standard Operating Procedures
ALI-02.05	4 June 2021	Sample Login, Handling, and Custody
ALI-03.02	24 Jan 2019	Glassware Cleaning
ALI-04.00	24 Jan 2019	Waste Disposal
ALI-05.00	1 Feb 2019	Data Entry
ALI-06.02	12 Oct 2020	Complaints
ALI-07.05	6 Jan 2021	Corrective Action Reports
ALI-08.02	19 August 2020	Standards and Reagents - Labeling, Logging, Storage, and Expiration Dates
ALI-09.05	2 Sept 2022	Instrument Maintenance and Calibrations
ALI-10.03	25 Nov 2019	Chemical Hygiene Plan
ALI-11.03	19 August 2020	Data Handling
ALI-12.00	20 Apr 2018	Laboratory Blind Sample
ALI-13.02	1 Apr 2019	Personnel Training Records
ALI-14.02	22 Oct 2021	Data Archiving
ALI-15.03	27 Feb 2022	Instrument Activities Logbooks
ALI-16.04	3 June 2021	Internal Inspections and Reporting
ALI-17.02	5 Sept 2018	Procedure for QA Audits of Instrument Activity Logs, IDC's and MDL's
ALI-18.02	15 Jun 2016	Sample Receiving
ALI-19.02	4 Jul 2018	Calibration and Monitoring of Thermometers
ALI-20.02	4 Jul 2018	IDEXX Bottle Volume and Sterility Test
ALI-21.04	25 Sept 2019	Customer Notification
ALI-22.03	23 May 2022	Training
ALI-23.02	19 Mar 2018	Shipping and Receiving

ALI-24.01	25 Jan 2016	Performing Records Inspections
ALI-25.03	14 Mar 2023	Performance of IDOCs, MDLs, and PQLs
ALI-26.06	6 June 2022	Data Reporting
ALI-27.03	10 Nov 2021	IT Systems Documentation
ALI-28.02	30 Aug 2018	QC Acceptance Ranges and Control Charting
ALI-29.03	3 Jun 2021	PT Reporting
ALI-30.03	7 Jul 2020	Authorized Signatures
ALI-31.03	30 May 2019	Fume Hood Performance Testing
ALI-32.02	4 Jul 2018	Vendor Qualifications and Purchasing
ALI-33.01	1 Jun 2016	Regulatory Inspections
ALI-34.02	Inactive	Law Enforcement, Cannabis and Anatek Labs
ALI-35.03	6 June 2022	Security System
ALI-36.00	20 Mar 2017	Preventive Action Reports
ALI-37.01	20 Dec 2019	Master List of Quality System Documents
ALI-38.00	11 Jan 2021	Element Laboratory Data Entry
ALI-39.01	19 Oct 2021	Micro Quality Systems
ALI-40.01	16 May 2022	Foreign Soil Handling
Office Manual (00)		
ALI-OM-1.04	19 Nov 2020	Customer Service
ALI-OM-2.03	1 Mar 2018	Custodial Services
ALI-OM-3.04	5 Jan 2021	Sample Handling Procedures
ALI-OM-4.03	10 Nov 2017	Telephone Systems Procedures
ALI-OM-5.02	28 April 2016	Mail Handling
ALI-OM-6.04	5 Jan 2021	Purchasing
ALI-OM-7.03	1 Mar 2018	Shipping
ALI-OM-8.02	16 May 2016	Office Equipment
ALI-OM-9.03	5 Jan 2021	Accounting
ALI-OM-10.02	20 May 2016	Credit Accounts
ALI-OM-11.03	19 Nov 2020	Employees
Analytical		
Organics (100)		
ALI-S-101.05	6 May 2020	Volatile Organic Analysis by EPA Method 524.2
ALI-S-102.03	1 Mar 2019	Volatile Organic Analysis by EPA Method 624
ALI-S-103.06	18 Mar 2020	Volatile Organic Analysis by EPA Method 8260C
ALI-S-104.03	Inactive	Total Organic Carbon by SM 5310C
ALI-S-105.07	30 Sept 2022	Total Organic Halides by EPA Method 9020B
ALI-S-106.06	30 Sept 2022	Extractable Organic Halides by EPA Method 9023
ALI-S-107.01	Inactive	Haloacetic Acids by SM 6251B

Inorganic and Wet Chemistry (200)

ALI-S-201.04	14 Feb 2023	Total Phosphorus by SM4500-PH
ALI-S-202.02	27 Sept 2019	Total Residual Chloride by SM4500Cl-G
ALI-S-203.04	Inactive	Total Cyanide by SM 4500CN-F
ALI-S-204.07	13 Jan 2020	pH by EPA Method 150.1
ALI-S-205.09	20 Dec 2019	Alkalinity (Carbonate & Bicarbonate) by SM 2320 B/EPA 310.1
ALI-S-206.07	13 Jan 2020	Conductivity by SM 2510 B
ALI-S-207.10	16 Dec 2021	Hardness by SM 2340 C – EPA 130.2 (CaCO3)
ALI-S-208.06	15 Dec 2022	Anions (NO3, NO2, SO4, Cl, F, PO4, Br) by EPA Method 300.0
ALI-S-209.01	Inactive	Ions (Bromate, Chlorate, Chlorite) by EPA Method 300.1 Part B
ALI-S-210.05	14 Jan 2020	Turbidity by EPA Method 180.1
ALI-S-211.07	18 Jan 2023	TSS (Total Suspended Solids) and VSS (Volatile Suspended Solids) by SM 2540 D & E
ALI-S-212.08	18 Jan 2023	TDS (Total Dissolved Solids) by EPA Method 160.1/SM 2540 C
ALI-S-213.02	18 Jan 2023	TS (Total Solids) by EPA Method 160.3
ALI-S-214.05	14 Feb 2023	BOD/DO/CBOD by SM 5210 B
ALI-S-215.05	26 Oct 2020	COD by EPA Method 410.4
ALI-S-216.00	6 Mar 2017	Percent Solids
ALI-S-217.06	1 Feb 2019	pH (non-aqueous) by EPA Method 9045D
ALI-S-218.04	27 Jan 2020	Color by SM 2120 B
ALI-S-219.04	14 Feb 2023	Ammonia Nitrogen by SM 4500 NH3-H
ALI-S-220.04	17 Feb 2023	Ortho-phosphate by SM 4500-PG
ALI-S-221.02	27 Jan 2020	Sulfide by SM4500-S2-D
ALI-S-222.03	27 Jan 2020	Acidity by EPA 310.1 / SM2310-B
ALI-S-223.02	18 Mar 2020	Sulfite by SM4500-SO3-B
ALI-S-224	Inactive	No Longer In Use
ALI-S-225.02	27 Jan 2020	Resistivity by ASTMG57A
ALI-S-226.10	7 May 2021	Metals by EPA 200.8
ALI-S-227.09	7 May 2021	Metals by EPA 6020A-B
ALI-S-228.04	15 Nov 2023	TKN by SM 4500NorgD
ALI-S-229.02	13 Nov 2020	Specific Gravity/Density
ALI-S-230.01	21 April 2020	Chlorine Demand by SM 2350B
ALI-S-231.01	Inactive	MBAS by SM 5540C
ALI-S-232.03	27 Jan 2020	Carbon Dioxide
ALI-S-233.03	27 Jan 2020	Sulfide by SM4500-S2-D
ALI-S-234.03	Inactive	CN in DW by SM 4500 CN N / EPA 335.4 Rolled into 235-04 on 4/13/2020
ALI-S-235.06	17 Feb 2023	Cyanide by SM 4500 CN N / EPA 335.4
ALI-S-236.06	17 Feb 2023	Nitrate + Nitrite by SM 4500
ALI-S-237.04	11 Nov 2019	Hexane Extractable Material by EPA 1664A/B
ALI-S-238.01	11 Oct 2019	Sharps, Inerts and Foreign Matter by TMECC 03.06
ALI-S-239.03	2 Feb 2023	Mercury in Water by EPA 245.1

ALI-S-240.02	Inactive	Trace Mercury Analysis by EPA 245.2/7471B – see 239/250
ALI-S-241.00	15 Mar 2019	Toxicity Characteristic Leaching Procedure by SW 846 Method 1311
ALI-S-242.00	Inactive	Cation Exchange Capacity of Soils by EPA Method 9081
ALI-S-243.00	15 Mar 2019	Acid Digestion of Sediments, Sludges, and Soils by EPA 3050B
ALI-S-245.00	Inactive	Mercury Analysis by EPA 7471 – See 250
ALI-S-246.01	4 Mar 2020	Total Fixed and Volatile Solids by SM 2540
ALI-S-247.00	20 Mar 2017	Hardness by SM 2340 B - Calculation
ALI-S-248.00	4 Oct 2019	Settleable Solids by SM 2540F
ALI-S-249.00	18 Mar 2020	Reactive Silica by SM 4500 SiO_2 C
ALI-S-250.01	10 Nov 2021	Hg in Solids by EPA 7471B
ALI-S-251.00	30 Dec 2020	ORP in Water by SM 2580B
ALI-S-252.00	5 Jan 2021	Hexavalent Chromium
ALI-S-253.00	3 Feb 2021	UV 254 by SM 5910 B
ALI-S-254.00	18 Mar 2021	Odor by SM 2150 B
ALI-S-255.00	23 Feb 2023	Conductivity by SEAL Minilab
Hazardous Waste/Waste Oil (300)		
ALI-S-301.04	5 May 2021	PCB's by EPA Method 8082
ALI-S-302.01	1 Apr 2019	BTU – Heat of Combustion
ALI-S-303.05	30 Sept 2022	Total Chlorine by EPA Method 9076
UST Petroleum Methods (400)		
ALI-S-401.09	19 Mar 2020	Gasoline Analysis by NW TPHG(x)
ALI-S-402.07	19 Mar 2020	BTEX by EPA Method 8021 (Modified)
ALI-S-403.03	Inactive	VPH by MADEP-VPH-98-1
ALI-S-404.01	Inactive	VPH by WA VPH Method
ALI-S-405.00	27 Oct 2022	Oxyfuel Analysis by ASTM D 4815
ALI-S-406.04	3 Mar 2020	Diesel and Lube Oil Analysis by NW-TPHDx & HCID
ALI-S-407.02	Inactive	Gasoline Range Organics (GRO) by EPA Method 8015B
Microbiology (500)		
ALI-S-501.07	20 Aug 2018	Total and E. coli by SM 9223B-PA Quanti-Tray
ALI-S-502.06	17 Jun 2019	Total and E. coli by SM 9223B-PA
ALI-S-503	inactive	Archived
ALI-S-504.07	10 Feb 2021	Multi-tube MPN Total and Fecal coliform SM 9221 B+E1+C
ALI-S-505.06	10 Feb 2021	Multi-tube MPN Fecal and E.coli SM 9221 E
ALI-S-506.04	10 Feb 2021	Multi-tube MPN Fecal and E.coli in soil SM 9221 E/F
ALI-S-507.05	30 Mar 2020	Heterotrophic Plate Count by SM 9215 B/C

ALI-S-508.03	9 Mar 2017	HPC by SimPlate (unit dose) SM 9221 B
ALI-S-509.03	31 Mar 2020	HPC by SimPlate (multi dose) SM 9221 B
ALI-S-510.03	30 Mar 2020	Fecal Coliform Membrane Filtration by SM 9222D
ALI-S-511.01	6 Mar 2017	Fecal in Biosolids by EPA 1680
ALI-S-512.02	9 Mar 2017	Salmonella in Biosolids by EPA 1682
ALI-S-513	17 Mar 2011	Fecal Streptococcus and Enterococcus by Multi-Tube Fermentation SM 9230 B
	Pending	?
ALI-S-515.01	1 Jun 2014	VIP Gold for Salmonella
ALI-S-516.02	8 Dec 2020	Microbial & Fungal
ALI-S-517		See SOP ALI-S-702
ALI-S-518.01	8 Dec 2020	Salmonella in Water by SM 9260D
ALI-S-519.00	Inactive- see ALI-S-800	Renumbered and added to Food and Consumables. See ALI-S-800
ALI-S-520.00	7 Aug 2020	EPA 1603
Radionuclides (600)		
ALI-S-601.06	11 Mar 2022	Gross Alpha and Gross Beta by EPA 900.0
ALI-S-602.03	11 Mar 2022	Radium 228 by EPA 904.0
ALI-S-603.02	20 Sept 2019	Radium 226 by EPA 903.0
Cannabis (700)		
ALI-S-701.05	Inactive	THC Analysis by HPLC with UV/VIS Detector
ALI-S-702.04	Inactive	Cannabis Microbiology Testing (Petrifilm Methods)
ALI-S-703.02	Inactive	Residual Solvent by GC/MS
ALI-S-704.01	Inactive	Foreign Matter in Cannabis
ALI-S-705.00	Inactive	Water Activity in Cannabis
ALI-S-706.03	Inactive	Mycotoxins in Cannabis
ALI-S-707.02	Inactive	Terpenes in Cannabis
Food and Consumables (800)		
ALI-S-800.01	25 Oct 2021	Listeria, Salmonella, and E. coli by MDA
ALI-S-801.00	23 Oct 2020	Degassing Procedure for Carbonated Alcoholic Beverages
ALI-S-802.00	23 Oct 2020	Appearance and Actual Color of Beer
ALI-S-803.00	1 Sept 2020	Specific Gravity and Related Analyses of Beer
ALI-S-804.00	1 Nov 2022	Diacetyl in Beer
ALI-S-805.00	27 Oct 2020	Beer Bitterness
ALI-S-806.00	30 Sept 2022	Food Microbiology Testing (Petrifilm Methods)
ALI-S-807.00	28 Sept 2022	STEC Gene Screen
ALI-S-808.00	29 Nov 2022	Detection of Aerobic and Anaerobic Bacteria in Beer
ALI-S-809.00	12 April 2023	Water Activity
ALI-S-810.00	17 Oct 2023	Mycotoxins in Food and Feed Products

Appendix B

Example of Sample Submission Form

Chain of Custody Record

Anatek Labs, Inc.
1282 Alturas Drive, Moscow ID 83843 (208) 883-2839
504 E Sprague Ste D, Spokane WA 99202 (509) 838-3999

Company Name:	Project Manager:
Address:	Project Name & # :
City: State: Zip:	Purchase Order #:
Phone:	Sampler Name & Phone:
Email Address(es):	

Turn Around Time & Reporting

Please refer to our normal turn around times at www.anateklabs.com/pricing-lists

__Normal
__Next Day*
__2nd Day*
__Other*_____

__Phone
__Email

*All rush order requests must have prior approval

List Analyses Requested

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Preservative:										

Note Special Instructions/Comments

Inspection Checklist

Received Intact?	Y	N
Labels & Chains Agree?	Y	N
Containers Sealed?	Y	N
No VOC Head Space?	Y	N
Cooler?	Y	N
Ice/Ice Packs Present?	Y	N

Temperature (°C):_____
Number of Containers:_____
Shipped Via:_____
Preservative:_____
Date & Time:_____
Inspected By:_____

	Printed Name	Signature	Company	Date	Time
Relinquished by					
Received by					
Relinquished by					
Received by					
Relinquished by					
Received by					

Samples submitted to Anatek Labs may be subcontacted to other accredited labs if necessary. This message serves as notice of this possibility. Subcontracted analyses will be clearly noted on the analytical report.

Appendix C

Quick Reference for Chemical Safety

ACIDS	Hazards	First Aid (Skin)	Fire-Fighting	Spillage
Acetic Acid (CH_3COOH)	Flammable, corrosive	Water spray	CO_2, Powder	Neutralize with weak base
Hydrochloric acid (HCl) (concentrated)	Not combustible, corrosive	Rinse with plenty of water	Any extinguishing agent	Report to supervisor
Hydrochloric acid (HCl) (diluted, 50%<)	Corrosive, not combustible	Rinse with plenty of water	Any extinguishing agent	Neutralize with weak base
Hydrofluoric Acid (HF) (concentrated)	Corrosive, not combustible	Rinse with plenty of water	NO hydrous agent	Report to supervisor
Hydrofluoric Acid (HF) (diluted 30%<)	Corrosive, not combustible	Rinse with plenty of water	NO hydrous agent	Neutralize with weak base
Nitric Acid (HNO_3) (concentrated)	Corrosive, not combustible	Rinse with plenty of water	NO FOAM	Report to supervisor
Nitric Acid (HNO_3) (diluted, 50%<)	Corrosive, not combustible	Rinse with plenty of water	NO FOAM	Neutralize with weak base
Phosphoric Acid (H_3PO_4) (diluted or concentrated)	Corrosive, not combustible	Rinse with plenty of water	Any extinguishing agent	Neutralize with weak base
Sulfuric Acid (H_2SO_4) (diluted or concentrated)	Corrosive, not combustible	Rinse with plenty of water	Powder, CO_2, NO WATER	Neutralize with weak base
BASES				
Ammonium Hydroxide (NH_4OH)	Corrosive, not combustible	Rinse with plenty of water	Any extinguishing agent	Neutralize with weak acid

(diluted)				
Potassium Hydroxide (KOH) (diluted)	Corrosive, not combustible	Rinse with plenty of water	Any extinguishing agent	Neutralize with weak acid
Sodium Hydroxide (NaOH) (diluted)	Corrosive, not combustible	Rinse with plenty of water	Any extinguishing agent	Neutralize with weak acid
SOLVENTS	**Hazards**	**First Aid (Skin)**	**Fire-Fighting**	**Spillage**
Acetone	Highly flammable	Rinse with water	CO_2, Powder	Ventilate, Collect in container
Acetonitrile	Flammable	Rinse with plenty of water	CO_2, Powder	Ventilate, Collect in container
Carbon Disulfide	Highly flammable	Rinse with plenty of water	CO_2, Powder	Evacuate, report to supervisor
Chloroform	Drowsiness, not combustible	Rinse with plenty of water	Any extinguishing agent	Evacuate, Collect in container
Diethyl Ether	Extremely flammable, drowsiness	Rinse with water	CO_2, Powder	Evacuate, Collect in container
Ethanol	Highly flammable	Rinse with water	CO_2, Powder, Water	Collect in container
Ethyl Acetate	Drowsiness, Highly flammable	Rinse with water	CO_2, Powder	Evacuate, Collect in container
Ethylene Glycol	Combustible	Rinse with water	CO_2, Powder	Collect in container
Hexane	Drowsiness, Highly flammable	Rinse with water	CO_2, Powder	Ventilate, Collect in container
Hydrogen Peroxide	Corrosive, not combustible	Rinse with plenty of water	Water	Ventilate, wash with plenty of water
Isooctane	Drowsiness, Highly flammable	Rinse with water	CO_2, Powder	Evacuate, Collect in container

Methanol	Highly flammable	Rinse with water	CO_2, Powder, Water	Evacuate, Collect in container
Methylene Chloride	Drowsiness, combustible	Rinse with water	Any extinguishing agent	Ventilate, Collect in container
MTBE	Highly flammable	Rinse with water	CO_2, Powder	Ventilate, Collect in container
THF	Highly flammable	Rinse with water	CO_2, Powder, Water	Ventilate, Collect in container
Toluene	Highly flammable	Rinse with water	CO_2, Powder	Collect in container

Appendix D

Laboratory Management and Staff
CVs/Qualifications

ANATEK LABS, INC.

MIKE PEARSON

MIKE@ANATEKLABS.COM

EXPERIENCE

08/00– Present **Laboratory Manager**, Alturas Analytics, Inc, Moscow, ID
Manages and initiates experiments in the laboratory including:
Develops and directs employees in the development of HPLC/MS/MS methods,
Maintains analytical equipment, supervise scientific employees, perform HPLC/MS/MS quantitation of drugs and other compounds from various matrices, develops HPLC/MS/MS methods

03/92- Present **Laboratory Director**, Anatek Labs, Inc., Moscow, ID
Directs all aspects of the laboratory including:
Supervise scientific and administrative personnel, develop business plan and marketing strategy, prepare and analyze budgets, bid contracts

09/87-03/92 **Instrumentation Specialist**, Precision Analytics, Pullman, WA

SKILLS AND TECHNIQUES

- Gas Chromatography (GC) with ECD, FID, NPD detection
- Gas Chromatography/Mass spectrometry (GC/MS), and tandem mass spectrometry (GC/MS/MS)
- HPLC with UV and Fluorescence detection and post column reaction techniques
- Liquid Chromatography with tandem mass spectrometry (LC/MS/MS)
- Ion Chromatography and Flow Injection Analysis
- ICP-MS, Atomic Absorption/Atomic Emission spectroscopy AA and AE
- CVAFS – Cold vapor atomic fluorescence spectroscopy
- Method development and analysis of small molecule organic and inorganic compounds using the above techniques
- Extractions and wet chemistry including solid and liquid phase extraction techniques

EDUCATION

BS in Electrical Engineering, University of Idaho, Moscow, ID, 1987

ANATEK LABS, INC.
TODD TARUSCIO
TODDT@ANATEKLABS.COM

EXPERIENCE

2016 – Present	**Laboratory Manager**, Anatek Labs, Inc, Moscow, ID Responsible for all aspects of day-to-day operation of a full service analytical laboratory, including customer relations, preparation of bids and reports, troubleshooting methods and analytical instruments, and developing new methods per customer guidelines.
2006– 2016	Technical Director, Anatek Labs, Inc, Moscow, ID Manage and coordinate activities of laboratory departments, assuring objectives of the QA Plan are met. Provide technical support to laboratory staff, and investigate new methods and technologies. Responsible for non-routine instrument maintenance. Write reports and work with customers as necessary.
1999 – 2006	Organic Group Leader/Manager, Analytical Sciences Laboratory, Dept. of Food Science and Toxicology, University of Idaho, Moscow, ID General & direct supervision of scientists & technicians performing organic analysis, including pesticides, herbicides, and other compounds in biological and environmental samples. Also responsible for QA/QC oversight and Good Laboratory Practice compliance.
1994-1999	Laboratory Manager, Anatek Labs, Inc., Moscow, ID Managed full service environmental laboratory, including inorganic and organic analyses of water and soil samples.
1989-1994	Teaching Assistant, Dept. of Zoology, Washington State University, Pullman Organized, supervised, and lectured in physiology courses, including human, mammalian, and cell physiology.

SKILLS AND TECHNIQUES

- Gas Chromatography (GC) with ECD, FID, NPD detection
- Gas Chromatography/Mass spectrometry (GC/MS), and tandem mass spectrometry (GC/MS/MS)
- HPLC with UV and Fluorescence detection and post column reaction techniques
- Liquid Chromatography with tandem mass spectrometry (LC/MS/MS)
- Ion Chromatography
- Residue analysis, method development and validation, technical report writing, personnel management
- Extractions and wet chemistry including solid and liquid phase extraction techniques

EDUCATION

Ph.D in Zoophysiology, Washington State University, Pullman, 1994

B.S. in Biochemistry, Washington State University, Pullman, 1989

ANATEK LABS, INC.
ERIN LINSKEY
ERIN@ANATEKLABS.COM

EXPERIENCE

7/02 – Present **Inorganic Supervisor, Chemist III**, Anatek Labs, Inc, Moscow, ID
Typical duties include training junior level staff, editing and improving analytical procedures and coordinating Inorganic department, troubleshooting methods and analytical instruments. Responsible for performing preparation and analysis of trace and ultra trace metal levels in samples.

9/98 – 7/02 **Analyst/Lab Technician**, Anatek Labs, Inc, Moscow, ID

9/97 – 5/98 **Lab Technician**, Stukenholtz Laboratory, Twin Falls, ID

SKILLS AND TECHNIQUES

- ICP-MS, Atomic Absorption/Atomic Emission spectroscopy AA and AE
- CVAFS – Cold vapor atomic fluorescence spectroscopy
- Ion Chromatography IC
- Flow Injection Analysis FIA
- Wet Chemistry and Microbiology

EDUCATION

BS in Biology, Minor History, University of Idaho, Moscow, ID, 2000

AWARDS AND PROFESSIONAL AFFILIATIONS

National Dean's List, member, 2000 - present
American Red Cross, Certified First Responder, 1999 – present
Presidential Award for Academic Achievement, 1993

ANATEK LABS INC.
GENE M. SOLOMON
GENES@ANATEKLABS.COM

EXPERIENCE

8/04 – Present	**QA/QC Officer**, Anatek Labs, Inc., Moscow, ID Responsible for maintaining company QA Plan, SOPs, and training records. Responsible for ordering and organizing PE samples, performing internal audits and acting as liaison to the Quality departments of the various certifying agencies (IDOH, FLDOH, WADOE, etc.)
1/10 – 6/13	**QA Consultant**, Alturas Analytics, Inc., Moscow, ID
8/04 – 12/09	**QA Officer**, Alturas Analytics, Inc., Moscow, ID Responsible for performing internal audits of all GLP studies. Responsible for maintaining company SOPs and training records.
8/94 – Present	**GMP Software Consultant & Trainer**, self-employed, worldwide
1/95 – Present	**Technical Writer/Editor**, self-employed, various locations
1/92 – 8/94	**Customer Service Manager**, Blue Mountain Quality Resources, State College, PA

EDUCATION

B.A. in Economics with High Honors, University of Montana, Missoula, 1988

PROFESSIONAL DEVELOPMENT & TRAINING

Radiation Safety Officer Training, Radiation Safety Associates, September 2014
WordPress Design and Marketing, Nectar Consulting, January 2014
Internal Data Review Training – Organics & Inorganics, Advanced Systems, April 2010
Ethics Training for Environmental Labs, Advanced Systems, March 2010
Laboratory Controls in the GMP/GLP Environment, SQA, April 2009
Continual Quality Improvement, SQA, April 2009
PK/TK Training, Drug Safety Evaluation Consulting, January 2009
Analytical Instrument Qualification Seminar, SQA, January 2008
Bioanalytical Training, SQA, May 2007
Advanced Training: Good Laboratory Practices, SQA, April 2006
Basic & Advanced Training: Good Laboratory Practices, SQA, September 2005
Quality Responsibilities of Management, SQA, September 2005
GLP Facility Audit Training, Mary Kay Erickson, QA Consultant, January 2005
GLP Training, Alturas Analytics, August 2004
GMP-FDA Quality System Requirements-1996, Parts 1-3

PROFESSIONAL MEMBERSHIP

Member Pacific Regional Chapter of the Society of Quality Assurance, 2004 – 2010
Associate Member of the Society of Quality Assurance, 2004 – 2010

ANATEK LABS INC.
KATHLEEN A. SATTLER
KATHY@ANATEKLABS.COM

EXPERIENCE

10/01 – Present **Laboratory Manager**, Anatek Labs, Inc., Spokane, WA
Responsible for all aspects of day-to-day operation of a full service analytical laboratory. Typical duties include training junior level staff, preparing bids and reports, troubleshooting methods and analytical instruments, and developing new methods per customer guidelines, and customer relations.

07/96 – 10/01 **Microbiology Supervisor**, Anatek Labs, Inc., Spokane, WA

10/96 – 02/97 **Laboratory Assistant**, Sacred Heart Medical Center, Spokane, WA

07/95 – 07/96 **Microbiologist I**, Bremerton-Kitsap County Health District, Bremerton, WA

SKILLS AND TECHNIQUES

- Bacteria cultures, isolation, identification
- Membrane filtration
- Multiple tube fermentation
- Heterotrophic plate count
- Bacteriological examination of water
- Proficient with aseptic technique
- Nutrient agar preparation
- Centrifugation and separation of blood for testing
- Spectrophotometry
- Dilutions, titrations
- Urine analysis
- Quality control and Quality analysis

EDUCATION

B.S. in Microbiology, Minor in Chemistry, University of Idaho, 1994

Professional Affiliations

American Water Works Association Member
AWWA Inland Empire Subsection Member

ANATEK LABS INC.

AUNNA YOUNGER
AUNNAY@ANATEKLABS.COM

EXPERIENCE

11/16 – Present **Chemist II and Wet Chem Supervisor**, Anatek Labs, Inc., Spokane, WA
Responsible for oversight of wet chemistry testing. Also proficient in VOC analysis. Also proficient in IC, diesel, and PCB analyses

02/12 – 08/12 **Laboratory Technician,** USDA, Albany, CA
Biochemical characterization of Uronate Dehydrogenase

SKILLS AND TECHNIQUES

- GC MS: Volatile Organic Compounds
- GC PID/FID: BTEX, THPG, Oxyfuel, THP-DX, HCID
- PCB's
- Fats Oils and Greases
- pH Probe
- Turbidimeter
- Wet chemistry: Alkalinity, TSS, TDS, Acidity, Hardness, pH, Turbidity, Color, Odor, Resistivity, Conductivity, COD's , Sulfides, TVS, FDS, pH 1:5, BOD's.
- Quality control and Quality analysis
- IC
- Dilutions and Titration
- Trained in RADS: Gross alpha/ Beta, Radium 226
- Preparation of Media
- PCR thermocycler
- Gel electrophoresis
- UV-VIS
- DNA Mini Prep
- Cell Culture transfection
- Restriction digestion
- Molecular cloning
- Western blotting
- Protein kinetics
- Thermo stability of enzymes
- AKTAprime purification system
- SDS-Page

EDUCATION

B.S. Bioengineering, University of the Pacific, Stockton, CA, 2013

ANATEK LABS INC.

LEAH CLAPPES
LEAHC@ANATEKLABS.COM

EXPERIENCE

11/19-Present — **QA Officer**, Anatek Labs, Inc., Spokane, WA
-Perform internal audits for all analytical methods in accordance with QA Plan
-Prepare reports of audit findings and recommendations
-Ensure all Regulatory Agency requirements are met
-Develop and implement corrective action plans
-Work closely with lab manager to make sure all QA requirements are met, including performance evaluation
-Maintain all quality control documents and SOPs

11/17-11/19 — **Chemist I**, Anatek Labs, Inc., Spokane, WA
Responsibilities:
-Analysis of PCBs by GC/ECD
-Analysis of petroleum hydrocarbons by GC/FID
-Analysis of anions by IC
-Maintenance and troubleshooting of GC and IC
-Assist with various other wet chem and micro analysis as needed

09/17-11/17 — **Lab Assistant**, Anatek Labs, Inc., Spokane, WA
Responsibilities:
-Assist with cannabis lab sample preparation, analysis
-Microbiology: Bile tolerant, E. coli, and Salmonella Presence/Absence
-Sample extraction for analysis by HPLC
-Some reagent preparation
-Lab maintenance: washing glassware and waste disposal

SKILLS AND TECHNIQUES

- GC-ECD, GC-FID, IC
- Standard and reagent preparation
- Instrument maintenance and troubleshooting, calibration
- Wet chemistry: TSS, TDS, Turbidity, BOD, CBOD, pH
- Quality control and quality analysis
- Dilutions
- Data entry using LIMS
- Coliform Presence/Absence Method
- Techniques of EPA 8082, EPA 300.0, WATPH-HCID, NWTPHDx

EDUCATION

2014 — B.S. in Biology and Environmental Studies, University of Wisconsin

ANATEK LABS INC.

BROCK GERGER
BROCKG@ANATEKLABS.COM

EXPERIENCE

11/17 – Present **Project Manager**, Anatek Labs, Inc., Spokane, WA
Responsible for customer service, sample receiving, project reporting, and managing projects through various stages. Also familiar with metals analysis by ICP-MS, BOD, Ions, Microbiology, and Cannabis analysis.

SKILLS AND TECHNIQUES

- pH probe
- Turbidity
- BOD
- Quality control and Quality analysis
- Dilutions and titrations
- Soil Extractions
- Reagent Preparation
- Cleaning Glassware
- ICPMS
- IC
- HPLC
- Microbiology

EDUCATION

B.S. in Biochemistry, University of Idaho, Moscow, 2014

Appendix E

Current State Certifications
Anatek - Moscow

Florida Department of Health (NELAP # E87893)
(Primary Accrediting Authority for NELAP)
Idaho Department of Health (EPA ID00013)
Washington Department of Ecology (C595)
Oregon Department of Environmental Quality (ORELAP # ID200001)
Nevada Department of Conservation and Natural Resources (ID00013)
Montana Department of Public Health and Human Services (CERT0028)
New Mexico Environment Department, Drinking Water Bureau (ID00013)
EPA Region 8/Wyoming (EPA ID00013)
Hawaii Department of Health (ID00013)

Current State Certifications
Anatek - Spokane

Florida Department of Health (NELAP # E871099)
(Primary Accrediting Authority for NELAP)
Idaho Department of Health (EPA WA00169)
Washington Department of Ecology (C585)
Montana Department of Public Health and Human Services (CERT0095)
Nevada Department of Conservation and Natural Resources (WA00169)
New Mexico Environment Department, Drinking Water Bureau (WA00169)
Oregon Department of Environmental Quality (ORELAP # 4169)
ANAB ISO-17025 Food Microbiology (AT-2934)

Current scopes of accreditation are available at
www.anateklabs.com/certifications

LINEAR CALIBRATION USING A LEAST SQUARE REGRESSION

According to NIST Linear least squares regression is by far the most widely used modeling method. It is what most people mean when they say they have used "regression", "linear regression" or "least squares" to fit a model to their data.

Least square regression is a method of determining the curve that best describes the relationship between expected and observed sets of data by minimizing the sums of the squares of deviation between observed and expected values. The regression calculations attempt to minimize this sum of the squares, hence the name “least squares regression.”

A linear calibration model based on a least squares regression may be employed based on past experience or a prior knowledge of the instrument response and at the discretion of the analyst. This approach may be used for analytes that do meet the RSD Limits. The linear calibration model is most easily achieved by performing a linear least squares regression of the instrument response versus the mass of the analyte.

Correlation Coefficient Definition: A measure of the interdependence of two random variables that ranges in value from −1 to +1, indicating perfect negative correlation at −1, absence of correlation at zero, and perfect positive correlation at +1. Also called coefficient of correlation.

Linear Equation

$$y = mx + b$$

Where: y = Response Ax for External Standard
Or
Ax/Ais for Internal Standard

x = Concentration Cx for External Standard
or
Cx/Cis for Internal Standard
m = Slope
b = Intercept

Anatek Labs, Inc.

Appendix F

Backup, Fault Tolerance, Disaster Recovery and Data Archive of Mission-critical Information Storage and Services

Terrill Settles
Information Systems Manager

Updated 8/12/2015

Introduction

Mission-critical information storage and services are those that a business cannot afford to lose. Loss of such data or interruption of such services will seriously impact the daily operations of the business and incur monetary loss.

Fault Tolerance

Fault tolerance in data storage involves redundant storage disks to tolerate certain faults in the hardware. For example, in RAID 5 implementation, in case of failure of one disk, the remaining disks in the array still maintain the data. But with the loss of a disk the array is in a critical state and its performance is greatly reduced until the failed disk is replaced and the array is rebuilt.

Fault tolerance only tolerates hardware faults. It does not cover human or application software faults. For example, accidental or intentional deletion by operators or file damage caused by misbehaving applications is not covered by fault tolerance. So fault tolerance does not replace backups and the archiving of the data.

Backup

Backup is the process of copying data to other media creating an extra copy. The media can be copied to hard disk drives, tape drives, USB drives, CD and DVD disks, and even to the internet "cloud." In case of loss of or damage to current files, if they were backed up, and the media is available, the data can be restored. Backup usually occurs during off-peak hours, normally nights and weekends.

Backups generally cannot copy certain open system files and database files such as SQL databases and Exchange Information Store. However, by using the built-in backup tools within these programs a backup can be created to a file or folder. After these backups have occurred this data can now be backed up to another media.

System Disaster Backup and Recovery

A system disaster is an incident that causes the loss of the server operating system and other data due to hardware or software failure. If set up correctly the downtime due to system disaster can be minimized due to a well-planned, and rehearsed, recovery model.

Normal data backup works well for regular data files but does not back up the system files. The system files are used by the server's operating system. In case of loss of the server system such as an operating system crash, the server cannot be restored the same as restoring normal data files. In a disaster recovery scenario the operating system will need to be installed, then any additional programs will need to be installed. Finally, any configurations and data files will need to be restored as well.

A disaster recovery plan involves recognizing and documenting what programs are installed on the system, backing up of the system files and other programs configuration files, and having available a recovery plan and the backups of the files.

A backup of the system has to be made during a downtime made available for system maintenance. There are different possibilities backing up of the system files. One could be an image of the server created while off-line. Backups can also be accomplished by backing up the system files using other manufacturers' offline backup programs.

Data Archiving

Infrequently used older data should be archived onto other media. Data archiving serves dual purposes. It frees online disk storage, and, if it is still necessary to put a copy online, the archive provides a backup.

Identification of mission-critical information storage and services

Analytical data and results acquired by the instruments:

The analytical data resides on a server with RAID 5 fault tolerance. Current and recent data files are in a share folder called "AnatekData." Archived data is copied to CD/DVD ROMs and is available in IT and in off-site storage. These files are backed up nightly Monday through Friday, and again on Sunday night.

SQL Server running on Windows server:

SQL server databases for LIMS and other miscellaneous databases: LIMS databases provide data entry, storage and reporting. Databases and their logs reside on RAID drives. Further, database files and log files reside on separate disk spindles for maximum recoverability in case of disk failure. SQL provides its own backup nightly -- the files are also backed up nightly Monday through Friday, and again on Sunday night.

Exchange Server running on Windows server:

Microsoft Exchange Provides e-mail, tasking, scheduling and other collaborating functions to the company. The Exchange data is located on a RAID drive. Exchange provides its own backup nightly – the files are also backed up nightly Monday through Friday, and again on Sunday night.

Windows Domain Controller Servers:

These servers provide Active Directory services which includes user authentication, security, and sharing functions for the domain. Active Directory services provide the platform on which SQL, Exchange, FTP, IIS, and other services reside.

Standard Windows File Server:

Provide general file service for user shares.

IIS on Windows Server:

Provides a web service for Internet, Intranet and Extranet.

QuickBooks files on Windows File Server:

Stores all accounting information of the company, including banking, purchasing, receivable, payable and payroll. These files are stored on the RAID disk of Windows file server.

Data security/integrity implementations

Fault Tolerance

Each Windows Server has been configured with RAID 5 or RAID 10 for storage of critical data files. All disks are hot swappable. The domain controllers have redundant power supplies.

Backup

The backup software currently in use is Macrium Reflect and the Windows NTbackup utility. Backup hardware is a removable hard disk drive for disk-to-disk backup. Macrium Reflect runs on server Treasure copying the following files: Analysis Data from server Treasure and other Instrument PCs; SQL and FTP backups from server Bobwhite; department and user personal files from Grouse; Quickbook and Payclock backup files from PC Moonstone; and Quickbook files from Magpie. Data backups on Friday run a full backup. Data backups Sunday through Thursday run incremental backups.

Exchange runs its own backup and places the backup files on server Bobwhite in folder "ExchangeBackup."

Quickbooks backups are copied from server Magpie in the folder "Quickbooks." PC Moonstone also runs a windows backup to copy the files every Sunday through Friday at 9AM.

SQL runs its own backups and they occur Sunday through Thursday at 1AM and are placed on server Bobwhite in folder "SQL2K8\Backup".

Disaster recovery

We have Symantec Ghost 7.5 as an imaging tool. The entire hard disks of the Windows servers and majority of workstations have been taken as a snapshot. The images of those disks were either burned onto DVD disks or storage on removable drives.

As imaging the servers requires taking them off-line, the imaging is not a regularly scheduled task. However, when major changes are made to servers, re-imaging should be done once the servers have been tested to be running satisfactorily.

Workstation imaging is updated when there is major configuration change in hardware or software.

Data archiving

The older data files on the analytical data storage server (older than 6 or 12 months, as dictated by data volume) are archived to CD/DVD at intervals of 6 or 12 months, or when deemed necessary, for permanent archival. The permanent archive has two copies, one kept on-site and another off-site. The DVD/CD disks, if properly stored, should have a lifetime of at least 50 years. A few randomly selected DVD/CD disks are checked for readability annually to ensure the availability of older data files.

A copy of the archived data files is kept available for read-only, as long as the storage server has enough space for them. When the space approaches depletion, the oldest files will be purged.

The shared location for the older data is secured so only system administrators can change them. All regular users have read-only permission.

Summary

We have hardware redundancy to protect against disk failure for the most important data. Our backup scheme is disk-to-disk technology and CD/DVD archival. The disk backups are on a four week off-site rotation. The servers and majority of workstations are imaged for quick disaster recovery. Data archiving is done on a regular basis and two permanent copies of archived data are kept.

Appendix G

Control Chart Information

Control Charting

Control charting is a useful way to determine accuracy and precision data for specific repeated recovery calculations (surrogates, LFBs, CCVs, etc.). It is most useful to calculate acceptance criteria from the most recent data, and allows comparison to written method requirements if they exist.

At minimum, control charts must be made for control standards. For methods that require the addition of surrogate compounds, control charts are also required for the surrogate recoveries.

Definitions: Let X_1, X_2, X_3, X_4,.....X_n ($n \geq 20$) represent the first n time ordered determinations for an analyte, and then define the following:

$$X = \text{average} = \frac{1}{n}\,(X_1 + X_2 + X_3 + \ldots\ldots\ldots\ldots + X_n)$$

$$S = \text{Standard Deviation of the Group} = \left[\frac{\Sigma (X_n - X)^2}{n-1}\right]^{\frac{1}{2}}$$

Based on the average and standard deviation information of this n number of trials a control chart can be plotted using the formulas outlined in Table 1. An example of a control chart is shown in Figure 1 with X = 99 % and S = 4 %. Such plot can then be used to determine if one or a set of trial is out of control.

Table 1: Control Chart Formula.

Parameter	**Symbol**	**Formula**
Centerline	CL	X
Upper Control Limit	UCL	X + 3S
Lower Control Limit	LCL	X – 3S
Upper Warning Limit	UWL	X + 2S
Lower Warning Limit	LWL	X – 2S

Criteria for an Out-of-Control Situation

A process is considered out of statistical control whenever one of the following conditions is demonstrated from control charting.

a. Any one point is outside of the control limits.

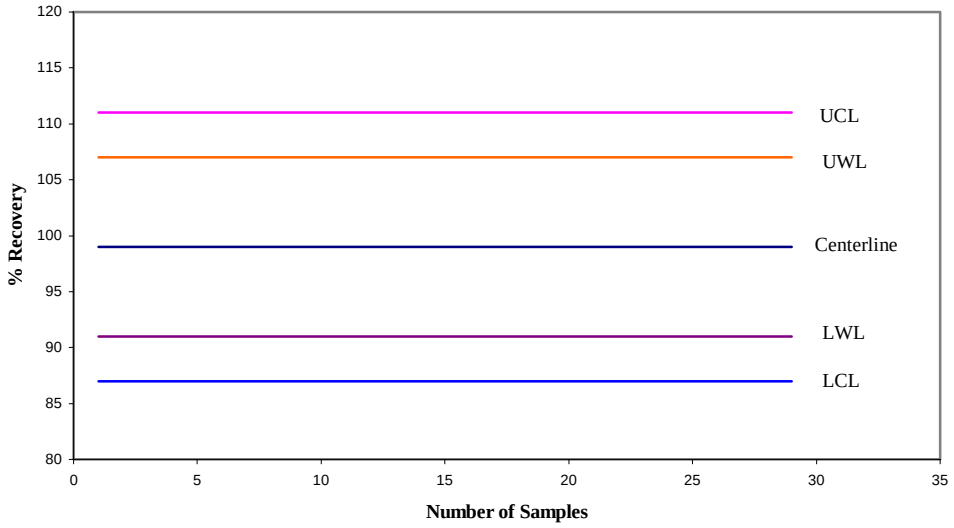
b. Any three consecutive points are outside the warning limits.

c. Any ten consecutive points are on the same side of the centerline.

d. Any six consecutive points are such that each deviation is greater than its predecessor.

e. Any obvious cyclic pattern is seen in the points.

Figure 1: A sample control chart.



Corrective Action

When a process is out of control as determined by control chart monitoring, an immediate solution must be found before processing more samples. An example might be the slow deterioration of the PID lamp, which might cause recoveries to slowly decrease. This problem may easily be remedied by more frequent cleaning or perhaps more frequent calibration.

Appendix H

Method Detection Limit

United States Environmental Protection Agency

Office of Water EPA 821-R-16-006

www.epa.gov December 2016

Definition and Procedure for the Determination of the Method Detection Limit, Revision 2

This document contains the text of Revision 2 of the method detection limit procedure from 40 CFR 136 Appendix B; but formatted as a more user friendly stand-alone document.

Please address questions or comments to:

CWA Methods Team
Engineering and Analytical Support Branch/EAD (4303T)
Office of Science and Technology
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue
Washington, DC 20460

https://www.epa.gov/cwa-methods

DEFINITION AND PROCEDURE FOR THE DETERMINATION OF THE METHOD DETECTION LIMIT
REVISION 2

Definition

The method detection limit (MDL) is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results.

Scope and Application

The MDL procedure is designed to be a straightforward technique for estimation of the detection limit for a broad variety of physical and chemical methods. The procedure requires a complete, specific, and well-defined analytical method. It is essential that all sample processing steps used by the laboratory be included in the determination of the method detection limit.

The MDL procedure is *not* applicable to methods that do not produce results with a continuous distribution, such as, but not limited to, methods for whole effluent toxicity, presence/absence methods, and microbiological methods that involve counting colonies. The MDL procedure also is *not* applicable to measurements such as, but not limited to, biochemical oxygen demand, color, pH, specific conductance, many titration methods, and any method where low-level spiked samples cannot be prepared. Except as described in the addendum, for the purposes of this procedure, "spiked samples" are prepared from a clean reference matrix, such as reagent water, spiked with a known and consistent quantity of the analyte. MDL determinations using spiked samples may not be appropriate for all gravimetric methods (e.g., residue or total suspended solids), but an MDL based on method blanks can be determined in such instances.

Procedure

(1) Estimate the initial MDL using one or more of the following:

(a) The mean determined concentration plus three times the standard deviation of a set of method blanks.

(b) The concentration value that corresponds to an instrument signal-to-noise ratio in the range of 3 to 5.

(c) The concentration equivalent to three times the standard deviation of replicate instrumental measurements of spiked blanks.

(d) That region of the calibration where there is a significant change in sensitivity, i.e., a break in the slope of the calibration.

(e) Instrumental limitations.

(f) Previously determined MDL.

It is recognized that the experience of the analyst is important to this process. However, the analyst should include some or all of the above considerations in the initial estimate of the MDL.

(2) Determine the initial MDL

Note: The Initial MDL is used when the laboratory does not have adequate data to perform the Ongoing Annual Verification specified in Section (4), typically when a new method is implemented or if a method was rarely used in the last 24 months.

(a) Select a spiking level, typically 2 – 10 times the estimated MDL in Section 1. Spiking levels in excess of 10 times the estimated detection limit may be required for analytes with very poor recovery (e.g., for an analyte with 10% recovery, spiked at 100 micrograms/L, with mean recovery of 10 micrograms/L; the calculated MDL may be around 3 micrograms/L. Therefore, in this example, the spiking level would be 33 times the MDL, but spiking lower may result in no recovery at all).

(b) Process a minimum of seven spiked samples and seven method blank samples through all steps of the method. The samples used for the MDL must be prepared in at least three batches on three separate calendar dates and analyzed on three separate calendar dates. (Preparation and analysis may be on the same day.) Existing data may be used, if compliant with the requirements for at least three batches, and generated within the last twenty four months. The most recent available data for method blanks and spiked samples must be used. Statistical outlier removal procedures should not be used to remove data for the initial MDL determination, since the total number of observations is small and the purpose of the MDL procedure is to capture routine method variability. However, documented instances of gross failures (e.g., instrument malfunctions, mislabeled samples, cracked vials) may be excluded from the calculations, provided that at least seven spiked samples and seven method blanks are available. (The rationale for removal of specific outliers must be documented and maintained on file with the results of the MDL determination.)

(i) If there are multiple instruments that will be assigned the same MDL, then the sample analyses must be distributed across all of the instruments.

(ii) A minimum of two spiked samples and two method blank samples prepared and analyzed on different calendar dates is required for each instrument. Each analytical batch may contain one spiked sample and one method blank sample run together. A spiked sample and a method blank sample may be analyzed in the same batch, but are not required to be.

(iii) The same prepared extract may be analyzed on multiple instruments so long as the minimum requirement of seven preparations in at least three separate batches is maintained.

(c) Evaluate the spiking level: If any result for any individual analyte from the spiked samples does not meet the method qualitative identification criteria or does not provide a numerical result greater than zero, then repeat the spiked samples at a higher concentration. (Qualitative identification criteria are a set of rules or guidelines for establishing the identification or presence of an analyte using a measurement system. Qualitative identification does not ensure that quantitative results for the analyte can be obtained.)

(d) Make all computations as specified in the analytical method and express the final results in the method-specified reporting units.

(i) Calculate the sample standard deviation (S) of the replicate spiked sample measurements and the sample standard deviation of the replicate method blank measurements from all instruments to which the MDL will be applied.

(ii) Compute the MDL_s (the MDL based on spiked samples) as follows:

$$MDL_S = t_{(n-1,\ 1-\propto=0.99)} S_s$$

where:

MDL_s = the method detection limit based on spiked samples

$t_{(n-1,\ 1-\alpha\ =\ 0.99)}$ = the Student's *t*-value appropriate for a single-tailed 99th percentile *t* statistic and a standard deviation estimate with n-1 degrees of freedom. See Addendum Table 1.

S_s = sample standard deviation of the replicate spiked sample analyses.

(iii) Compute the MDL_b (the MDL based on method blanks) as follows:

(A) If none of the method blanks give numerical results for an individual analyte, the MDL_b does not apply. A numerical result includes both positive and negative results, including results below the current MDL, but not results of "ND" (not detected) commonly observed when a peak is not present in chromatographic analysis.

(B) If some (but not all) of the method blanks for an individual analyte give numerical results, set the MDL_b equal to the highest method blank result. If more than 100 method blanks are available, set MDL_b to the level that is no less than the 99th percentile of the method blank results. For "n" method blanks where $n \geq 100$, sort the method blanks in rank order. The (n * 0.99) ranked method blank result (round to the nearest whole number) is the MDL_b. For example, to find MDL_b from a set of 164 method blanks where the highest ranked method blank results are … 1.5, 1.7, 1.9, 5.0, and 10, then 164 x 0.99 = 162.36 which rounds to the 162nd method blank result. Therefore, MDL_b is 1.9 for n =164 (10 is the 164th result, 5.0 is the 163rd result, and 1.9 is the 162nd result). Alternatively, you may use spreadsheet algorithms to calculate the 99th percentile to interpolate between the ranks more precisely.

(C) If all of the method blanks for an individual analyte give numerical results, then calculate the MDL_b as:

$$MDL_b = \overline{X} + t_{(n-1,1-\propto=0.99)} S_b$$

where:

MDL_b = the MDL based on method blanks

$\bar{X}$ = mean of the method blank results (use zero in place of the mean if the mean is negative)

$t_{(n-1,\ 1-\alpha\ =\ 0.99)}$ = the Student's *t*-value appropriate for the single-tailed 99th percentile *t* statistic and a standard deviation estimate with n-1 degrees of freedom. See Addendum Table 1.

S_b = sample standard deviation of the replicate method blank sample analyses.

Note: If 100 or more method blanks are available, as an option, MDL_b may be set to the concentration that is greater than or equal to the 99th percentile of the method blank results, as described in Section (2)(d)(iii)(B).

(e) Select the greater of MDL_s or MDL_b as the initial MDL.

(3) Ongoing Data Collection

(a) During any quarter in which samples are being analyzed, prepare and analyze a minimum of two spiked samples on each instrument, in separate batches, using the same spiking concentration used in Section 2. If any analytes are repeatedly not detected in the quarterly spiked sample analyses, or do not meet the qualitative identification criteria of the method (see Section 2(c) of this procedure), then this is an indication that the spiking level is not high enough and should be adjusted upward. Note that it is not necessary to analyze additional method blanks together with the spiked samples, the method blank population should include all of the routine method blanks analyzed with each batch during the course of sample analysis.

(b) Ensure that at least seven spiked samples and seven method blanks are completed for the annual verification. If only one instrument is in use, a minimum of seven spikes are still required, but they may be drawn from the last two years of data collection.

(c) At least once per year, re-evaluate the spiking level.

(i) If more than 5% of the spiked samples do not return positive numerical results that meet all method qualitative identification criteria, then the spiking level must be increased and the initial MDL re-determined following the procedure in Section 2.

(d) If the method is altered in a way that can be reasonably expected to change its sensitivity, then re-determine the initial MDL according to Section 2, and the restart the ongoing data collection.

(e) If a new instrument is added to a group of instruments whose data are being pooled to create a single MDL, analyze a minimum of two spiked replicates and two method blank replicates on the new instrument. If both method blank results are below the existing MDL, then the existing MDL_b is validated. Combine the new spiked sample results to the existing spiked sample results and recalculate the MDL_s as in Section 4. If the recalculated MDL_s does not vary by more than the factor specified in Section 4(f) of this procedure, then the existing MDL_s is validated. If either of these two conditions is not met, then calculate a new MDL following the instructions in Section 2.

(4) Ongoing Annual Verification

(a) At least once every thirteen months, re-calculate MDL_s and MDL_b from the collected spiked samples and method blank results using the equations in Section 2.

(b) Include data generated within the last twenty four months, but only data with the same spiking level. Only documented instances of gross failures (e.g., instrument malfunctions, mislabeled samples, cracked vials) may be excluded from the calculations. (The rationale for removal of specific outliers must be documented and maintained on file with the results of the MDL determination.) If the laboratory believes the sensitivity of the method has changed significantly, then the most recent data available may be used, maintaining compliance with the requirement for at least seven replicates in three separate batches on three separate days (see Section 2b).

(c) Include the initial MDL spiked samples, if the data were generated within twenty four months.

(d) Only use data associated with acceptable calibrations and batch QC. Include all routine data, with the exception of batches that are rejected and the associated samples reanalyzed. If the method has been altered in a way that can be reasonably expected to change its sensitivity, then use only data collected after the change.

(e) Ideally, use all method blank results from the last 24 months for the MDL_b calculation. The laboratory has the option to use only the last six months of method blank data or the fifty most recent method blanks, whichever criteria yields the greater number of method blanks.

(f) The verified MDL is the greater of the MDL_s or MDL_b. If the verified MDL is within 0.5 to 2.0 times the existing MDL, and fewer than 3% of the method blank results (for the individual analyte) have numerical results above the existing MDL, then the existing MDL may optionally be left unchanged. Otherwise, adjust the MDL to the new verification MDL. (The range of 0.5 to 2.0 approximates the 95th percentile confidence interval for the initial MDL determination with six degrees of freedom.)

ADDENDUM: DETERMINATION OF THE MDL FOR A SPECIFIC MATRIX

The MDL may be determined in a specific sample matrix as well as in reagent water.

(1) Analyze the sample matrix to determine the native (background) concentration of the analyte(s) of interest.

(2) If the response for the native concentration is at a signal-to-noise ratio of approximately 5-20, determine the matrix-specific MDL according to Section 2 but without spiking additional analyte.

(3) Calculate MDL_b using the method blanks, not the sample matrix.

(4) If the signal-to-noise ratio is less than 5, then the analyte(s) should be spiked into the sample matrix to obtain a concentration that will give results with a signal-to-noise ratio of approximately 10-20.

(5) If the analytes(s) of interest have signal-to-noise ratio(s) greater than approximately 20, then the resulting MDL is likely to be biased high.

Table 1: Single-Tailed 99th Percentile *t* Statistic

Number of replicates	Degrees of freedom (n-1)	$t_{(n-1, 0.99)}$
7	6	3.143
8	7	2.998
9	8	2.896
10	9	2.821
11	10	2.764
16	15	2.602
21	20	2.528
26	25	2.485
31	30	2.457
32	31	2.453
48	47	2.408
50	49	2.405
61	60	2.390
64	63	2.387
80	79	2.374
96	95	2.366
100	99	2.365

Documentation

The analytical method used must be specifically identified by number or title and the MDL for each analyte expressed in the appropriate method reporting units. Data and calculations used to establish the MDL must be able to be reconstructed upon request. The sample matrix used to determine the MDL must also be identified with MDL value. Document the mean spiked and recovered analyte levels with the MDL. The rationale for removal of outlier results, if any, must be documented and maintained on file with the results of the MDL determination.

Appendix I

CALIBRATION METHODS AND EQUATIONS

This chapter provides an overview of calibration models and equations commonly used by methods performed at Anatek Labs, Inc. Calibration information is provided here as a reference, so that definitions and equations do not have to be provided in each individual analytical SOP. Review of this information shall be considered adequate on-going training in calibration models and equations.

This chapter consists of the following sections:

- Definitions
- General Criteria for All Calibration Models
- External Standard Calibration
- Internal Standard Calibration
- Response/Calibration Factor Model
- Linear Calibration Using A Least Square Regression
- Weighted Least Squares Regression

DEFINITIONS

Calibration can be defined in several ways:

- **Reference standards with known values for selected points covering the chosen concentration range are measured with the instrument. A functional relationship is then established between the values of the standards and the corresponding measurements.**

- **Calibration: set of operations that establish, under specific conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.**

Instrument calibration is intended to eliminate or reduce bias in an instrument's readings over a range for all continuous values.

Precision is a measure of the degree of agreement among replicate analyses of a sample, usually expressed as a standard deviation.

Bias is consistent deviation of measured values from the true value, caused by systematic errors in a procedure.

Accuracy is the combination of bias and precision of an analytical procedure, which reflects the closeness of a measured value to a true value

An acceptable calibration assures that an instrument will produce results which meet or exceed some defined criteria with a specified degree of confidence.

GENERAL CRITERIA FOR ALL CALIBRATION MODELS

- **Mid-points cannot be dropped to meet criteria**
- **Points can be reanalyzed, original run must be discarded**
- **Analyzing additional standards and discarding some to achieve a better correlation coefficient value is prohibited**
- **Narrowing of curve on either end is allowed**

Initial Calibration

Perform initial calibration with a minimum of three concentrations of standards for linear curve, a minimum of five concentrations for nonlinear curves, or as specified by the method of choice.

At the beginning of each day that samples are to be analyzed, a calibration curve covering the sample concentration range and all target analytes should be generated according to the approved SOP. Depending on concentration ranges, the curve should be composed of three or more points. The reporting limit should be included in the calibration range.

Daily Verification Standard

Where the determinative time is extensive and the instrument is very stable, the calibration curve should be initially developed. Thereafter, each day analyses are performed, this curve should be verified by analysis of at least one standard for each of the target analytes at the expected concentration range. This verification should be done at both the beginning and end of the analyses.

Calibration Plot

A working curve is a plot of the instrument response as a function of analyte concentration. The concentration of an unknown sample is determined by correlating its response to the mathematical relationship of concentration to the instrument response established by the curve.

Response Factor/Calibration Factor

Both calibration factors and response factors are measures of the slope of the calibration relationship. Each calibration or response factor represents the slope of the line between the response for a given standard and the origin. Under ideal conditions, the factors will not vary with the concentration of the standard. In practice, some variation is to be expected.

If response factors or calibration factors are used, the calculated % RSD for each analyte of interest must be less than or equal the method-specified value. Refer to the applicable method for the calibration procedure and acceptance criteria on the response factors or calibration factors for each analyte.

Correlation Coefficient

The correlation coefficient is a measure of the degree with which the independent variable and its partner move either together or in opposition. A positive result indicates direct correlation and a negative result indicates an inverse correlation.

If linear regression is used, use the minimum correlation coefficient specified in the method. If the minimum correlation coefficient is not specified then a minimum value of 0.995 is recommended. The appropriate linear or nonlinear correlation coefficient for standard concentration to instrument response should be > 0.995.

It is not necessarily true that a relationship measured by r is meaningful. There must be a rational relationship of the two variables under investigation.

The sample on which the data is based must be large enough to ensure that the influence of chance causes of variation is minimized.

Coefficient of Determination

In a correlation analysis, r2 (occasionally called the “correlation index”) may be calculated most simply by squaring the correlation coefficient, r. It may be described as the amount of variability in one of the variables accounted for by correlating that variable with the second variable. As in regression analysis, r2 may be considered to be a measure of the strength of the straight-line relationship. In order for the linear regression model to be used for quantitative purposes, r, COD, or r2 must be greater than or equal to 0.99

EXTERNAL STANDARD CALIBRATION

For an external standard quantitation, known data from a calibration standard and unknown data from the sample are combined to generate a quantitative report.

It is called external standard because the standard or known material is separate or external to the unknown material. External standard calibration is one of the most common approaches to calibrations. It involves a simple comparison of instrument responses from the sample to the responses from the target compounds in the calibration standards.

Sample peak areas (or peak heights) are compared to peak areas (or heights) of the standards. The ratio of the detector response to the amount (mass) of analyte in the calibration standard is defined as the calibration factor (CF).

$$CF = (Ax)/(Cx)$$

Where: Ax = Area of the compound
Cx = Concentration of the compound

Advantages:

- The advantages of external standard calibration are that it is simple to perform this type of calibration and it can be applied to a wide variety of methods.

Disadvantages:

- The primary disadvantage is that it is greatly affected by the stability of the chromatographic detector system and the presence of chromatographic interferences in a sample or sample extract.

INTERNAL STANDARD CALIBRATION

Internal standard calibration involves the comparison of the instrument responses from the target compounds in the sample to the responses of reference standards added to the sample or sample extract before injection.

The response of the target compound is normalized to the response of the reference standard. This reference standard is called an *internal standard* because it is contained within the aliquot of the sample or sample extract that is actually injected into the instrumentation. A constant amount of the internal standard is added to all samples or extracts. That same amount of the internal standard is also included in each of the calibration standards.

The ratio of the peak area (or height) of the target compound in the sample or sample extract to the peak area (or height) of the internal standard in the sample or sample extract is compared to a similar ratio derived for each calibration standard.

This ratio is termed the response factor (RF) or relative response factor (RRF), indicating that the target compound response is calculated relative to that of the internal standard.

$$\mathbf{RF = ((Ax)(Cis))/((Ais)(Cx))}$$

Where: **Ax = Area of the compound**
Cx = Concentration of the compound
Ais = Area of the internal standard
Cis = Concentration of the internal standard

Selection of Internal Standards

- Internal standards that are similar in analytical behavior to the compounds of interest, and not expected to be found in the samples
- The analyst needs to demonstrate that the measurement of the internal standard is not affected by target analytes, surrogates, or by matrix interferences
- This is not as useful for GC and HPLC methods with non-MS detectors, unless the internal standards could be separated from target compounds chromatographically.

Advantages:

- Accounts for routine variation in the response of the chromatographic system
- Accounts for the variations in the exact volume of sample or sample extract introduced into the chromatographic system
- The retention times of the target compound and the internal standard may be used to calculate the relative retention time (RRT) of the target compound and can then be used to compensate for small retention time shifts

Disadvantages:

- The principal disadvantage to internal standard calibration is that the internal standards must be compounds that are not found in the samples to be analyzed and they must produce an unambiguous response on the chromatographic detector system.

RESPONSE/CALIBRATION FACTOR MODEL

Calibration Factor: A measure of the chromatographic response of a target analyte relative to the mass injected.

Response Factor: A measure of the relative mass spectral response of an analyte compared to its internal standard.

Each calibration or response factor represents the slope of the line between the response for a given standard and the origin. The average calibration factor or response factor of the standards for each analyte is then used to calculate the concentration of the sample.

When the variation, measured as the relative standard deviation (RSD) of the factors, is less than or equal to 20%, then the slopes of the lines for each standard are sufficiently close to one another that the use of the linear model is generally appropriate over the range of standards that are analyzed. A relative standard deviation (RSD) of 25% or less is considered linear.

Response/Calibration Factor Equations

External Standard Equation

$$CF = (Ax)/(Cx)$$

or

Internal Standard Equation

$$RF = ((Ax)(Cis))/((Ais)(Cx))$$

Where: Ax = Area of the compound
Cx = Concentration of the compound
Ais = Area of the internal standard
Cis = Concentration of the internal standard

Response/Calibration Factor Statistical Equations

Average RF or CF: $RFAVE = (S\ RFi / n)$

Standard Deviation (s): $s = \sqrt{\{ [S (RFi - RFAVE)2] / (n-1) \}}$

Relative Standard Deviation (RSD): $RSD = s / RFAVE * 100$

Where: n = number of pairs of data
RFi = Response Factor for each level
RFAVE = Average of all the response factors
S = the sum of all the individual values

In the equations above RF can be replaced with CF

Response/Calibration Factor Equations for Concentration

External Standard Equation
$Cx = Ax/CFAVE$

or

Internal Standard Equation
$Cx = ((Ax)*(Cis)) / ((Ais)*(RFAVE))$

Advantages

- Assumes linearity through the origin, no negative calculated concentrations.
- Simple calculation

Disadvantages

- Linearity of the curve is required.
- May not reflect actual detector response curve.

Linear Regression Statistical Equations

Slope (m)

$$m = \frac{[(Swxiyi * Sw) - (Swxi * Swyi)]}{[(Sw * Swxi2) - (Swxi * Swxi)]}$$

Intercept (b)

$$b = yAVE - (m * (xAVE))$$

Correlation Coefficient (r)

$$r = \frac{[(Sw * Swxiyi) - (Swxi * Swyi)]}{\sqrt{\{[(Sw * Swxi2) - (Swx * Swxi)] * [(Sw * Swyi2) - (Swyi * Swyi)]\}}}$$

Coefficient of Determination (r2)

$$r2 = r * r$$

Where:
- n = number of x, y pairs
- xi = individual values for the independent variable
- yi = individual values for the dependent variable
- w = weighting factor, for equal or no weighting w = 1
- xAVE = average of the x values
- yAVE = average of the y values
- S = the sum of all the individual values

Equations for Concentration

External Standard Equation

$$Cx = \{Ax-b\} /m$$

or

Internal Standard Equation

$$Cx = [\{(Ax)/(Ais)\}-b] /m * Cis$$

Advantages

- This technique is the simplest and most commonly applied form of Linear Curve
- Computation of coefficients and standard deviations is easy

Disadvantages

- If least squares regression (linear and non-linear) is used for curve construction it is usually noticed that the lower levels of the calibration may fail the re-fit criteria (<20% D) even when the r/COD/r2 criteria have been met.

- Analysts that use least squares regression and rely only on the r/COD/r2 criteria for curve acceptance may not be aware of this potential problem at the lower calibration levels.

WEIGHTED LEAST SQUARE REGRESSION

Each term in the weighted least squares criterion includes an additional weight that determines how much each observation in the data set influences the final parameter estimates and it can be used with functions that are either linear or nonlinear in the parameters.

One of the common assumptions underlying most process modeling methods, including linear and nonlinear least squares regression, is that each data point provides equally precise information about the deterministic part of the total process variation. In other words, it is assumed that the standard deviation of the error term is constant over all values of the predictor or explanatory variables. This assumption clearly does not hold, even approximately, in every modeling application.

In a weighted fit, less weight is given to the less precise measurements and more weight to more precise measurements when estimating the unknown parameters in the model. Using weights that are inversely proportional to the variance at each level of the explanatory variables yields the most precise parameter estimates possible.

Method 8000C describes variance as the difference between the observed instrument response for the i^{th} calibration standard and the predicted or calculated response for the i^{th} calibration standard.

Weighting the sum of the squares of the differences may significantly improve the ability of the least square regression to fit the linear model to the data.

$$\sum w_i (y_i - y'_i)^2$$

where:

w_i = **Weighting factor for the i^{th} calibration standard (w=1 for unweighted least square regression)**

y_i = **Observed instrument response for the i^{th} calibration standard**

y'_I = **Predicted (or calculated) response for the i^{th} standard**

$\sum$ = **The sum of all individual values**

The mathematics used in unweighted least squares regression has a tendency to favor numbers of larger value over numbers of smaller value. Thus the regression curves that are generated will tend to fit points that are at the upper calibration levels better than those points at the lower calibration levels.

Examples of weighting factors which can place more emphasis on numbers of smaller value are:

$$w_i = 1/y_i \quad \text{or} \quad w_i = 1/y_i^2$$

where,

wi = weighting factor for the ith calibration standard (wi=1 for unweighted least squares regression).

y_i = observed instrument response (area or height) for the i^{th} calibration standard.

Different Types Of Weights

No Weights:	Default higher weighting of higher amounts or signal values
1/Amount:	Nearly cancels out the weighting of higher amounts
1/Amount^2 :	Causes over-proportional weighting of smaller amounts
1/Response:	Nearly cancels out the weighting of higher signal values
1/Response^2:	Causes over-proportional weighting of smaller signal values
1/RSD:	Weights signal values with small relative standard deviations more than those with large relative standard deviations
1/RSD ^{2} :	Weights signal values with small relative standard deviations clearly more than those with large relative standard deviation.

Advantages

- Weighted least squares is an efficient method that makes good use of small data sets. It also shares the ability to provide different types of easily interpretable statistical intervals for estimation, prediction, calibration and optimization.

- The main advantage that weighted least squares enjoys over other methods is the ability to handle regression situations in which the data points are of varying quality.

Disadvantages

- The biggest disadvantage of weighted least squares is probably the fact that the theory behind this method is based on the assumption that the weights are known exactly. The exact weights are almost never known in real applications, so estimated weights must be used instead. The effect of using estimated weights is difficult to assess, but experience indicates that small variations in the weights due to estimation do not often affect a regression analysis or its interpretation.

- When the weights are estimated from small numbers of replicated observations, the results of an analysis can be very badly and unpredictably affected. This is especially likely to be the case when the weights for extreme values of the predictor or explanatory variables are estimated using only a few observations. It is important to remain aware of this potential problem, and to only use weighted least squares when the weights can be estimated precisely relative to one another.

- Weighted least squares regression is also sensitive to the effects of outliers. If potential outliers are not investigated and dealt with appropriately, they will likely have a negative impact on the parameter estimation and other aspects of a weighted least squares analysis.

- If a weighted least squares regression actually increases the influence of an outlier, the results of the analysis may be far inferior to an unweighted least squares analysis.

Authorized Signatures

The individuals listed below are authorized to sign/approve documents in the classes listed. See also SOP ALI-30.

Approval Signatures - Moscow

Quotes/Contracts/RFP Submissions

- Todd Taruscio, Lab Manager
- Erin Linskey, QC Manager
- Mike Pearson, Lab Director
- Gene Solomon, QA Officer

Analytical Reports

- Todd Taruscio, Lab Manager
- Erin Linskey, QC Manager
- Mike Pearson, Lab Director
- Justin Doty, Customer Service Manager (on behalf of Todd Taruscio)
- Cheyenne Garrett (on behalf of Todd Taruscio)

SOPs

- Todd Taruscio, Lab Manager
- Gene Solomon, QA Officer
- Justin Doty, Customer Service Manager (for office procedures)
- Erin Linskey/Todd Taruscio, Technical Director (in Lab Manager's absence)
- Mike Pearson, Lab Director (in Lab Manager's absence)

Corrective Action Reports

- Todd Taruscio, Lab Manager
- Erin Linskey, QC Manager
- Mike Pearson, Lab Director
- Gene Solomon, QA Officer

Demonstrations of Capability (IDC/DOC)

- Todd Taruscio, Lab Manager
- Gene Solomon, QA Officer
- Erin Linskey, QC Manager (in Lab Manager's absence)
- Mike Pearson, Lab Director (in Lab Manager's absence)

Approval Signatures - Spokane

Quotes/Contracts/RFP Submissions

- Kathleen Sattler, Lab Manager
- Leah Clappes, QA Officer
- Mike Pearson, Lab Director

Analytical Reports

- Kathleen Sattler, Lab Manager
- Leah Clappes, QA Officer
- Mike Pearson, Lab Director
- Brock Gerger, Project Manager (on behalf of Kathleen Sattler)

SOPs

- Kathleen Sattler, Lab Manager
- Leah Clappes, QA Officer
- Mike Pearson, Lab Director
- Mike Pearson, Lab Director (in Lab Manager's absence)

Corrective Action Reports

- Kathleen Sattler, Lab Manager
- Leah Clappes, QA Officer
- Mike Pearson, Lab Director

Demonstrations of Capability (IDC/DOC)

- Kathleen Sattler, Lab Manager
- Leah Clappes, QA Officer
- Mike Pearson, Lab Director