



Information and Services Profile

[Effective April 1, 2009]

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CORPORATE VISION / OVERVIEW

Access Analytical Laboratories Inc. is a privately owned, Alberta company, which was formed to provide core, quality environmental analytical services.

We believe that project-driven service, with a strong client orientation is critical to any long-term relationship. This, plus a strong technically experienced staff, will provide the three-dimensional service support clients require.

Our vision is not to be the biggest but to provide:

“ Quality and Accessible Solutions”

The Team

Bob Corbet, M.Sc., P.Ag., P.Chem.– Chief Operating Officer,
Manager, Technical Support,

Bob has over 30 years experience as a chemist in Analytical Chemistry and Environmental Studies. He has worked in both private and government agencies and has been involved in a range of nationally-based studies. His experience includes projects in the pipeline and refinery industry, waste utilization, soil remediation, dioxin analysis, as well as in the areas of water and air quality. Bob will be our client's scientific and project liaison and will be one of our client service contacts.

Trevor Ahlstrom, Ch.T. – Manager, Analytical Services

Trevor is a Chemical Technologist with 29 years experience in commercial laboratories. He has set up trace organic analysis at several labs and will be responsible to oversee the laboratory services. Trevor is our quality control / quality assurance and methods development specialist with extensive experience in setting up and maintaining audited, certified lab operations. He will also be working with our customers as a client services contact.

Holly Finn – Office Manager – Administration, Client Services

Holly has 29 years experience in Office Administration including 21 years in a laboratory environment. She is responsible for the daily administration of the office as well as our financial services. She enjoys working with customers and will be the first point of contact for our clients.

John V. Paul, Ch.T. – Inorganic Services

John has been a Chemical Technologist since graduating from SAIT in 1982. He has worked as a Senior Inorganic Chemist at several labs in the Calgary area. He was an integral part of the set up of numerous environmental labs including one in the United States. He will be responsible for the co-ordination of inorganic services at Access and is also very well versed in issues related to soil chemistry, remediation, and water quality issues. John welcomes our clients' questions and will also be a customer contact person.

Kim van der Linden – B.Sc., Ch.T. – Quality Assurance

Kim is the Quality Assurance Officer and Internal Auditor for Access. Kim's roots are with inorganic analysis and she has been involved in the Environmental Industry since 2000. Kim's efforts directly compliment and guide the review and assessment of our analysis and how they are handled by our senior analysts. She also coordinates our activities with various accreditation bodies.

Gavin January – BSc.T. – Organic Services

Gavin is an analyst in our Organic Services Group and has over 19 years of experience in private environmental labs. Gavin is dedicated and his high level of technical and personal standards is reflected in the quality of his work. Gavin is approachable and available for client inquiries.

Ron Towler – Ch.T. – Organic Services

Ron is a senior analyst in our Organic Services Group. Ron brings a wealth of technical expertise to Access Labs, with over 20 years of environmental laboratory experience.

Sandy January – Client Services

Sandy has been with us since 2001 and is a valued member of our customer service team. She has worked in many areas of the lab and knows the way the work flows. Sandy is your Customer Service contact for additional tests and reporting queries.

Rahul Suryawanashi - M.Sc. - Inorganic Services

Rahul is a soil scientist with 2-3 years of experience. He provides soil expertise and lab analytical project support.

Quality Control / Quality Assurance

Philosophy:

Access subscribes to the philosophy that we must maintain the best interests of our clients. Therefore, Access Labs is required to provide on time services which are traceable, valid and provide the best available reproducible value. As part of this philosophy, we subscribe to external auditing agencies, and proficiency testing.

Quality Control:

External Agencies – Access is an accredited member of the Canadian Association for Environmental Analytical Laboratories (CALA) and we routinely participate in a range of CALA Quality Control Proficiency Programs. As part of CALA, we currently follow the ISO 17025 guidelines. Access participates in CALA / Industry round robin programs and continues to expand its scope of services with CALA.

Proficiency testing (external) – Access is involved in routine external blind sample assessment of samples provided by CALA. Successful performance of this is required to maintain our certifications.

Analytical Methodologies / Reference Methods

Access performs, routinely for each of its services, daily calibration checks of multi-point calibration curves. Duplicate / matrix spike and method blank data is collected with every batch of samples (≤ 15). All instruments are monitored daily and their performance documented. All GC/MS analytical samples are spiked with internal standards and surrogates to assess the testing performance as per the standard US EPA / Env Canada methodology. All final reports are reviewed by a senior chemist before release. Raw and QA data are maintained for one year.

All analytical methods and tests are traceable methodologies established with either federal or provincial agencies or through the US Environmental Protection Agency.

Services / Support

Customer Services

- Access Labs has a **Pick up and Delivery Service** (within Calgary limits) for samples (call 291-4682).
- Sample supplies (containers, preservatives, coolers) are available upon request.
- Samples will be received by Access Labs on a “collect” basis. The use of couriers DHL or Greyhound is preferred but other couriers are available upon request.
- Upon request, Access Labs will send out additional copies of reports and courier out results.
- Our technically experienced staff are always pleased to discuss projects and special analytical requirements that are not listed in this Schedule or in interpretation of your analytical needs.
- All results and information obtained by Access Labs will be strictly confidential. Any requests for information, from other than the original consultant, will be followed up for permission to provide the data.
- Access Labs is available 24/7 through an after hours phone line to one of our senior staff members.

Sampling Supplies

All sampling materials, cool packs and coolers used in the collection of samples to be analyzed by Access Labs are supplied at no charge to the client. Please refer to Appendix A for the sampling container and volume requirements. Samples will be stored for 30 days upon completion of the analysis. If a longer storage time is required, please contact Access Labs, either by telephone or by returning the Sample Disposal Form attached to the hard copy of the results. A storage fee is charged for long-term storage and invoiced on a monthly basis (rate of \$2.00 per sample per month). Customized COC's are also available upon request, which contain the specific client's information already filled out.

Access reserves the right to charge for any and all materials provided and used for in-field screening/testing or handling of samples by a consultant.

Access Labs Contacts

Organics	Results interpretation, queries, project development	Bob Corbet
	Results interpretation, queries, laboratory services	Trevor Ahlstrom Gavin January
Inorganics	Results interpretation, queries	John Paul Bob Corbet
Administration	Accounting, customer service, general queries	Holly Finn Sandy January Laurie Kratochvil

Turnaround Time

All of the standard services have a turnaround time of **5 working days** from the time of arrival of the samples and a completed COC request at the laboratory. There are several specific services and volume limits, which may require longer TAT. These are:

Service (sublet)	Access Code	TAT(working days)
BOD (5 days + 1 reporting)	BOD	6-7 days
Organic Halides (sublet)	OXE	6-7 days
Hexavalent Chromium	CR+6	7-10 days
General Herbicide Screen (non-sterilant)	POXY02	7-15 days (as per sublet lab)

Rush Surcharges

Rush surcharges will be levied for rush services. The charges will be applied as follows (unless otherwise negotiated). Please call the lab for prior approval of rush services.

Next Day (≤ 24 hrs)	100%
Day 3 (> 25 hrs < 72 hrs)	50%
Day 4 (72 hrs to 96 hrs)	25%

Penalties

If TAT, for pre-approved rush analysis is not met, there will be no surcharges applied.

Drop Box

We have a lockable, secure drop box at the back of the building that is available 24 hours a day, 7 days a week. We ask that you contact the after hours line (403) 291-4682 so that any samples can be promptly moved into the lab.

Environmental Services – Hours of Operation

May to December 10 Mon to Fri - Laboratory 7:30 am to 5:30 pm (extended upon request)
Sat Receiving 8:00 am to 2:30 pm

December 10 to April Mon to Fri All Services 8:00 am to 5:00 pm (extended as needed)

Emergencies and After Hours – Access Labs will be available 24 hours a day, 7 days a week (403-291-4682). After regular hours, calls will be forwarded to a cell phone for direct staff contact and response.

Minimum Charge and Pricing

Access Labs reserves the right to levy a minimum charge of \$75.00 per work order due to material costs and overhead. Prices are shown for analytical services and may be subject to change without notice. GST is not included in the prices shown.

Safe Environmental Disposal Costs

All wastes are properly segregated and characterized and then disposal of through a registered and certified disposal company. All records are available to clients and regulatory agencies as required or requested.

To help offset our disposal costs, an Environmental Disposal fee of \$2.00 will be levied against all samples.

Liability

Access Labs uses approved, documented and validated methodologies. We take part in regular proficiency test programs and are accredited by the Canadian Association of Environmental Analytical Laboratories (CAEAL) for specific environmental tests listed in the scope of accreditation approved by CAEAL. However as we cannot control the sampling or the specific handling prior to the samples' arrival at the lab, Access Labs assumes no liability from the misuse or misinterpretation of results. Access is not liable for the loss, misdirection or breakage of samples while in transit. Access will only, where applicable, assume liability for the analytical costs incurred.

Insurance

Proof of insurance is available upon request.

Reporting

Access Labs is pleased to be able to provide custom reporting formats to our clients. Results can be available in PDF, Flat Format, and Excel by E-mail and/or Fax. A complete report will be transmitted to our customer or to the representative specified on the Chain of Custody (by means as specified on the COC or as otherwise negotiated). A signed, hard copy of the complete report, along with the invoice, will be mailed to the customer or to the otherwise specified representative.

Access Labs' Customer reports may only be reproduced in full by the client. The results contained in these reports relate only to the samples tested in the lab.

COR Accreditation

Access is pleased to indicate that it has been COR (Certificate of Recognition) accredited (2007) in support of its own ongoing program of safety and quality improvement.

SERVICES LIST

ORGANICS - HYDROCARBON SCREENS

Volatiles and Non-Volatiles

Access Code

BTX01	Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) by GC/MS
BTX02	BTEX and Purgeable Hydrocarbons (GC/MS/FID)
BTX03	BTEX, Purgeables & Extractable Hydrocarbons (C30+)
MAH	Monoaromatic Hydrocarbons (BTEX, Styrene)
MAHF1	BTEX + Styrene + F1 (C6-C10)

Note: All TEH packages include chromatogram

TEH01	Total Extractable Hydrocarbons (C11-C30) (Single Value) including Chromatogram
TEH02	C11-C30 Extractable Hydrocarbons with Individual Carbon Group Breakdown including Chromatogram
TEH03	Total Extractable Hydrocarbons with Fuel Type Assessment and Chromatogram
TEH04	Total Extractable Hydrocarbons (C11-C60+)(Single Value) including Chromatogram
TEH05	C11-C60+ Extractable Hydrocarbons with Individual Carbon Group Breakdown including Chromatogram
TEH05SK	Saskatchewan Extractable Hydrocarbons, C11-C22, C23-C60 with silica gel cleanup, carbon group breakout and chromatogram
VPH01	Total Purgeable Hydrocarbons (C6-C10) (F1)
TH01	Total Purgeable and Extractable Hydrocarbons C30 (Single Values)
CHRO	Chromatogram – Report Quality Presentation
CCVP00	CCME BTEX, F1 Extraction Preparation Only
CCVP01	CCME Assessment - BTEX and F1 (C6-C10)
CCVP02 ¹	CCME Hydrocarbon Assessment in soil which includes F1 (C6-C10), BTEX, F2 (C10-C16), F3 (C16-C34), C34+ or F4(C34-C50) _{HTG} (Classic* - Validated) - Soxhlet
CCVP02C	CCME Hydrocarbon Assessment in soil which includes F1 (C6-C10), BTEX, F2 (C10-C16), F3 (C16-C34), C34+ or F4(C34-C50) _{HTG} (Classic* - Validated) – Soxhlet (includes chromatogram)
CCVPCS	CCME Criteria Assessment which includes F1 (C6-C10), BTEX and F2, F3, F4 (C34+) or F4 (C34-C50) _{HTG} using a modified method
CCVP75	CCVP02 + PS75 (200 Sieve Particle Size)
CCVP75C	CCVP02 + PS75 (200 Sieve Particle Size) includes chromatogram
USTW	CCME Hydrocarbon Assessment in water which includes F1 (C6-C10), BTEX, F2 (C10-C16) (UST criteria)
CCVP03	CCME Criteria Assessment: F2/F3/F4/ F4 _{HTG} Non-Volatile Fractions only (Classic* - Validated) - Soxhlet

- PS75 #200 Sieve Size Analysis (for texture classification Coarse >75 micron and Fine <75 micron) per Alta Tier 1 and CCME Guidelines (*requires preparation test DRY02*)
¹All denoted packages include BTEX and F1 – BTX Assessment
 * **Classic** refers to the Soxhlet method that is validated and performed specifically as outlined in CCME Method (June, 2001)

Oil & Grease

**Access
Code**

- O&G01 Oil/Grease assessment with Methylene Chloride (Pits)
 O&G02 Oil/Grease assessment by Dean Stark Extraction (% Solids, Oil & Water)
- O&G03 Oil & Grease in Water (Gravimetric)
 CCO&G Oil/Grease assessment as per the CCME guidelines (gravimetric)

Volatile Organic Screens

- MTBE Methyl ter-Butyl Ether
 THM Trihalomethanes in Water (refer to Appendix A)
 VO8260 EPA 8260 Volatiles Screen (refer to Appendix A – 74 Targets)
 VOC01 Single Volatile Compound by GC/MS (please specify)
 VOC624 EPA 624 Volatiles Screen (30 Targets)

Semi-Volatile Organic Compounds

- ALC01 Single Alcohol (please specify)
 ALC02 Alcohol Screen (refer to Appendix A)
- AMN01 Single Amine (please specify)
 AMN02 Full Amine Screen (refer to Appendix A)
- GLY01 Single Glycol (please specify)
 GLY02 Glycol Screen (refer to Appendix A)
- PAH02 Polyaromatic Hydrocarbons (21 components) (refer to Appendix A)
 PAH03 Polyaromatic Hydrocarbons in an Oily Waste – Road Application (refer to Appendix A)
 PAH04 Polyaromatic Hydrocarbons – CCME Specific (10 compounds)
 PAH06 Polyaromatic Hydrocarbons (as per Tier 1 July 2007) with B(a)p toxic equivalents and IARC (*Index of Additive Cancer Risk*)
- SUF01 Sulfolane

Qualitative Scans / Special Services

Non-target GC/MS evaluation and summary review – excellent for use in unknown site situations

QSV	Semi-Volatile Qualitative Scan and Consulting Assessment
QVS	Volatiles Qualitative Scan and Assessment
PRODUCT	Free Product Characterization (C1-C30 with carbon breakout, monoaromatics, pristane, phytane and comparison if required)

Organic Halides

(*These tests will be sublet and are performed by Neutron Activation)

OXA01*	Adsorbable Organic Halides in Water (AOX)
OXE01*	Extractable Organic Halides by neutron activation (EOX)
OXT01*	Total Organic Halides in oil or solvents (TOX)

Sterilants (Agrichemicals)

PSTER01	Individual Sterilant (please specify)
PSTER02	Sterilant Scan: Atrazine, Bromacil, Diuron, Linuron, Simazine, Tebuthiuron (Trace)

Special Waste / Products Testing / Prep Services

Access Code

PAH03	PAHs in an Oily Waste (naphthalene, phenanthrene, pyrene, benzo(a)pyrene, benzo(a)anthracene (Alberta Guidelines)
BTX01	BTEX in an Oily By-Product
BTXL	Leachable BTEX by GC/MS (includes preparation)
FP01	Flashpoint
PFT	Paint Filter Test
TCLP	TCLP Leachate Preparation
TCLM	TCLP Leachate Metals Scan (Ag, As, B, Ba, Be, Cd, Cr, Co, Cu, Fe, Hg, Ni, Pb, Sb, Se, Ti, U, V, Zn, Zr) (includes preparation)
TCLZ	TCLP Leachate Preparation (Zero Headspace for Organics)
TCPbHg	Leachable Lead & Mercury (Roadway Screen – Saskatchewan)
NAPL	Leachable Naphthalene (Roadway – Sask)

Bioassay Screens**

MTX01	Microtox Bioassay – EC50+EC20 Test for Sump Liquids
MTXC	Microtox Bioassay – EC50+EC20 Test for Charcoal Treated Sump

**Test will be sublet

Saskatchewan – Hydrocarbon Services

TEH05SK	Extractable Hydrocarbons: C11-C22, C23-C60 with silica gel cleanup, carbon group breakout and chromatogram (option: histogram) (Spigec, 1999)
SAL02SK	Soil Salinity - % Saturation, pH in Sat Paste, EC, Ca, Mg, Na, K, S04, Cl ⁻ SAR, TGR (needs DRY02) *Note Regulations for Guideline Packages

Air Testing Analytical Services

BTX04	BTEX in Air – NIOSH Method 3700 (Tedlar Bag)
BTX05	Light Hydrocarbons / Aromatics (Tedlar Bag)
TOHC	Total Hydrocarbons in Air (Tedlar Bag) – Single Value
VOC01	Single Volatile in Air
METH	Methane in Air

Please Note: We are always reviewing our Air Testing capabilities. If you have a specific request, please give us a call at (403) 291-4682.

INORGANICS – Soil

Access

Code	Sample Preparation
COMP	Sample Compositing (per set) (per hour)
DENS	Bulk Density (Dry Soil)
DRY01	Drying
DRY02	Drying, Grinding and Sieving
DIG03	Acid Digestion (Soil/Water)
DIG04	Extractable Barium Extraction
MOIS	Moisture Content (As Received)
PROD	Product Preparation (Difficult Matrix Surcharge)
SAT	Saturated Paste Extraction for Individual Analysis (requires DRY02)
SG	Specific Gravity

Physical Analysis

PS01	Particle Size (%Sand, Silt & Clay) (Two Point Hydrometer) <i>(requires Prep DRY02)</i>
PS75	#200 Sieve Size Analysis (>75 micron) <i>(requires Prep DRY02)</i>
WET	Soil Wettability (Molarity Ethanol Droplet Value) <i>(requires Prep DRY02)</i>
OM	Organic Matter % (Walkley-Black Method)

Available Nutrients *(tests require Preparation Test DRY02)*

N0302	N03-N (CaCl extract)
NH402	NH4-N (KCl extract)
NH403	NH4-N + N03-N (KCl extract)
NUTR01	pH, EC, N, P, K, S
NUTR02	N, P, K, S, NH3-NO3
NUTR04	Available N03-N, P, K
NUTR05	Available NH4, N03-N, P

Soil Salinity Assessment

PHSAT	pH in Saturated Paste (Dry and Saturation Included)
PH02	pH (1:1 in Water)
PH03	pH (1:2 in CaCl ₂) (Tier I Criteria)
SAT02	% Sat, pH and EC in Saturated Paste
SAL01	Drilling Fluid Salinity (G50) Screen: % Saturation, pH, EC, Cl-
SAL02	Salt Spill Assessment (Alta): % Saturation, pH03 (in CaCl ₂), EC, Ca, Mg, Na, K, S04, Cl-, SAR, TGR <i>(needs DRY02)</i>
SAL02SK	Soil Salinity - % Saturation, pH in Sat Paste, EC, Ca, Mg, Na, K, S04, Cl-, SAR, TGR <i>(needs DRY02)</i>
SAL03	Oil Spill (includes Salt Spill): % Saturation, pH, EC, Ca, Mg, Na, K, Cl-, S04, SAR, TGR, % Oil (Methylene Chloride), N03+N02, Wettability <i>(needs DRY02)</i>
SAL04	Routine Salinity: % Saturation, pH, EC, Ca, Mg, Na, SAR, TGR <i>(needs DRY02)</i>
SAL06	SAL02 + Soluble N02, N03, NH4 <i>(needs DRY02)</i>

Soil Quality Parameters

EXC01	CEC, Exchangeable Cations, TEC, % Base Saturation (NH ₃ Ac / KCl)
CEC01	Cation Exchange Capacity (Ammonium Acetate)
GYP	Free Gypsum estimate

Soil Individual Parameters

(Require preparation test DRY02 + SAT on Page 14)

C03	Carbonate (C03)
Cl	Chloride (Cl)
HC03	Bicarbonate (HC03)
MSCa	Calcium (Ca)
MSK	Potassium (K)
MSMg	Magnesium (Mg)
MSNa	Sodium (Na)
MSP	Phosphorus (P)
N3/2	Nitrate+Nitrite (N03+N02)
NH4	Ammonia Nitrogen (NH ₄ -N)
PHEN	Phenol in Soil
S02	Total Sulphur (Leco) <i>(requires DRY02)</i>
S04	Sulphate (S04)
TKN	Total Kjeldahl Nitrogen

Single Metals Analysis:

DIG03	Digestion
MSET	Setup for ICP Metals Individual Metal (eg: MSAg) (each)

Carbon Assessments

TOC	Total Organic Carbon (Leco) Direct
TOCA	Carbon Assessment (TC, TOC, TIC)
IC	Inorganic Carbon

Soil Metals Analysis

CCMEM	<u>CCME / Tier 1 Criteria Heavy Metals Scan by ICP/MS:</u> Ag, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Tl, Sb, Se, Sn, V, Zn, Hg <i>(Requires DIG03)</i>
G50M	*G50 Metals: B (hot water), Ba, Cr, Zn, Pb, Cu, Cd, Ni, V <i>(Requires DIG03)</i>
PBU	Lead in Soil (includes prep)
CR+6	Hexavalent Chromium (Cr ⁺⁶) [optional addition to TIERM] sublet – only applicable at certain limited sites
Hg	Mercury in Soil
B01	Hot Water Soluble Boron (potential addition to TIER 1 and CCMEM Scan)
B02	Boron by Saturated Paste Extract (preparation included)

ExtBa	Extractable Barium (AB Env. 2004) (<i>requires DIG04</i>)
NBBa	Strong Acid Digest Non-Barite Barium (ICP)
BARITE	Total Barium by Fusion Preparation (Alta Env 2009) (ICP)

INORGANICS – Water

Routine Water Quality

Access Code

POT	Routine Potability: pH, Conductivity, Ca, Mg, Na, K, Fe, Mn, Cl, C03, HC03, N03+N02, F, S04, TDS, Hardness, Ion Balance, Alkalinity, Hydroxide
POTQC	Quick Check: pH, TDS, Fe, Mn, Ca, Mg, Na, Hardness
IS	Irrigation Suitability: pH, EC, Ca, Mg, Na, K, S04, N03+N02, Cl, TDS, Hardness, Sodium Adsorption Ratio (SAR), Recs.
EFF	Water Softener Efficiency: Ca, Mg, Na
AC	Animal Consumption: pH, EC, Ca, Mg, Na, K, S04, N03+N02, TDS, Hardness
SAL07	Water Salinity: pH, EC, Ca, Mg, Na, K, Cl-, S04, SAR
SAL09	Water SAR: pH, EC, Ca, Mg, Na, SAR

Microbiological

COLI	Total and EColi Coliforms
TFC	Fecal Coliforms
SPC	Standard Plate Count (Heterotrophic Plate Count)
FeBac	Iron Bacteria in Water
SulRed	Sulfur Reducing Bacteria in Water

Coal Bed Methane – Groundwater Assessment (Guide 25, 2007)*

POT	Routine Water Quality – see parameters above
MWTFe/Mn	Total Iron and Manganese
COLI	Total and E.Coli Coliforms in Water
TFC	Fecal Coliform in Water
METH	Free Methane in Water by GC/FID
FeBac	Iron Bacteria in Water
SulRed	Sulfur Reducing Bacteria in Water
CBM01	CBM Well Water Assessment Package Price

*Carbon Isotope work will be done, if requested, at the University of Alberta (please contact lab for pricing)

Water – Metals Assessment

Please specify the type of method to be used for your sample (e.g. Dissolved, Extractable or Total).

*Total metals will require a Dig03

Dissolved: Those elements which pass through a 0.45 micron filter (for example: groundwater)
Extractable: Unfiltered samples that have been preserved with acid
Total: The concentration determined on an unfiltered sample following digestion with a strong acid. Total metals are usually determined for surface water and effluent samples.

Individual Price for Basic Metals:

MWSET Setup Charge for ICP Metals in Water
 Individual metal (please specify method) (each)
 For Example: MWDAG = Dissolved Silver
 MWTAg = Total Silver
 MWEAg = Extractable Silver

Potential Element List Ti, As, Se, Cr, Zn, Pb, Cu, Cd, Ni, Be, Co, Th, V, Ag, Al, Ba, Sn, Mo, Sb, Zr, Mn, Fe, Mg, Ca, Na, K, S, U, B, Hg, P, Ti

MWDC **Complete Dissolved Metals Screen by ICP/OES:** Ag, Al, As, B, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, V, Zn, Sr, Ti, Tl, U

MWDCMS	Complete Dissolved Metals Screen by ICP/MS: Ag, Al, As, B, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Se, Sn, V, Zn, Sr, Ti, Tl, U
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MWT	Complete Total Metals Screen by ICP/MS: Al, Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, Sr, Th, Sn, Ti, U, V, Zn
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CCMEMW	CCME Metals in Water: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Sb, Se, Ag, Tl, Sn, V, Zn, Hg
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Table 1.0 Key CCME Guidelines – Inorganics In Water

Parameter	Fresh Water Aquatic Life	Complete Water Inorganic	CCME Metal Screen
pH	✓	✓	
NH4	✓	✓	
Cl	✓	✓	
TDS		✓	
F		✓	
N03+N02		✓	
N02	✓	✓	
S04			
CN (Free)	✓	✓	
Ag	✓	✓	✓
Al	✓	✓	
As	✓	✓	✓
B		✓	✓
Ba		✓	✓
Be		✓	✓
Bi		✓	
Ca		✓	
Cd	✓	✓	✓
Co		✓	✓
Cr	✓	✓	✓
Cu	✓	✓	✓
Fe	✓	✓	
Hg	✓		✓
K		✓	
Li		✓	
Mg		✓	
Mn		✓	
Mo	✓		✓
Na		✓	
Ni	✓	✓	✓
P		✓	
Pb	✓	✓	✓
S		✓	
Sb		✓	
Se	✓	✓	✓
Si		✓	
Sn			✓
Sr		✓	
Ti		✓	
Tl		✓	
U			
V		✓	✓
Zn	✓	✓	✓
Codes	FAL	REM	CCMEW

Organic Parameters – CCME has established a range of assessment levels for a changing and diverse set of parameters. Often the tests, due to the client’s process, require specific tests. Therefore, please consult with our staff so that we can establish the best, cost effective set of screens to suit your needs. This service is therefore provided on a quotation basis.

Individual Water Parameters

Access Code

ALK	Total Alkalinity in Water (includes pH, HC03, C03, OH) {potentiometric}
ANION	Nitrate, Nitrite, Sulphate, Chloride, Fluoride by Ion Chromatography
CATION	Calcium, Magnesium, Sodium, Potassium by Ion Chromatography
Br	Bromide (Br-) by Ion Chromatography
Cl	Chloride (Cl-) by Ion Chromatography
CLR	Colour
CR+6	Hexavalent Chromium (Cr+6) (sublet)
CYD	Dissolved Cyanide (Spectrometry)
CYT	Total Cyanide (Distillation)
DKN	Dissolved Kjeldahl Nitrogen
DOC	Dissolved Organic Carbon
F	Fluoride (F-) by Ion Chromatography
Fe/Mn	Iron and Manganese by Atomic Absorption.
HARD	Hardness (Ca, Mg, Na) by Atomic Absorption [calculation]
HgW	Mercury in Water
N02	Nitrite (N02) by Ion Chromatography
N03	Nitrate (N03) by Ion Chromatography
NH4	Ammonia Nitrogen (NH4-N) (by Ion Chromatography)
PH	pH
PHEN	Phenols (Total Distillation) (Spectrometry)
S04	Sulphate (S04) by Ion Chromatography
SUL	Hydrogen Sulphide as S (p)
TDS	Total Dissolved Solids (TDS)
TP	Total Phosphorus
TSS	Total Suspended Solids
TURB	Turbidity

Sewer / Sanitary Discharge Analysis

BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
O&G03	Oil and Grease
TOC	Total Organic Carbon (Total Carbon minus Total Inorganic Carbon)
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids

Sewage Release Analysis – Test for BOD and TSS and pH

BOD	Biochemical Oxygen Demand
TSS	Total Suspended Solids
PH	pH in Water

REGULATIONS

CCME Interim Guidelines – Soil (June/2001)

CCVP01	CCME Assessment – BTEX and F1 (C60-C10)
CCVP02*	CCME Hydrocarbon Assessment which includes F1 (C6-C10), BTEX, F2 (C10-C16), F3 (C16-C34), C34+ or F4(C34-C50) _{HTG} (Classic* - Validated) – Soxhlet
CCVPCS	CCME Criteria Assessment which includes F1 (C6-C10), BTEX and F2, F3, F4 (C34+) or F4 (C34-C50) _{HTG} using a modified method as per Alberta Environment/CAEAL
CCVP03*	CCME Criteria Assessment: F2/F3/F4/ F4 _{HTG} Non-Volatile Fractions
PS75	#200 Sieve Size Analysis (for texture classification Coarse >75 micron and Fine <75 micron) per Alta Tier 1 and CCME Guidelines (<i>requires preparation test DRY02</i>)
CCME01	Full Assessment: % Sat, pH, EC, Ca, Mg, Na, SAR, F-, B, Cr+6, Water Soluble and Total Cyanide, As, Ag, Ba, Be, Cd, Cr, Co, Cu, Hg, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn (<i>Requires DRY02 and DIG03</i>)
TOC	Total Organic Carbon (<i>test will be sublet</i>)
S02	Total Sulphur – recommended at sulphur pile or storage areas only

***Classic method** is performed strictly as per the CWS-PHC Method (June, 2001)

Tier I Guidelines – Soil: Alberta (see also Appendix B-2) (2007)

Access Code

TIER01	Full Assessment Criteria (inorganic and metals): % Sat, pH, EC, Ca, Mg, Na, SAR, F, Hot Water Soluble Boron, Cr ⁺⁶ , Total & Water Soluble Cyanide, Ag, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Sb, Se, Sn, Tl, V, Zn (<i>Requires DRY02 and DIG03</i>)
CCMEM	CCME / Tier I Metals by ICP/MS: Ag, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Sb, Se, Sn, Tl, V, Zn, Hg (<i>Requires DIG03</i>)
S	Elemental Sulphur – noted for sulphur piles or storage areas only
O&G02	Tier I Criteria: Total Hydrocarbon Content (% Oil +% Water + %Sediment by Dean Stark
CCVP02	Assessment using CCME Hydrocarbon Criteria Method (BTEX, C6-10, C10-16, C16-34, C34-50, >C50) (Classic Method – June, 2001)
PAH06	Polyaromatic Hydrocarbons (as per Tier 1 July 2007) with B(a)p toxic equivalents and IARC (<i>Index of Additive Cancer Risk</i>)

Tier 1 Organic Contaminants List (Appendix B2): The Alberta Environmental Protection list is diverse and often the components of concern are those which relate directly to the client's process / actual activity. Therefore, please consult with our staff regarding the best, most cost effective screen for which a quote will be required.

Underground Storage Tanks (Alta. Environment Guidelines – 2001)

Access

Code

USTS	F1, BTEX, F2 (C10-C16), F3 (C16-C34), F4(C34-C50) or F4 (C34+) _{HTG} , including Lead and Chromatogram (CCME)
USTW	F1, BTEX, F2 (C10-C16) (CCME)
PBU	Lead (includes preparation)
PS75	#200 Sieve Size Analysis (<i>requires preparation test DRY02</i>)

Landfarm / Remediation (recommended options)

Access

Code

BTX02	BTEX and Purgeables in Soil (GCMS/FID)
TEH05	C11-C60+ Extractable Hydrocarbons with Individual Carbon Group Breakdown in Soil including Chromatogram
SAL04	*% Saturation, pH, EC, Ca, Mg, Na, SAR, TGR)(<i>Requires DRY02</i>)
NUTR02	N, P, K, S, NH ₃ -N03 (<i>Requires DRY02</i>)
CCMEM	Heavy Metals: As, Ag, Ba, Be, Cd, Cr, Co, Cu, Hg, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn (<i>Requires DIG03</i>) Optional additional tests: Boron and Hexavalent Chromium – see Page 15

Pits and Ponds Characterization (EUB)

(*Requires Preparation Test DRY02)

(Open for revision 2009)

Site Assessment:

SAL04	*% Sat, pH, EC, Ca, Mg, Na, SAR, TGR
PS01	*Particle Size (% Sand, Silt & Clay)
CCMEM	CCME / Tier I Element Scan: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Tl, V, Zn, Hg (Requires DIG03)
TOC	Total Organic Carbon
OM	% Organic Matter (Walkley-Black)

Materials Assessment (for backfilling):

SAL04	*% Sat, pH, EC, Ca, Mg, Na, SAR, TGR
CCMEM	CCME / Tier 1 Element Scan: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Tl, V, Zn, Hg (Requires DIG03)
BTX03	BTEX, Purgeables & Extractable Hydrocarbons (C10-C30+) including Chromatogram
O&G02	% Oil +% Water + % Sediment by Dean Stark (3 values)
OXE01	Extractable Organic Halides (by Neutron Activation)
DENS	Bulk Density (requires DRY02)
PS01	*Particle Size (% Sand, Silt & Clay) (requires DRY02)

Pit Assessment (after excavation):

SAL04	*% Sat, pH, EC, Ca, Mg, Na, SAR, TGR
CCMEM	CCME / Tier 1 Element Scan: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Tl, V, Zn, Hg (Requires DIG03)
O&G02	% Oil +% Water + % Sediment by Dean Stark

Pit Fluid or Wastewater:

PH	pH in Liquid
CI	Chloride
O&G01	Oil & Grease

Groundwater Characterization:

POT	Routine Water Potability
MWDC	Dissolved Metals by ICP: Ag, Al, As, B, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Mo, Ni, S, Se, Sn, Li, Sr, Ti, U, V, Zn
TKN	Total Kjeldahl Nitrogen
BTX03	BTEX, Purgeable & Extractable Hydrocarbons including Chromatogram

Note: Remediation of Flare Pits services for British Columbia and Saskatchewan are available upon request.

Drilling Waste Disposal
(as per EUB / G50 Criteria, 1996)
(Possibly open for revision 2009)

**Access
Code**

ONSITE – Mix, Bury & Cover*

DW03 Total Waste – Cl, Specific Gravity (S.G.)
DW04 Solids – Cl, S.G.

ONSITE – Landspreading*

DW05 Total Waste – EC, Cl, Ca, Mg, Na, SAR, TDS (calc.)
DW06 Solids – EC, Cl, S.G., TDS (calc.)
DWRS Receiving Soil – EC, Ca, Mg, Na, SAR
For unsaturated waste add \$10.00 for preparation

OFFSITE – Landspraying*

DW01 Total Waste – EC, Cl, S.G., Ca, Mg, Na, SAR, TDS (calc.)
DW02 Solids – EC, Cl, S.G., Ca, Mg, Na, SAR, TDS (calc.)
DWR Receiving Soil – EC, Cl, S.G., Ca, Mg, Na, SAR, TDS (calc.)
In all matrices, Guide 50 recommends a Microtox Evaluation
MTX01 Microtox Bioassay – EC50+EC20 Test for Sump Liquids

OFFSITE – Landspraying While Drilling*

DWLSS Solid Waste – EC, Ca, Mg, Na, SAR, TDS (calc.)
DWLSM Makeup Water – EC, Ca, Mg, Na, SAR
DWLSF Fluids – EC, Ca, Mg, Na, SAR, TDS (calc.)

OFFSITE - Pumpoff*

DWPF Fluids – pH, EC, Cl, Ca, Mg, Na, SAR, TDS (calc.) (Optional Microtox)
DWPR Receiving Soil – EC, Ca, Mg, Na, SAR, TDS, (calc.)

LAND Treatment Disposal Option – Drilling*

LTAF Fluids – EC, Ca, Mg, Na, SAR, Cl, S.G., T.E.H. (GC/FID for Hydrocarbons)
LTAW Waste – EC, Ca, Mg, Na, SAR, Cl, S.G., T.E.H.
LTAT Total Waste – EC, Ca, Mg, Na, SAR, Cl, S.G., T.E.H.
LTAS Post Soil – % Saturation, EC, Ca, Mg, Na, SAR, Cl, S.G., T.E.H.
O&G02 *Oil & Grease by Dean Stark (Optional)

* With every option it is stated that if there are additives or entrained materials suspected in the mud systems affecting the maximum loading rates or toxicity criteria, then the following additional tests may be required. All samples are tested “as received” unless otherwise noted by Guide 50.

MTX01	Microtox Bioassay – EC50+EC20 Test for Sump Liquids
TEH01	Total Extractable Hydrocarbons (C11-C30)(Single Value) including Chromatogram
TKN	Total Kjeldahl Nitrogen

*For all variations and aspects refer to *Guide 50, Drilling Waste Management, EUB, Oct 1996* Guide may be open for revision in 2008

Landspreading of Wastewater / Sludge onto Agricultural Land (per AENV.)

Access Code

DRY02	Drying, Grinding and Sieving
PS01	Particle Size Analysis (% Sand, Silt & Clay)
PH03	pH in CaCl ₂ (1:2) (<i>requires DRY02</i>)
N03	Nitrate Nitrogen (CaCl Extraction)
NH4	Ammonia Nitrogen (KCl Extraction)
TP	Total Phosphorus

Saskatchewan Guidelines (related Screens / Packages)

TEH05SK	Hydrocarbon screen (C11-C60) with silica gel (C11-C22; C22-C60) plus chromatogram
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Saskatchewan Road Application of Soil / Waste (Spigec, 1999)

Surface Application - Recommended Screens on Waste

O&G02	% Oil / Water /Solid
PH03	pH (in CaCl ₂ 1:2 Ratio) <i>requires DRY02</i>
SAL03	Oil Spill (includes Salt Spill): % Saturation, pH, EC, Ca, Mg, Na, K, Cl-, S04, SAR, TGR, % Oil (Methylene Chloride), N03+N02, Wettability (<i>requires DRY02</i>)
SASMET	Metals – Cd, Hg, Pb, Ni, Cu, Zn (<i>requires DIG03</i>)
OXE01	Extractable Organic Halides by neutron activation (EOX)
DENS	Bulk Density (Dry Soil)

Encapsulation - Utilize packages for Surface Application and add the following;

B	Hot Water Soluble Boron
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If the material is derived from existing or buried pits or flare pits, then include:

PCB	Polychlorinated Biphenyls in Waste (test is sublet)
PAH03	PolyAromatic hydrocarbons in an Oily Waste (5 targets)
BTX010	BTEX in Oily By-Product (Pit Waste)
TCPbHg	Leachable Lead and Mercury (includes preparation)
NAPL	Leachable Naphthalene (Roadway-Sask)

Gas Plants

GPE06	Gas Plant Effluent: pH, TSS, Odour, Total Sulfide, NH ₄ -N, Oil & Grease, COD
AMN02	Amine Screen in Water (see Appendix A)
GLY02	Glycol Screen in Water (see Appendix A)
SUF01	Sulfolane
S02	Total Sulphur

Process Water:

GPW07	COD, Oil & Grease, TSS, Sulfide, NH ₃ -N, TKN, pH
GPW08	COD, Oil & Grease, TSS, pH
GPW09	COD, TSS, Oil & Grease, pH

Sewage Sludge To Be Applied (1L required)

MOIS	Moisture Wet Weight
TN	Total Nitrogen
NH ₄	Ammonia Nitrogen (KCl)
M3050	EPA 3050 Metals in Soil/Sludge: Al, Sb, As, Ba, Be, Bi, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Li, K, Na, Mo, Ni, P, Se, Si, Ag, Sr, Tl, Sn, Ti, V, Zn, Mg & Hg
DIG03	Acid Digestion

Disposal of Oily By-Products to Roads (Alberta)

O&G02	% Oil +% Water + % Sediment by Dean Stark
SAL06O	pH, EC, Na, Cl (1:9 Water Ratio)
MOWD	Metals (Nitric Acid Digestion): Cd, Cu, Pb, Ni, V, Hg
PAH03	PolyAromatic Hydrocarbons in an Oily Waste (5 targets)
OXT01	Total Organic Halides – Oil / Solvents (Optional)
BTX01	BTEX in Oily By-Product (Pit Waste) (Optional)

Waste Characterization – Alberta

Hazardous Waste Characterization

Screens required to characterize a waste as hazardous or not as specified in the Waste Control Regulations (AR 192/96).

Access Code

Liquid:

FP01	Flashpoint
PCB	Polychlorinated Biphenyls (test will be sublet)
PH	pH
TIERW	Alberta Tier I: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Tl, V, Zn, Hg

Solid:

PH03	*PH (1:2 in CaCl ₂) (AB Tier I Criteria)
FP01	Flashpoint
HWCS	*Solvent Screen – Alberta Environment (Schedule 2 plus preparation)
PFT	Paint Filter Test (Optional)

Solid (as Leachate):

TCLZ	TCLP Leachate Preparation (Zero Headspace) (Organics)
TCLP	TCLP Leachate Preparation - Inorganics
TCCY	Leachable Cyanide (requires TCLP)
TCF	Leachable Fluoride (requires TCLP)
TCLM	TCLP Leachate Metals – Sb, As, Se, Hg, Ba, Be, B, Cd, Cr, Co, Cu, Fe, Pb, Ni, Ag, Tl, U, V, Zn, Zr (price includes preparation TCLP)
CR+6	Hexavalent Chromium (plus preparation) sublet
Hg	Mercury (plus preparation)
BTXL	Leachable BTEX (optional) (price includes preparation TCLZ)

*There is a range of parameters noted in Schedule 2 of the Act. Please contact the lab so that the most cost-effective services can be quoted.

Landfill Exclusion Assessment (Class 1A or 1B Facilities)

**Access
Code**

Liquid:

CYF	Free Cyanide
FP01	Flashpoint
LANDM	Metals Screen – As, Be, Cd, Cr ⁺⁶ , Pb, Hg, Ni, Se, Ag, Tl, U
PCB	Polychlorinated Biphenyls (test is sublet)
PH	pH
OXA	Adsorbable Organic Halides (test is sublet)

Solid:

OXE	Extractable Organic Halides (test is sublet)
FP01	Flashpoint
PCB	Polychlorinated Biphenyls (test is sublet)
LANDM	Metals Screen – As, Be, Cd, Cr ⁺⁶ , Pb, Hg, Ni, Se, Ag, Tl, U (<i>Requires DIG03</i>)
TCLZ	TCLP Leachate Preparation (Zero Headspace) (Organics)
PH02	pH in Soil (1:1 in water)

Technical Aid Rates

CONS01	Technologist (per hour)
CONS02	Senior Technologist (per hour)
CONS03	Senior Chemist (per hour)
TRAV	Vehicle charge (per kilometre)
CLER	Clerical Services (per hour)

Definitions

Volatiles and Non-Volatiles (See Appendix A)

To perform a proper, thorough assessment of hydrocarbon contamination, both volatile and non-volatile components should be analyzed. The volatiles proportion contains compounds, which are both toxic and highly mobile. The higher carbon number fraction (non-volatiles) assessment is necessary for product identification and is typically the limiting factor in hydrocarbon contaminated site remediation sites.

The BTEX components are Benzene, Toluene, Ethylbenzene and Xylene (forms ortho, meta & para). The purgeable component hydrocarbon fraction includes light aromatic hydrocarbons including BTEX and all other purgeable hydrocarbons up to C10. This is assessed using EPA Method 5030 (Purge & Trap) with GC/MS assessment (EPA Method 8260). The extractable hydrocarbons can range from C8-C30+ depending on the site. If the contaminant hydrocarbon range exceeds C30, two alternative tests are available: a C11-C60 carbon assessment or a mineral oil & grease. Also, the new CCME Method can be used (4 fractions C5-C50).

PolyAromatic Hydrocarbons (See Appendix A)

PAHs, as a group, are comprised of complex lipophilic hydrocarbons, which are made up of a series linked aromatic ring. Currently, regulatory authorities assess up to 22 specific (target) compounds using EPA Method 8270 (GC/MS). In 2007, Alberta Tier 1 guidelines underwent the last of several revisions. The final list consists of 8 non-carcinogenic and 8 carcinogenic PAHs. Their respective limits are assessed either through a summarized benzo(a)pyrene carcinogenic equivalents (B(a)p eq) and/or by an I.A.R.C. () factor. Refer to Alta Env – Tier 1/Tier 2 regulations, July, 2007.

Volatile Organic Compounds (See Appendix A)

These compounds are commonly found in organic solvents and are of concern due to their low boiling points, large use, high toxicity and high degree of halogenation. Some of the VOC's participate in atmospheric reactions that have been attributed to the formation of photochemical smog. This is assessed using EPA method 5030 (Purge & Trap) with GC/MS assessment (EPA Method 8260).

Trihalomethanes

THMs are found in many chlorinated water supplies and some of which are industrial effluents or as a result of the water chlorination process. Halomethanes such as chloroform have been shown to cause adverse effects to the environment. The components in this screen include: bromoform, chloroform, bromodichloromethane, and dibromochloromethane. This is assessed using EPA Method 5030 (Purge & Trap) with GC/MS assessment (EPA Method 8260).

Alcohols

These compounds can be found in industrial, medical, domestic cleaning products as well as in food. They are very soluble and can present a hazard to human health and the environment. Alcohols such as methanol are widely used and released in the oil/gas upstream industry as it is extensively used as a hydrate, moisture control and hydrostatic agent. The target compounds in this analysis are: methanol, ethanol, iso-propanol, butanol and pentanol. The assessment is performed with a gas chromatograph with a FID (Flame Ionization Detector).

Glycols and Amines (water soluble and non-volatile)

They are commonly used in coolant systems and industrial feed stocks. In the upstream gas industry, it is used as water and sulphur removal systems in gas processing facilities. Compounds of interest in this screen include: propylene, ethylene, diethylene, triethylene, and tetraethylene glycols. The amine screen includes such alkanolamines as ethanolamine, diisopropanolamine, diethanolamine, and triethanolamine. The assessment is performed with as gas chromatograph with a FID (Flame Ionization Detector).

Chlorinated and Non-Chlorinated Phenols (by-products or products of industrial manufacturing).

Include wood preservatives, agrochemical and medical products as well as cleaning agents.

Qualitative Scans (non-target by GC/MS).

Results matched to library spectra followed by interpretation.

Inorganic - Soil

Sample Preparation

Most soil samples require drying, grinding and sieving (2 millimeter) before being analyzed to ensure homogeneity and thus a representative sample.

Physical Analysis

To determine the suitability of a material for a specific purpose such as reclamation, containment, land treatment and landscaping, a physical analysis is done on the sample. This includes texture and water retention characteristics.

Salinity

Commonly used to assess damage caused by salt water spills. The sample is prepared using a saturated paste extraction (water added to dried, ground soil and filtered prior to analysis).

Calculations

$$\text{TGR} = 0.00335 \times a^2 \left\{ \left(\frac{1}{b^2} \right) - \left(\frac{1}{c^2} \right) \right\} \times \% \text{ saturation}$$

c = actual site Sodium Adsorption Ratio

% Oil

Methylene Chloride extraction is mostly used for heavy crude oil spills or for oil spills where most of the volatile components have evaporated. The sample is dried and ground before analysis.

Inductively Coupled Plasma (ICP):

ICP Is used in the sequential determination of trace elements in solution. This, coupled with an Ultrasonic Nebulizer, enables Access Labs to achieve instrument detection limits in the low parts per billion levels.

Appendix A – Target Lists

See Definitions for Trihalomethanes, Alcohols, Amines and Glycols Target Lists

EPA 8260	EPA 8260	EPA 624	PAH Screens
Acetone	2-hexanone	Benzene	Naphthalene ^{1 3 4}
Acetonitrile	Hexachlorobutadiene	Bromodichloromethane	Acenaphthylene ⁴
Acrylonitrile	Hexachloroethane	Bromoform	Acenaphthene ⁴
Allyl Chloride	p-isopropyltoluene	Bromomethane	Fluorene ⁴
Benzene	Methacrylonitrile	Carbon tetrachloride	Phenanthrene ^{1 3 4}
Bromobenzene	Methylene chloride	Chlorobenzene	Anthracene ⁴
Bromochloromethane	Methyl methacrylate	Chloroethane	Fluoranthene ^{3 4}
Bromodichloromethane	4-methyl-2-pentanone (MIBK)	2-chloroethylvinyl ether	Pyrene ^{1 3 4}
Bromoform	Naphthalene	Chloroform	Benzo(a)anthracene ^{1 2 3 4}
Bromomethane	Pentachloroethane	Chloromethane	Chrysene ^{2 4}
2-butanone (MEK)	Propionitrile	Dibromochloromethane	Benzo(b)fluoranthene ^{2 3 4}
n-butylbenzene	Iso-propylbenzene	1,2-dichlorobenzene	Benzo(k)fluoranthene ^{2 3 4}
Sec-butylbenzene	n-propylbenzene	1,3-dichlorobenzene	Benzo(a)pyrene ^{1 2 3 4}
Tert-butylbenzene	Stryene	1,4-dichlorobenzene	Dibenzo(a,h)anthracene ^{2 3 4}
Carbon Disulphide	1,1,1,2-tetrachloroethane	1,1,-dichloroethane	Benzo(ghi)perylene ⁴
Carbon tetrachloride	1,1,2,2-tetrachloroethane	1,2-dichloroethane	Indeno(1,2,3-cd)pyrene ^{2 3 4}
Chlorobenzene	Tetrachloroethene	1,1-dichloroethene	Benzo(j)fluoranthene ^{2 4}
Chloroethane	Toluene	Cis1,2-dichloroethene	2-methyl-Naphthalene
Chloroform	1,2,3-trichlorobenzene	Tran1,2-dichloroethene	Acridine
Chloromethane	1,2,4-trichlorobenzene	1,2-dichloropropane	Perylene
2-chlorotoluene	1,1,1-trichloroethane	Cis1,3-dichloropropene	Quinoline
4-chlorotoluene	1,1,2-trichloroethane	Tran1,3-dichloropropene	
Dibromochloromethane	Trichloroethene	Ethylbenzene	Alcohols
1,2-dibromo-3-chloropropane	Trichlorofluoromethane	Methylene choride	Methanol
1,2-dibromoethane	1,2,3-trichloropropane	1,1,2,2-tetrachloroethane	Ethanol
Dibromomethane	1,2,4-trimethylbenzene	Tetrachloroethene	Iso-Propanol
Cis1,4-dichloro-2-butene	1,3,5-trimethylbenzene	Toluene	Propanol
Tran1,4-dichloro-2-butene	Vinyl chloride	1,1,1,-trichloroethane	Butanol
1,2-dichlorobenzene	Total xylenes	1,1,2-trichloroethane	Pentanol
1,3-dichlorobenzene		Trichloroethene	
1,4-dichlorobenzene	Trihalomethanes	Trichlorofluoromethane	Glycols
1,1-dichloroethane	Chloroform	Vinyl chloride	Ethylene Glycol
1,2-dichloroethane	Bromodichloromethane	Total Xylenes	Propylene Glycol
1,1-dichloroethene	Dibromochloromethane		Diethylene Glycol
Cis1,2-dichloroethene	Bromoform	Amines	Triethylene Glycol
Tran1,2-dichloroethene		MonoEthanolamine	Tetraethylene Glycol
Dichlorodifluoromethane		Diethanolamine	
1,2-dichloropropane		Triethanolamine	
1,3-dichloropropane		Diisopropylamine	
2,2-dichloropropane		Methyl-diethanolamine	
1,1-dichloropropene			
Cis1,3-dichloropropene			
Tran1,3-dichloropropene			
Ethylbenzene			
Ethyl methacrylate			

¹ PAHs in Oily Waste Regulations – AB Env 1999

² PAHs – Alta Soil/Water Quality Guide for Upstream Oil & Gas, June, 2001

³ PAHs – CCME PHC PAH List for subtraction, if required – June 2001

⁴ PAHs - Polyaromatic Hydrocarbons (as per Tier 1 July 2007) with B(a)p toxic equivalents plus IARC

Appendix B-2 (Alta Env. 2007)

*Alberta Tier 1 Soil and Groundwater Remediation Guideline Examples (please refer to Alta Env. Tier 1 Guide 2007 for a complete data set)

	Soil:		Groundwater:	
	Fine mg/kg	Coarse mg/kg	Fine mg/L	Coarse mg/L
Units				
General and Inorganic Parameters				
pH (in 0.01M CaCl ₂)	6 - 8.5	6 - 8.5	-	-
pH	-	-	6.5 - 8.5	6.5 - 8.5
Ammonia	-	-	see note 1	see note 1
Chloride	-	-	100	100
Cyanide	-	-	0.005	0.005
Cyanide (free)	0.9	0.9	-	-
Fluoride	200	200	0.12	0.12
Nitrate	-	-	13	13
Nitrate + Nitrite (as nitrogen)	-	-	100	100
Nitrite (as nitrogen)	-	-	0.06	0.06
Sodium	-	-	200	200
Sulphate	-	-	500	500
Sulphide (as H ₂ S)	-	-	0.002	0.002
Sulphur (elemental)	500	500	-	-
Total Dissolved Solids (TDS)	-	-	500	500
Metals				
Aluminium	-	-	see note 2	see note 2
Antimony	20	20	0.006	0.006
Arsenic	-	-	0.005	0.005
Arsenic (inorganic)	17	17	-	-
Barium	750	750	1	1
Barite-barium	3200	3200	-	-
Beryllium	5	5	-	-
Boron	-	-	0.5	0.5
Boron (hot water soluble)	2	2	-	-
Bromate	-	-	0.01	0.01
Cadmium	1.4	1.4	see note 2	see note 2
Chromium	-	-	see note 2	see note 2
Chromium (hexavalent)	0.4	0.4	-	-
Chromium (total)	64	64	-	-
Cobalt	20	20	-	-
Copper	63	63	see note 2	see note 2
Iron	-	-	0.3	0.3
Lead	70	70	see note 2	see note 2
Manganese	-	-	0.05	0.05

Alberta Tier 1 Soil and Groundwater Remediation Guidelines

Units	Soil:		Groundwater:	
	Fine mg/kg	Coarse mg/kg	Fine mg/L	Coarse mg/L
Metals continued				
Mercury	-	-	see note 2	see note 2
Mercury (inorganic)	6.6	6.6	-	-
Molybdenum	4	4	-	-
Nickel	50	50	see note 2	see note 2
Selenium	1	1	0.001	0.001
Silver	20	20	see note 2	see note 2
Thallium	1	1	-	-
Tin	5	5	-	-
Uranium	23	23	0.01	0.01
Vanadium	130	130	-	-
Zinc	200	200	0.03	0.03
Hydrocarbons				
Benzene	0.046	0.073	0.005	0.005
Toluene	0.52	0.49	0.024	0.024
Ethylbenzene	0.11	0.21	0.0024	0.0024
Xylenes	15	12	0.3	0.3
Styrene	0.68	0.80	0.072	0.072
F1	210	24	2.2	0.81
F2	150	130	1.1	1.1
F3	1300	300	-	-
F4	5600	2800	-	-
Acenaphthene	0.32	0.38	0.0058	0.0058
Acenaphthylene	5.0	6.0	0.046	0.046
Anthracene	0.0046	0.0056	0.000012	0.000012
Fluoranthene	0.032	0.39	0.00004	0.00004
Fluorene	0.29	0.34	0.003	0.003
Naphthalene	0.016	0.018	0.0011	0.0011
Phenanthrene	0.051	0.061	0.0004	0.0004
Pyrene	0.034	0.040	0.000025	0.000025
Carcinogenic PAHs	IARC<1.0	5.3;IARC<1.0	-	-
Carcinogenic PAHs (as B(a)P TPE)	-	-	0.00001	0.00001
Benz[a]anthracene	0.070	0.083	0.000018	0.000018
Benzo[b+j]fluoranthene	6.2	6.2	0.00048	0.00048
Benzo[k]fluoranthene	6.2	6.2	0.00048	0.00048
Benzo[g,h,i]perylene	-	-	0.00021	0.00017
Benzo[a]pyrene	0.60	0.60	0.000017	0.000015
Chrysene	6.2	6.2	0.0014	0.0014
Dibenz[a,h]anthracene	7.4	8.4	0.00028	0.00026
Ideno[1,2,3-c,d]pyrene	-	-	0.00023	0.00021

Alberta Tier 1 Soil and Groundwater Remediation Guidelines

Units	Soil:		Groundwater:	
	Fine mg/kg	Coarse mg/kg	Fine mg/L	Coarse mg/L
Halogenated Aliphatics				
Vinyl chloride	0.0083	0.00034	0.002	0.0011
1,1-Dichloroethene	0.15	0.021	0.014	0.014
Trichloroethene (Trichloroethylene, TCE)	0.054	0.012	0.005	0.005
Tetrachloroethene (Tetrachloroethylene, Perchloroethylene, PCE)	0.69	0.16	0.03	0.03
1,2-Dichloroethane	0.0062	0.0027	0.005	0.005
Dichloromethane (Methyl chloride)	0.052	0.048	-	-
Dichloromethane (Methylene chloride)	-	-	0.05	0.05
Trichloromethane (Chloroform)	0.0029	0.0010	0.0018	0.0018
Tetrachloromethane (Carbon tetrachloride)	0.013	0.00056	0.005	0.00056
Dibromochloromethane	0.12	0.12	0.1	0.1
Chlorinated Aromatics				
Chlorobenzene	0.39	0.018	0.0013	0.0013
1,2-Dichlorobenzene	0.097	0.18	0.0007	0.0007
1,4-Dichlorobenzene	0.051	0.098	0.001	0.001
1,2,3-Trichlorobenzene	0.26	0.26	0.008	0.008
1,2,4-Trichlorobenzene	0.78	0.23	0.015	0.015
1,3,5-Trichlorobenzene	1.9	0.13	0.014	0.014
1,2,3,4-Tetrachlorobenzene	0.042	0.050	0.0018	0.0018
1,2,3,5-Tetrachlorobenzene	0.37	0.10	0.0038	0.0038
1,2,4,5-Tetrachlorobenzene	0.19	0.052	0.002	0.002
Pentachlorobenzene	3.7	4.5	0.006	0.006
Hexachlorobenzene	0.80	0.50	0.00052	0.00052
2,4-Dichlorophenol	0.0029	0.0034	0.0002	0.0002
2,4,6-Trichlorophenol	0.19	0.37	0.002	0.002
2,3,4,6-Tetrachlorophenol	0.039	0.047	0.001	0.001
Pentachlorophenol	0.024	0.029	0.0005	0.0005
Dioxin & Furans	0.000004	0.000004	0.00000012	0.00000012
PCBs	1.3	1.3	0.0094	0.0094
Pesticides				
Aldicarb	0.012	0.012	0.001	0.001
Aldrin	3.4	3.4	-	-
Aldrin and dieldrin	-	-	0.0007	0.0007
Atrazine and metabolites	0.0088	0.010	0.0018	0.0018
Azniphos-methyl	0.41	0.75	0.00001	0.00001
Bendiocarb	0.14	0.21	0.04	0.04
Bromoxynil	0.044	0.052	0.00033	0.00033
Carbaryl	1.9	3.6	0.0002	0.0002
Carbofuran	0.082	0.089	0.0018	0.0018

Alberta Tier 1 Soil and Groundwater Remediation Guidelines

Units	Soil:		Groundwater:	
	Fine mg/kg	Coarse mg/kg	Fine mg/L	Coarse mg/L
Chlorothalonil	0.0084	0.010	0.00018	0.00018
Chloropyrifos	3.2	3.8	0.0000035	0.0000035
Cyanazine	0.029	0.032	0.0005	0.0005
2,4-D	0.10	0.10	0.004	0.004
DDT	0.015	0.018	0.000001	0.000001
Diazinon	2.2	4.2	0.02	0.02
Dicamba	0.12	0.12	0.000006	0.000006
Dichlofop-methyl	0.059	0.071	0.00018	0.00018
Dieldrin	0.011	0.014	0.000056	0.000056
Dimethoate	0.0028	0.0027	0.003	0.003
Dinoseb	1.1	1.3	0.00005	0.00005
Diquat	11	21	0.07	0.07
Diuron	1.9	3.5	0.15	0.15
Endosulfan	0.0085	0.010	0.00002	0.00002
Endrin	0.0075	0.0090	0.000036	0.000036
Pesticides continued				
Glyphosate	0.054	0.049	0.065	0.065
Heptachlor epoxide	0.039	0.010	0.0000038	0.0000038
Lindane	0.11	0.13	0.00001	0.00001
Linuron	0.051	0.059	0.000071	0.000071
Malathion	0.82	1.3	0.0001	0.0001
MCPA	0.020	0.025	0.000025	0.000025
Methoxychlor	0.046	0.056	0.00003	0.00003
Metolachlor	0.048	0.055	0.0078	0.0078
Metribuzin	0.012	0.014	0.0005	0.0005
Paraquat (as dichloride)	1.1	2.2	0.01	0.01
Parathion	7.2	14	0.000013	0.000013
Phorate	0.075	0.14	0.002	0.002
Picloram	0.024	0.022	0.029	0.029
Simazine	0.033	0.038	0.0005	0.0005
Tebuthiuron	0.12	0.11	0.00027	0.00027
Terbufos	0.080	0.15	0.001	0.001
Toxaphene	3.3	4.8	0.0000002	0.0000002
Triallate	0.0077	0.0092	0.00024	0.00024
Trifluarin	0.038	0.045	0.0002	0.0002
Other Organics				
Aniline	0.36	0.60	0.0022	0.0022
Bis(2-ethyl-hexyl)phthalate	34	41	0.016	0.016
Dibutyl phthalate	0.54	0.65	0.019	0.019
Dichlorobenzidine	4.2	8.1	0.007	0.007

Alberta Tier 1 Soil and Groundwater Remediation Guidelines

Units	Soil:		Groundwater:	
	Fine mg/kg	Coarse mg/kg	Fine mg/L	Coarse mg/L
Diisopropanolamine	14	17	1.6	1.6
Ethylene glycol	60	62	31	31
Hexachlorobutadiene	0.026	0.0067	0.0013	0.0013
Methylmethacrylate	1.3	0.10	0.47	0.47
MTBE	0.044	0.046	0.015	0.015
Nitrilothriacetic acid	-	-	0.4	0.4
Nonylphenol + ethoxylates	2.7	3.3	0.001	0.001
Phenol	0.0014	0.012	0.002	0.002
Sulfalane	0.18	0.18	0.09	0.09
Trihalomethanes - total (THMs)	-	-	0.1	0.1

*Please note that table contents may be changed with notification

Containers and Preservatives - Organics

Water

Volatile Organics	Sample Amount	Container	Holding Time	Preservative
EPA 8240/8260/624	3 x 40 mL	EPA Septum Vials	14 days	*4°C, No Headspace
Trihalomethanes	3 x 40 mL	EPA Septum Vials	14 days	*4°C, No Headspace
BTEX and/or Purgeable Hydrocarbons	3 x 40 mL	EPA Septum Vials	14 days	*4°C, No Headspace

Note*: Some jurisdictions recommend Sodium Thiosulphate preservation, especially with chlorinated water sources.

Semi-Volatile Organics	Sample Amount	Container	Holding Time	Preservative
Extractable Hydrocarbon Sources	1000 mL	PreCleaned Glass with Teflon Lids	7 Days	4°C
PolyAromatic Hydrocarbons (PAHs)	1000 mL	PreCleaned Glass with Teflon Lids	7 Days	4°C
Priority Pollutants EPA Screen (EPA 8270/625)	2000 mL	PreCleaned Glass with Teflon Lids	7 Days	4°C
Pesticide/Herbicides (per screen)	1000 mL	PreCleaned Glass with Teflon Lids	14 Days	4°C
Chlorophenols	1000 mL	PreCleaned Glass with Teflon Lids	7 Days	4°C
Amines / Glycols	3 x 40 mL	EPA Septum Vials	7 Days	4°C

Soil / Sediment

Volatile Organics	Sample Amount	Container	Holding Time	Preservative
BTEX, Purgeables or EPA 8260 Screen	50 g	PreCleaned Glass	14 Days	*4°C (no headspace)

Semi-Volatile Organics	Sample Amount	Container	Holding Time	Preservative
Extractable Hydrocarbons and/or Oil & Grease (gravimetric)	100 g	PreCleaned Glass	14 Days	4°C
Other Screens PAHs, Chlorophenols, PCBs, Pesticides/Herbicides, Amines & Glycols	100 g	PreCleaned Glass	14 Days	4°C

Note*: All samples should be kept cool and in the dark, but **should not be frozen**.

Containers and Preservatives – Inorganics

Routine Water Tests	Sample Amt (mLs)	Container	Holding Time	Preservative
Alkalinity	100	Plastic	14 Days	4°C
pH	50	Plastic	ASAP	4°C
Anions (Cl, SO ₄ , F)	100	Plastic	28 Days	4°C
Total Dissolved Solids	100	Plastic	7 Days	4°C
Total Suspended Solids	200	Plastic	7 Days	4°C
Turbidity	100	Plastic	1-2 Days	4°C
Nitrate (NO ₃)	50	Plastic	28 Days	2ml 25% Sulphuric Acid
Ammonia Nitrogen (NH ₄)	20	Plastic	28 Days	2ml 25% Sulphuric Acid
Nitrate-Nitrite (NO ₃ -NO ₂)	50	Plastic	28 Days	2ml 25% Sulphuric Acid
Total Kjeldahl Nitrogen (TKN)	100	Plastic	28 Days	2ml 25% Sulphuric Acid
Total Phosphorus (TP)	50	Plastic	28 Days	2ml 25% Sulphuric Acid
Biochemical Oxygen Demand (BOD) (5 day)	250	Plastic	24 Hours	4°C
Chemical Oxygen Demand (COD)	500	Plastic	28 Days	1ml 25% Sulphuric Acid
Total Organic Carbon (TOC)	100	Plastic	28 Days	2ml 25% Sulphuric Acid
Dissolved Organic Carbon	50	Plastic	28 Days	Routine (4°C)

Specialty Tests – Routine

Cyanide	500	Plastic	14 Days	6 mL NaOH
Phenols	500	Glass	28 Days	50% Sulphuric Acid
Colour	200	Plastic	7 Days	4°C
Hexavalent Chromium (Cr+6)	250	Plastic	24 Hours	4°C
Tannins & Lignins (T&L)	200	Plastic	7 Days	4°C
Odour	200	Plastic	7 Days	4°C

Metals Screens

Metals by ICP	600	Precleaned Plastic	90 Days	5 mL 20% Nitric Acid
Mercury	30	Precleaned Plastic	28 Days	5 mL 20% Nitric Acid
Hydride (Se, As or Se)	50	Precleaned Plastic	90 Days	5 mL 20% Nitric Acid

Microbiological

Coliforms, Total & E.Coli, Fecal, Sulfur Reducing & Iron Bacteria	200	Sterile Plastic	24-48 Hours	Sterile (sodium thiosulphate if chlorinated)
Microtox	200	Precleaned glass	48-72 hours	none

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