RADIOCHEMISTRY
List of Acronyms

A	*Standard Methods*	*NERHL*	*North Eastern Health Radiological Laboratory*
ASTM	*American Society for Testing & Materials*	*NORM*	*Naturally Occurring Radioactive Materials*
E or EPA	*US Environmental Protection Agency*	*SW*	*Solid Waste – 846*
HNO_3	*Nitric Acid*	*TSP*	*Total Suspended Particulate*
LAACC	*Large Area Activated Charcoal Canister*	*USNRC*	*U.S. Nuclear Regulatory Commission*
HASL	*Health and Safety Laboratory*		

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1. MATRIX DIGESTIONS – Prior to analysis

MATRIX	PREPARATION TECHNIQUE	AMOUNT OF SAMPLE REQUIRED
Drinking Water	HNO_3 to pH <2	1000 mL plastic
Drinking Water – ^{222}Radon	None Required	40 mL VOA vial – no headspace
Mine and Process Water – Soluble Constituents	Filtration, HNO_3 to pH <2	2000 mL plastic
Mine and Process Water – Total Constituents	HNO3 to pH <2	2000 mL plastic
Solids – Core, Sediments, Sludges, Soils, Rock	Acid Digestion	100 g
Vegetation – USNRC Guidelines	Ashing, Acid Digestion	20 Kg
Biomass – USNRC Guidelines	Ashing, Acid Digestion	20 Kg
Air Filters	Acid Leaching	Filter sample and blank filter
Oils	Acid Leaching	100 g
Gamma Sample Preparation	Drying, Pulverizing and Canning	500 g

2. RADIOCHEMICAL ANALYSES – Drinking Water

ANALYSIS	METHOD	Drinking Water MCL	MIN. REQUIRED REPORTING LIMIT	UNITS
Gamma Emitting Radionuclides	E901.1	NA	dependent on sample size	pCi/L
Gross Alpha and Beta Radioactivity	E900.0	15/50 (see note)	3.0/4.0	pCi/L
Gross Radium Alpha (minus Radon & Uranium)	E900.1	15	3.0	pCi/L
^{226} Radium (Alpha Emitting Isotopes)	E903.0	5.0 (see note)	1.0	pCi/L
^{228} Radium	RA-05	5.0 (see note)	1.0	pCi/L
^{222} Radon	ASTM D5072-92	NA	100	pCi/L
Radioactive Strontium	E905.0	NA (see note)	2.0	pCi/L
Tritium	E906.0	NA (see note)	1000	pCi/L
Isotopic Uranium (^{234}U, ^{235}U, ^{238}U)	E908.0	NA	0.67	pCi/L
Uranium	E200.8	30	1	ug/L

Sample Location: Entry point to distribution

Notes:
Gross Beta Activity MCL = 4 mRem/year ~ = 50 pCi/L. Regulation specifies monitoring for vulnerable systems.
The Radium MCL is for a combined Radium 226+Radium 228 = 5.0 pCi/L.

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3. RADIOCHEMICAL ANALYSES - Applicable to most matrices listed above (after digestion) Reporting Limits are matrix dependent

ANALYSIS	METHOD	MIN. REQUIRED REPORTING LIMIT	UNITS
Gamma Emitting Radionuclides	E901.1	dependent on sample size	pCi/L
Gross Alpha and Beta Radioactivity	E900.0	1.0/2.0	pCi/L
Gross Radium Alpha (minus Radon & Uranium)	E900.1	1.0	pCi/L
^{210} Lead	E909.0	1.0	pCi/L
^{210} Polonium	HASL-300 Po-02-RC	1.0	pCi/L
^{40} Potassium	E901.1	dependent on sample size	pCi/L
^{226} Radium (Alpha Emitting Isotopes)	E903.0	0.2	pCi/L
^{228} Radium	RA-05	1.0	pCi/L
^{222} Radon	ASTM D5072-92	100	pCi/L
Radioactive Strontium	E905.0	10	pCi/L
Isotopic Thorium (^{228}Th, ^{230}Th, ^{232}Th)	E908.0	0.2 per Isotope	pCi/L
^{230} Thorium	E908.0	0.2	pCi/L
^{232} Thorium	E200.8/SW 6020	1.0	pCi/L
Tritium	E906.0	1200	pCi/L
Isotopic Uranium (^{234}U, ^{235}U, ^{238}U)	A7500-U-C	0.2 per Isotope	pCi/L
Uranium, natural	E200.8/SW 6020	0.2	pCi/L
Uranium, natural – low level	E200.8/SW 6020	-	pCi/L

4. BIOASSAY - Uranium and other radionuclides in urine per USNRC Guideline 8.22.

ANALYSIS	REQUIRED VOLUME, mL	QC REQUIRED	MIN. REQUIRED REPORTING LIMIT	UNITS
Isotopic Uranium	1000 plastic	client specific	0.1	pCi/L
Uranium	100 plastic	25%	5.0	µg/L

5. Closed can gamma by Radium 226 converted to U_3O_8

ANALYSIS	METHOD	MIN. REQUIRED VOLUME, GMS	QC REQUIRED	MIN. REQUIRED REPORTING LIMIT	UNITS
U3O8	901.1	200	Duplicates & LCS	60	mg/kg-dry[1]
Uranium	901.1	200	Duplicates & LCS	50	mg/kg-dry[1]
Prep, if required, drying, pulverizing and canning.					

1. Uranium data is reported using assumed secular equilibrium with the measured analyte.

6. RADIOLOGICAL FIELD SERVICES

SERVICE
Radon - inside air by charcoal canister method (Ramses II Detector)
Consulting Radiation Safety Officer – USNRC Accepted
Surface Gamma Surveys - baseline, decontamination and decommissioning, process operations
Air Quality Sampling - TSP, High Volume Air Sampling
Equipment Decontamination and Release Surveys
Emanation Coefficient
Naturally Occurring Radioactive Materials (NORM) Surveys – oilfield related
Large Area Activated Charcoal Canister (LAACC) Tailings Surveys - Radon Flux by Method E115
Indoor Radon and Radon Progeny Measurements – Single or Multiple Site
Custom Radiation Safety Courses - mining, milling, and reclamation projects