

Appendix 10: Geochemistry – Stream Sediment & Silt Samples

Laboratory methodology

MS Excel stream sample database

Laboratory assay certificates

MS Excel results from laboratory (digital only)

QC results from laboratory (digital only)

Maps

SAMPLE PREPARATION PACKAGE

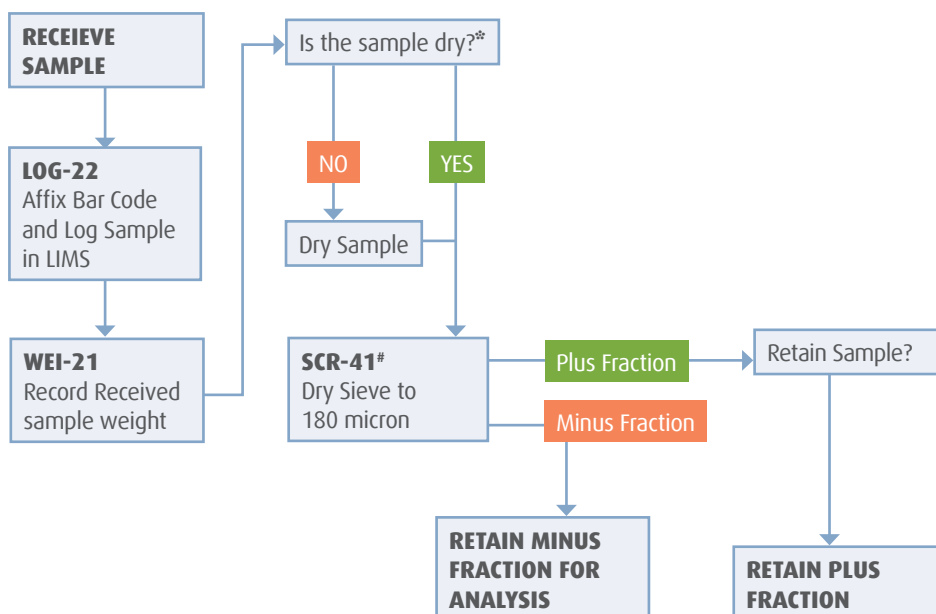
PREP- 41

STANDARD PREPARATION: DRY SAMPLE AND DRY- SIEVE TO -180 MICRON

Sample preparation is the most critical step in the entire laboratory operation. The purpose of preparation is to produce a homogeneous analytical sub-sample that is fully representative of the material submitted to the laboratory. An entire sample is dried and then dry-sieved using a 180 micron (Tyler 80 mesh) screen. The plus fraction is retained unless disposal is requested. This method is appropriate for soil or sediment samples up to 1 kg in weight.

METHOD CODE	DESCRIPTION
LOG-22	Sample is logged in tracking system and a bar code label is attached.
DRY-22	Low temperature drying of excessively wet samples where the oven temperature is not to exceed 60°C. This method is suitable for more soil and sediment samples that are analyzed for volatile elements.
SCR-41	Sample is dry-sieved to - 180 micron and both the plus and minus fractions are retained.

SAMPLE PREPARATION FLOWCHART PACKAGE –PREP- 41



*If samples air-dry overnight, no charge to client. If samples are excessively wet, the sample should be dried to a maximum of 120°C. **(DRY-21)**

#The plus fraction is the material remaining on the screen. The minus fraction is the material passing through the screen.

†The plus fraction is retained unless disposal is requested.

GEOCHEMICAL PROCEDURE

ME- MS41

ULTRA- TRACE LEVEL METHODS USING ICP- MS AND ICP- AES

SAMPLE DECOMPOSITION

Aqua Regia Digestion (GEO-AR01)

ANALYTICAL METHOD

Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES)

Inductively Coupled Plasma - Mass Spectrometry (ICP-MS)

A prepared sample (0.50 g) is digested with aqua regia in a graphite heating block. After cooling, the resulting solution is diluted to with deionized water, mixed and analyzed by inductively coupled plasma-atomic emission spectrometry. Following this analysis, the results are reviewed for high concentrations of bismuth, mercury, molybdenum, ment spectral interferences.

ELEMENT	SYMBOL	UNITS	LOWER LIMIT	UPPER LIMIT
Silver	Ag	ppm	0.01	100
Aluminum	Al	%	0.01	25
Arsenic	As	ppm	0.1	10 000
Gold	Au	ppm	0.2	25
Boron	B	ppm	10	10 000
Barium	Ba	ppm	10	10 000
Beryllium	Be	ppm	0.05	1 000
Bismuth	Bi	ppm	0.01	10 000
Calcium	Ca	%	0.01	25
Cadmium	Cd	ppm	0.01	1 000
Cerium	Ce	ppm	0.02	500
Cobalt	Co	ppm	0.1	10 000
Chromium	Cr	ppm	1	10 000
Cesium	Cs	ppm	0.05	500
Copper	Cu	ppm	0.2	10 000
Iron	Fe	%	0.01	50
Gallium	Ga	ppm	0.05	10 000
Germanium	Ge	ppm	0.05	500
Hafnium	Hf	ppm	0.02	500

ME- MS41

ELEMENT	SYMBOL	UNITS	LOWER LIMIT	UPPER LIMIT
Mercury	Hg	ppm	0.01	10 000
Indium	In	ppm	0.005	500
Potassium	K	%	0.01	10
Lanthanum	La	ppm	0.2	10 000
Lithium	Li	ppm	0.1	10 000
Magnesium	Mg	%	0.01	25
Manganese	Mn	ppm	5	50 000
Molybdenum	Mo	ppm	0.05	10 000
Sodium	Na	%	0.01	10
Niobium	Nb	ppm	0.05	500
Nickel	Ni	ppm	0.2	10 000
Phosphorus	P	ppm	10	10 000
Lead	Pb	ppm	0.2	10 000
Rubidium	Rb	ppm	0.1	10 000
Rhenium	Re	ppm	0.001	50
Sulphur	S	%	0.01	10
Antimony	Sb	ppm	0.05	10 000
Scandium	Sc	ppm	0.1	10 000
Selenium	Se	ppm	0.2	1 000
Tin	Sn	ppm	0.2	500
Strontium	Sr	ppm	0.2	10 000
Tantalum	Ta	ppm	0.01	500
Tellurium	Te	ppm	0.01	500
Thorium	Th	ppm	0.2	10000
Titanium	Ti	%	0.005	10
Thallium	Tl	ppm	0.02	10 000
Uranium	U	ppm	0.05	10 000
Vanadium	V	ppm	1	10 000
Tungsten	W	ppm	0.05	10 000
Yttrium	Y	ppm	0.05	500
Zinc	Zn	ppm	2	10 000
Zirconium	Zr	ppm	0.5	500

NOTE: In the majority of geological matrices, data reported from an aqua regia leach should be considered as representing only the leachable portion of the particular analyte.

SAMPLE #	TYPE	CREEK	map easting	map northing	ELEVATION	date sampled	sampler	ANGULARITY	COLOUR	GRAVEL%	SAND%	SILT%	CLAY%	ORGANICS%	ASPECT	SLOPE ANGLE	STREAM FLOW	VEGETATION	PHOTO	COMMENTS	CERTIFICATE
SSD1	STREAM SED	TECH GULCH	574641	6816077	1352	AUG 13/13	DEB, WINSTON	SA AND A	DARK GREY	70	20	5	2	3	N	MOD	FAST	WILLOW>FIREWEED >DWARF BIRCH>ALPINE	?	ROCKS IN CREEK MOSTLY BASALT, LESSER LIMESTONE AND SEDS. REMAINS OF OLD ROAD BESIDE CREEK	WH13150727
M896801	STREAM SED		573662	6816798	1290	AUG 13/13	DEB, WINSTON	SA	GREY	70	10	7	3	10	N	MOD	DRY	ALDER>>WILLOW	YES	DRY, INTERMITTENT CREEK ON ALLUVIAL FAN	WH13150727
M896802	STREAM SED		573461	6817046	1213	AUG 17/13	DEB, WINSTON, CODY	SA	DARK GREY	50	30	10	5	5	N	GENTLE TO MOD	MOD	WILLOW, DWARF BIRCH, GRASS, A FEW SPRUCE, FIREWEED, BIG OVAL	YES	UPSTREAM FROM PLACER ALONG ARCH CREEK.	WH13150727
M896803	STREAM SED	TRIB TO ARCH	573051	6817343	1203	AUG 17/13	DEB, WINSTON, CODY	SA	DARK GREY BROWN	65	20	10	2	3	N	MOD	DRY	WILLOW, ALDER, POPLAR, GRASS, VETCH, SOAPBERRY, SPRUCE ON BANKS	YES	INTERMITTENT	WH13150727
M896804	STREAM SED	TRIB TO ARCH	572725	6817433	1177	AUG 17/13	DEB, WINSTON, CODY	SA	GREY BROWN	65	15	12	3	5	W	GENTLE	MOD TO FAST	WILLOW, MINOR SPRUCE, DWARF BIRCH, FIREWEED, BIG OVAL, POSS WINTERGREEN, GRASS	YES	FLOWS, DRAINS OUT OF GROUND AT BASE OF TILL MOUND	WH13150727
M896805	STREAM SED	TRIB TO ARCH	571841	6817904		AUG 17/13	DEB, WINSTON, CODY	SA	DARK GREY	50	30	8	2	10	W	MOD	FAST	WILLOW, DWARF FIREWEED	YES	MOD SLOPE AT SITE, STEEP ABOV E. CLOSE TO ROAD.	WH13150727
M896806	STREAM SED	TRIB TO ARCH	571552	6818093	1105	AUG 17/13	DEB, WINSTON, CODY	SA	BROWN GREY	75	10	7	5	3	S	MOD TO STEEP	FAST	WILLOW, POPLAR, ASPEN, GRASS	YES	5M FROM ROAD	WH13150727
SILT1	SILT		571374	6818354		AUG 12/13	DEB, WINSTON	SA	BROWN						W	MODERATE TO STEEP		SPRUCE, WILLOW	NO	5M SOUTH OF L1600 600S	WH13150727
M896807	SILT		571345	6818707	1158	AUG 18/13	DEB	SA	GREY						W			W.SPRUCE, WILLOW, ALDER, GRASS	NO	25M NORTH OF L1400 350S	WH13150727
M896808	SILT		571143	6818638		AUG 22/13	DEB	SR TO SA	GREY	60	20	10	10	0	N	MOD	DRY	ALDER	NO	INTERMITTENT CREEK JUST SOUTH OF TECK SHOWING, DRAINING BOWL OF TILL	WH13160020

SAMPLE #	Au_ppm	Ag_ppm	Al_ppm	As_ppm	B_ppm	Ba_ppm	Be_ppm	Bi_ppm	Ca_%	Cd_ppm	Ce_ppm	Co_ppm	Cr_ppm	Cs_ppm	Cu_ppm	Fe_%	Ga_ppm	Ge_ppm	Hf_ppm	Hg_ppm	In_ppm	K_%	La_ppm	Li_ppm	Mg_%	Mn_ppm	Mo_ppm
SSED1	0.0044	0.18	2.23	17.75	30	146.5	0.38	0.072	1.75	0.349	15.15	24.3	102	1.44	106	4.46	6.9	0.123	0.115	0.27	0.027	0.07	7.52	19.1	2.17	545	1.21
M896801	0.0034	0.173	1.63	31.8	90	146.5	0.46	0.102	1.57	0.371	23.9	19.15	48.8	2.91	79.2	3.44	5.22	0.069	0.046	0.633	0.038	0.07	12.35	15.8	1	753	1.33
M896802	0.0018	0.128	1.83	24	50	206	0.31	0.066	1.11	0.414	16.95	23.7	76.1	1.56	62.2	5.64	7.96	0.092	0.069	0.198	0.032	0.05	8.42	14.6	1.22	661	1.69
M896803	0.0022	0.572	1.8	44	30	372	0.44	0.097	2.3	1.01	16.65	23.6	52.4	1.8	76.9	4.67	5.28	0.1	0.106	0.491	0.039	0.07	8.85	16.6	1.7	540	5.53
M896804	0.004	0.53	2.35	22.2	40	307	0.41	0.081	1.5	0.435	18.1	26.1	96.2	1.42	143.5	4.81	6.62	0.117	0.096	0.266	0.038	0.07	10.45	17.7	2.05	752	2.2
M896805	0.0032	0.12	2.08	21.9	20	136.5	0.41	0.07	2.16	0.27	15.25	26.9	116.5	0.995	93.3	4.9	6.4	0.123	0.242	0.211	0.029	0.06	7.46	17.4	2.21	606	1
M896806	0.003	0.884	2.16	44.9	30	371	0.41	0.112	3.03	1.405	14.75	29.5	76.9	1.8	113	5.1	6.82	0.124	0.16	0.315	0.04	0.06	7.86	13.3	2.05	641	7.33
SILT1	0.0028	0.093	1.98	17.95	10	112	0.35	0.057	1.8	0.221	13.75	24.9	107	0.789	85.5	4.51	5.96	0.119	0.163	0.233	0.025	0.06	6.77	15	2.1	616	0.95
M896807	0.003	0.102	1.79	14.15	10	97.1	0.34	0.073	1.45	0.319	17	21.1	88	0.736	72.1	3.85	5.53	0.08	0.08	0.11	0.026	0.06	8.39	13.4	1.66	605	0.96
M896808	0.0006	0.084	1.51	8.37	<10	70.9	0.27	0.053	3.39	0.188	16.2	16	60	0.457	46.6	2.93	4.94	0.114	0.232	0.024	0.015	0.07	7.53	10.7	1.3	556	0.95

SAMPLE #	Na_%	Nb_ppm	Ni_ppm	P_%	Pb_ppm	Pd_ppm	Pt_ppm	Rb_ppm	Re_ppm	S_%	Sb_ppm	Sc_ppm	Se_ppm	Sn_ppm	Sr_ppm	Ta_ppm	Te_ppm	Th_ppm	Ti_%	Tl_ppm	U_ppm	V_ppm	W_ppm	Y_ppm	Zn_ppm	Zr_ppm
SSED1	0.027	0.715	96.5	0.091	6.62	0.01	0.005	4.38	<0.001	0.06	1.215	9.47	1.5	0.3	40.9	0.006	0.04	0.923	0.116	0.046	0.411	99.8	0.102	11.1	99.8	4.17
M896801	0.026	0.645	42.5	0.092	6.91	0.008	<0.002	5.96	<0.001	0.13	1.79	7.75	1.8	0.26	43.2	<0.005	0.03	0.65	0.053	0.079	0.593	70.8	0.13	13.3	95.4	1.69
M896802	0.029	0.59	49.1	0.095	4.92	0.003	<0.002	4.24	<0.001	0.06	1.015	8.36	1	0.34	27.6	<0.005	0.03	0.742	0.158	0.048	0.38	162.5	0.116	8.42	112	1.88
M896803	0.033	0.247	73.5	0.099	8.36	0.007	0.003	3.37	0.008	0.18	2.07	10.8	4.3	0.28	57.5	<0.005	0.04	0.778	0.075	0.127	0.609	100.5	0.079	11.15	164.5	3.84
M896804	0.024	0.633	96.7	0.093	9.41	0.016	0.004	4.12	0.001	0.09	1.46	13.95	2.2	0.3	36.1	<0.005	0.04	0.811	0.12	0.085	0.467	111.5	0.116	16.75	114	3.41
M896805	0.027	0.191	149	0.075	5.44	0.018	0.007	3.53	0.002	0.05	1.28	10.2	1.1	0.31	43.6	<0.005	0.06	1.03	0.127	0.047	0.338	111	0.099	9.96	89.7	8.97
M896806	0.033	0.237	93.6	0.113	7.63	0.012	0.006	3.18	0.011	0.16	3.3	13.65	4.9	0.31	56.4	0.006	0.06	0.87	0.11	0.119	0.737	131.5	0.121	14.45	200	7.38
SILT1	0.03	0.306	130	0.071	4.8	0.024	0.009	3.33	0.001	0.02	1.125	9.09	0.8	0.27	42.4	<0.005	0.03	0.92	0.128	0.041	0.301	106.5	0.097	9.19	79.6	6.06
M896807	0.03	0.771	92.7	0.073	4.86	0.01	0.005	4.93	0.001	0.04	0.971	6.99	0.9	0.29	41.8	<0.005	0.02	1.065	0.114	0.056	0.423	89.5	0.147	8.67	76.7	2.88
M896808	0.035	0.145	43.4	0.087	4.15	0.006	0.003	3.61	0.001	0.07	0.537	5.68	1	0.25	102	0.005	0.03	1.35	0.117	0.047	0.477	70.3	0.067	9.59	53.6	8.08

Stream Sediment Sampling Key				
ANGULARITY		SLOPE DIRECTION		
WR	well rounded	N, NE, E, SE		
R	rounded	W, NW, S, SW		
SR	subrounded	SLOPE ANGLE		
SA	subangular			
A	angular			
COLOR	D	dark	1	flat (<5°)
	L	light	2	gentle (<5° -15°)
	GY	grey	3	moderate (<15° -25°)
	BK	black	4	steep (>25°)
	RD	red	STREAM FLOW	
	BR	brown		
	YE	yellow		
	OR	orange	1	dry
	GR	green	2	stagnant
	PK	pink	3	slow
TA	tan	4	moderate	
CW	cream	5	fast	
RBR	red brown	VEGETATION		
SEDIMENT COMP				
				D
		C	coniferous	
must add to 10 or 100%		A	absent	
		>2mm gravel		
				>0.16mm sand