CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

Geological Survey of Canada

URANIUM RECONNAISSANCE PROGRAM: ORIENTATION STUDIES IN URANIUM EXPLORATION IN THE YUKON

PART 1

A description of geochemical pilot studies carried out in July 1975 over selected areas of the Southern Yukon. Analytical data are presented on stream sediment and water, rocks and heavy mineral separates. Areas covered include parts of the Pelly Mountains, Selwyn Mountains, Ogilvie Mountains, Big Salmon Ranges, Dawson Ranges and Kluane Ranges.

PART 2

A discussion of stream water data acquired through the summer of 1976 from ten detailed areas within 106E, 106D, 116A, 116B and 116G covering parts of the Wernecke and Ogilvie Mountains of the Central Yukon. The following information is recorded: Uranium, fluorine and pH in stream waters. A short report discussing the interpretation of preliminary data is enclosed.

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PART 1

Geochemical Pilot Studies

Yukon — 1975

by

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Geological Survey of Canada

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INTRODUCTION

From July 17th and August 1st,1975 the authors conducted a pilot geochemical study for the Geological Survey of Canada in the southern part of Yukon Territory. The objectives of the study were:

1: to investigate the feasibility of doing low density reconnaissance helicopter supported geochemical surveys for uranium in the Yukon.

2: to examine and collect samples from selected areas so as to obtain as much background data as possible within the limited time available.

3: to determine which sample media (ie, stream sediments, stream waters, rocks and heavy minerals) would give the most meaningful results on a reconnaissance survey having a sample density of 1 sample per 5 square miles.

4: to attempt to define uraniferous areas.

During the programme a total of 187 stream sediments, 12 pan concentrate, 70 water and 108 rock samples were obtained. The waters were analyzed for Zn, Cu, Pb, Mn, Fe, U, F, Cl, Si and SO_4 and the sediments, rocks and heavy minerals were analyzed for Zn, Cu, Pb, Ag, Fe, Mn, Mo and U. For the latter group of samples U was analyzed fluorimetrically and by neutron activation.

This report will discuss the above results and make recommendations on the practicability of carrying out low density reconnaissance geochemical surveys in southern Yukon Territory.

AREAS SAMPLED

Because there was a Hughes 500C helicopter based in Ross River and under contract to the GSC much of helicopter work was concentrated in the eastern portion of the Yukon. In addition a Hughes 500C helicopter was chartered to sample two areas (Amphitheatre Mountain and Klotassin River) in the west part of the Yukon. All other areas were sampled from roads (figure 1).

Following discussions with government geologists (D.C. Findlay, D. Templeman-Kluit, S. Blusson and D. Craig) familiar with the geology of the Yukon certain areas were selected for sampling. Areas that were given priority included those underlain by Tertiary sedimentary rocks and acid intrusions, fluorite bearing granitic rocks, black shale units and Pre-cambrian sedimentary rocks.

FEASIBILITY OF DOING REGIONAL GEOCHEMICAL SURVEYS

Previous experience has proven that helicopter supported reconnaissance stream sediment and water geochemical surveys can be carried out effectively over most of the Yukon Territory.

Little trouble will be encountered in the mountainous areas. However in certain of the plateau and plain areas trees are sufficiently abundant below an elevation of 4000 feet, that reconnaissance drainage sampling (eg. 1 sample per 5 square miles) using helicopters would be practical only on the main streams. These areas include Klondike, Stewart, Lewes, Teslin, Nisutlin, Pelly Plateaus and Liard Plain.

In the past systematic reconnaissance stream sediment and water surveys carried out by the GSC over Stewart Plateau (Keno Hill area) and by various exploration companies over Klondike Plateau necessitated doing foot traverses down streams to obtain complete coverage. The sample density used on these surveys was 3 samples per square mile for Keno Hill and 1 sample per 2 square miles for the Klondike Plateau. However if a sample density of 1 per 5 square miles was used then many of these areas could be sampled by landing helicopters in the main streams.

Extensive,and in places,thick glacial and alluvial overburden covers major valleys (Tintina, Shakwak and Takhini), Liard Plain and parts of Lewes, Teslin and Pelly Plateaus. Detailed geochemical studies would be required in these areas to establish the proper sample medium and sample density.

Little trouble was encountered in obtaining fine sediment from the active drainage courses. It was found that where the stream flow is torrential and/or the rock types are such (eg. granites, quartzites) that they contribute relatively samll quantities of fine material to the stream load the best place to obtain a stream sediment sample is from the living moss which frequently grows along the stream banks. This moss acts as a trap for any fine sediment carried in suspension by the water. When dried and sieved the moss is retained on the screen and the fine sediment passes through. In the larger streams suitable sediment can be found in eddies or under boulders on stream and river bars.

RESULTS

Because of the nature of the study it is not practical to produce individual metal maps of parts of the 15 maps sheets from which samples have been taken. Hence the results will be presented in table form and for discussion they will be grouped by NTS map sheet number. Sample locations may be identified by description from the Tables and by N.T.S. co-ordinates in the Appendix. Any datum which is considered to be of further interest or worthy of discussion intext is underlined in the Tables.

1. ALASKA HIGHWAY NTS 105D

The results shown in Table 1 are from sediments taken in streams crossing the Alaska Highway southeast of Whitehorse. Except for an unexplained slight increase in Cu and U in sample #1 these results represent background values. Additional sampling would be required to determine the cause of the increase in Cu and U in sample #1. Economically the region is important because it forms part of the Whitehorse Copper Belt. These deposits are contact metasomatic types and they occur in skarn zones where Triassic limy beds have been intruded by Cretaceous granitic rocks. Regional stream sediment geochemistry can only be partially successful in outlining these occurrences because thick glacial deposits occupy much of the valley area below 3000' ASL. Research in the applications of overburden sampling at depth could prove fruitful in this environment.

TABLE 1: Stream Sediments from NTS 105D

Sample	#	Cu	Pb	Zn	Mo	Mn	Ag	Fe [1]	U [2]	U [3]
75000	1	58	18	74	2	435	0.8	1.42	6.6	7.3
	2	12	10	32	<1	180	0.7	1.14	1.7	3.1
	3	24	15	48	2	345	0.4	1.93	1.5	3.2
	4	12	12	37	3	540	0.4	1.59	1.3	2.5
	5	30	14	53	2	550	0.5	2.24	1.0	2.2
	6	38	20	69	2	665	0.7	2.76	1.3	2.2
	7	35	13	49	1	585	0.5	1.77	1.3	2.1
	8	20	13	45	1	990	0.6	1.86	1.5	2.7
	9	32	18	56	2	450	0.8	1.96	1.8	2.2
	10	16	11	38	1	410	0.4	1.75	2.8	1.7

Note: 1. Fe in %, all other elements in ppm
2. Fluorimetric determinations
3. Neutron Activation determinations

2. CANOL ROAD NTS 105C

In this area a total of 15 sediment samples were taken from streams crossing the Alaska Highway and Canol Road between Little Atlin Lake and Quiet Lake.

Geologically most of the area along Canol Road is underlain by a series of schists and gneisses intruded by Cretaceous granitic rocks. Between Little Atlin Lake and Teslin Lake Cretaceous granites intrude Permian volcanic and sedimentary rocks.

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TABLE 2: Stream Sediments from NTS 105C

Sample	No	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]
7500	11	19	16	44	3	605	0.7	1.45	1.0	1.7
	12	32	17	71	2	870	0.7	2.49	0.7	2.0
	13	20	9	43	2	670	0.4	1.54	1.0	2.1
	14	13	8	43	3	330	0.6	1.60	2.8	3.8
	15	16	11	44	3	365	0.6	1.91	9.1	12.6
	16	12	11	68	2	305	0.5	1.81	8.7	15.2
	17	14	11	48	2	305	0.4	1.87	15.2	17.3
	18	9	10	43	3	370	0.2	1.27	19.9	24.7
	19	7	8	31	2	185	0.5	0.95	2.7	4.8
	20	11	8	32	3	380	0.5	1.57	4.4	9.0
	21	14	8	29	2	360	0.4	1.47	1.0	3.2
	22	12	9	35	3	400	0.3	1.63	2.7	4.3
	23	12	8	36	2	275	0.3	1.50	1.5	2.3
	24	34	20	69	3	835	0.6	2.86	1.0	2.1
	25	17	11	42	2	480	0.6	1.73	1.7	2.0

1) Fe in % all other elements in ppm
2) Fluorimetric determinations
3) Neutron Activation determinations

Marked increases in uranium (9.1 to 19.9ppm fluorimetrically, 12.6 to 24.7ppm neutron activation) occur in stream sediments from the Cretaceous granitic rocks of the Big Salmon Range. The anomaly on the west side of the range has a dispersion train in excess of 5 miles and would have been found on a low density (eg. 1 sample 5 square miles) stream sediment survey.

3. CANOL ROAD, McCONNELL RIVER, BACON CREEK NTS 105F

On this sheet 27 stream sediment,1 water and 11 rock samples were taken along the Canol Road between Quiet Lake and Ross River. South of Lapie Lakes much of the area sampled is underlain by Cretaceous granitic rocks, north of the lakes Cambrian phyllites and Siluro-Devonian dolomites predominate.

In addition to the above work 2 areas(McConnell River and Bacon Creek) were systematically sampled using a Hughes 500C helicopter. McConnell River area was selected for sampling because the region contains several fluorite bearing syenitic stocks of supposedly Mississippian age. Approximately 160 square miles were sampled and 20 stream sediment, 20 water and 10 rock samples were taken from this area.

Bacon Creek was selected for sampling because the upper portion of the creek is underlain by late Precambrian (Windermere) phyllitic and quartzitic rocks; 8 stream sediment, 8 water and 7 rock samples were taken within this drainage system.

The results of the above work are shown in Tables 3A, 3B. and 3C.

TABLE 3A: Stream Sediment Samples from NTS 105F

Sample	No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe [1]	U [2]	U [3]	Remarks
7500	26	14	15	52	3	475	0.5	1.60	0.7	2.0	Canol Road
	27	13	15	47	3	270	0.6	1.72	2.7	5.2	"
	28	16	12	60	2	910	0.6	1.75	1.5	3.3	"
	29	28	13	64	2	575	0.6	2.10	3.4	6.5	"
	30	15	19	69	3	350	0.5	2.26	3.2	6.2	"
	31	10	15	40	4	420	0.3	1.78	18.5	24.0	"
	32	10	19	62	3	460	0.6	3.70	29.5	34.7	"
	33	12	19	56	2	340	0.5	2.09	4.0	8.5	"
	34	7	19	53	3	455	0.4	2.06	8.3	11.7	"
	35	11	19	52	2	325	0.6	2.43	4.4	25.2	"
	36	13	21	60	2	370	0.7	2.48	21.0	11.8	"
	37	6	30	55	3	1080	0.4	1.56	22.5	42.0	"
	38	19	29	78	3	370	0.7	2.90	2.3	10.6	"
	39	10	15	44	2	290	0.4	1.79	1.3	5.9	"
	40	10	19	61	2	510	0.4	2.30	3.4	9.0	"
	41	24	38	137	5	455	0.9	2.37	1.3	3.5	"
	42	26	26	82	3	470	0.6	3.72	0.9	2.6	"
	43	15	26	81	2	400	0.5	3.29	1.0	3.8	"
	44	19	25	71	4	485	0.7	2.81	1.7	3.4	"
	45	19	23	62	3	480	0.9	2.70	0.8	3.3	"
	46	19	24	68	3	470	0.8	2.57	1.7	3.4	"
	47	17	25	82	3	445	0.8	2.56	1.3	3.9	"
	48	24	33	400	6	300	1.1	1.50	0.7	2.6	"
	49	24	26	115	5	385	1.1	1.85	0.9	3.7	"
	50	18	25	108	5	345	0.9	1.73	0.9	3.4	"
	51	16	30	256	8	150	2.5	0.45	6.9	9.4	"
	52	33	31	142	4	510	1.0	2.67	1.3	5.8	"

TABLE 3A con'd

Sample	No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
7500	58	12	57	229	19	1070	0.8	4.16	6.2	12.7	McConnell R.
	59	24	47	130	7	640	0.6	3.70	2.5	8.0	"
	60	30	56	128	6	600	0.7	4.16	4.4	8.8	"
	61	15	101	520	12	1750	0.9	5.38	0.5	12.3	"
	62	23	46	152	5	700	0.7	3.35	0.9	6.0	"
	63	28	46	105	5	620	0.9	3.30	0.9	3.5	"
	64	21	42	140	4	780	0.8	3.08	0.7	4.7	"
	65	32	49	114	5	615	1.1	3.32	0.9	3.3	"
	66	31	51	100	4	635	0.8	3.59	1.0	3.5	"
	67	39	22	87	4	650	0.9	3.73	0.9	2.4	"
	68	36	62	120	6	570	1.0	3.00	1.0	3.4	"
	69	52	94	143	4	655	1.1	3.81	1.0	3.9	"
	70	26	30	71	3	750	0.8	3.48	0.4	3.2	"
	71	24	54	131	4	835	0.7	2.64	1.0	4.4	"
	72	24	114	195	3	730	0.9	3.35	0.7	4.9	"
	73	28	108	263	6	1015	1.0	3.55	0.9	6.0	"
	74	24	43	139	3	565	0.7	2.92	0.9	4.7	"
	75	27	46	159	3	480	0.8	3.18	0.9	5.1	"
	76	29	53	159	4	700	0.9	3.50	0.7	4.6	"
	77	64	80	134	10	510	0.8	4.08	2.5	8.2	"
	78	23	20	78	2	420	0.6	3.00	2.3	4.3	Bacon Cr.
	79	23	21	92	1	450	0.8	3.11	1.9	4.3	"
	80	23	36	105	3	715	0.5	3.50	12.6	22.5	"
	81	24	35	127	2	725	0.7	3.27	13.4	17.9	"
	82	24	33	102	3	715	0.6	2.88	12.6	12.8	"
	83	21	25	86	3	450	0.6	3.19	6.3	16.2	"
	84	24	26	59	3	515	0.7	2.94	0.7	2.5	"
	85	22	22	71	2	210	0.4	2.70	3.0	6.1	"

1) Fe in %,other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

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TABLE 3B Stream Waters from NTS 105F

Sample No.	pH	F	SiO_2[1]	Cl	Mn	Fe	Cu	Zn	Ag	Pb	U	SO_4
75- 3051	7.01	155	4.58	0.10	2.5	9.4	0.2	0.5	0.2	1.2	34.0	340
58	7.48	155	1.65	0.05	2.5	9.4	0.2	1.0	0.2	1.2	1.18	11.0
59	7.44	212	2.30	0.05	2.5	6.3	0.2	0.5	0.2	1.2	1.28	10.0
60	7.50	218	2.40	0.05	2.5	5.0	0.2	0.5	0.2	1.2	1.22	10.4
61	7.50	370	3.25	0.05	2.5	5.0	0.2	1.2	0.2	1.2	0.78	63.5
62	6.51	120	2.50	0.19	2.5	12.2	0.2	1.2	0.2	1.2	1.52	34.4
63	7.66	94	2.20	0.05	2.5	5.0	0.5	0.5	0.2	1.2	1.02	21.2
64	7.75	142	2.60	0.10	2.5	5.0	0.2	1.2	0.2	1.2	1.32	32.5
65	7.80	69	2.12	0.05	2.5	5.0	0.2	0.5	0.2	1.2	1.30	21.1
66	7.87	46	2.05	0.29	2.5	5.0	0.2	0.5	0.2	1.2	0.66	16.8
67	7.87	36	2.00	0.29	2.5	5.0	0.2	0.5	0.2	1.2	0.58	11.5
68	7.86	59	2.12	0.10	2.5	5.0	0.2	0.5	2.0	1.2	1.40	32.0
69	7.93	51	1.98	0.10	2.5	5.0	0.2	0.5	1.5	1.2	1.48	42.5
70	8.08	57	2.19	0.19	5.7	6.9	0.2	0.5	0.2	1.2	1.22	33.9
71	8.08	115	2.70	0.19	2.5	5.0	0.2	0.5	0.2	1.2	1.20	43.5
72	8.13	57	2.39	0.19	2.5	5.0	0.2	0.5	0.2	1.2	0.98	30.3
73	8.02	205	2.26	0.19	2.5	5.0	0.2	0.5	0.5	1.2	1.34	98.0
74	8.09	112	2.65	0.05	6.2	8.4	0.2	0.5	1.2	1.2	0.78	37.9
75	8.08	200	2.80	0.10	6.9	5.0	0.2	0.5	0.2	1.2	0.44	58.7
76	8.09	67	2.59	0.10	2.5	5.0	0.2	0.5	0.2	1.2	0.96	27.5
77	8.27	82	2.12	0.10	2.5	5.0	0.2	0.5	0.2	1.2	0.62	15.0
78	7.92	69	2.85	0.19	2.5	5.0	0.2	0.5	0.2	1.2	0.54	10.0
79	7.89	70	3.25	0.19	2.5	5.0	0.2	0.5	0.2	1.2	0.28	7.1
80	8.23	34	2.30	0.29	2.5	5.0	0.2	0.5	0.5	1.2	0.26	6.4
81	8.15	42	2.00	0.29	2.5	5.0	0.2	0.5	0.2	1.2	0.30	6.1
82	8.00	48	2.25	0.10	2.5	5.0	0.2	0.5	0.5	1.2	0.34	9.6
83	7.93	53	2.55	0.29	2.5	6.9	0.5	0.5	0.2	1.2	0.64	9.2
84	7.67	65	2.60	0.10	2.5	7.6	0.2	0.5	0.2	1.2	0.82	12.5
85	7.83	64	2.71	0.05	2.5	11.1	10.7	0.5	0.2	1.2	0.58	10.2

1) SiO_2, Cl, SO_4 in ppm, other elements in ppb

TABLE 3C Rock Samples from NTS 105F

Sample	No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75200	1	4	11	9	<1	102	<0.1	0.40	2.8	4.5	Musc. Grnt/py. Canol
	2	10	20	11	2	230	0.4	0.36	3.0	6.0	Grnt boulders " Rd.
	3	16	35	67	5	490	1.5	1.09	0.4	1.1	Carb. ppt. "
	4	12	28	16	<1	625	1.3	3.47	2.5	0.2	Qtz.bld./py. "
	5	16	30	129	4	220	1.5	0.50	2.1	3.0	Fe carb.ppt. "
	6	9	8	16	2	13	0.3	0.16	0.2	1.1	Tert. cglm "
	7	31	16	160	2	88	0.3	0.87	0.7	3.6	Tert. slsn. "
	15	29	44	168	3	6070	0.8	9.10	0.5	4.9	Tert. coal "
	16	14	21	55	2	745	0.5	2.07	0.9	1.7	Tert. slsn. "
	17	28	30	129	2	650	0.7	3.58	1.4	4.2	Tert. shle. "
	18	7	30	16	<1	250	0.3	0.62	1.0	2.1	Syen-sheared/McConnell
	19	20	26	18	1	135	0.4	0.70	6.5	6.8	Tuff-shr-rusty " Rv.
	20	12	16	21	6	145	0.3	0.57	5.8	6.9	Vlcc. brec-2%py "
	21	16	34	32	2	285	0.8	1.16	0.4	5.1	Dacite,1-2%py "
	22	12	30	137	16	485	0.8	1.50	4.4	13.9	Q.F.Porph.1-5%py"
	23	9	100	550	10	1335	0.8	3.48	8.0	19.5	Synt./fluor. "
	24	11	43	625	6	1500	0.6	2.95	12.5	22.6	Synt./fluor. "
	25	4	27	155	22	2500	0.7	6.80	16.1	25.7	Qtz.fluor.vein "
	26	7	67	64	8	1685	0.7	2.25	2.0	9.8	Carb.breccia "
	27	5	26000	4520	2	355	13.5	0.57	0.2	4.7	Qtz vein/galena "
	29	4	42	7	8	635	4.0	0.22	0.2	0.4	Lmsn Bacon Cr.
	30	4	57	15	8	680	2.7	0.64	0.9	0.7	Phyllite-limy "
	31	52	12	13	2	84	0.6	1.59	2.9	2.9	Phyllite Bacon Cr.
	32	24	24	66	1	180	0.8	5.60	1.2	3.7	Phyllite "
	33	8	14	31	2	130	0.4	2.27	1.6	2.8	Qtzite "
	34	14	21	61	2	245	0.7	3.60	0.9	2.7	Calc. qtzite "
	35	7	18	12	2	87	0.7	0.30	0.6	2.4	Qtzite "
	77	53	20	77	2	630	0.2	2.00	0.2	1.7	Graph.schist "

1) Fe in %, other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

Canol Road Results:

Above normal increases in U are evident in sediment samples 75-31 to 38 (Table 3A) and the source of this uranium is probably the Cretaceous granitic rocks. The highest values (F*-22.5ppm;NA*-42.0ppm) come from a creek in which pink granitic boulders are common; one of these (#75-2002, Table 3C) analyzed 3ppm fluorimetric U and 6ppm U by neutron activation.

Sediment sample 75-48 contains 400ppm Zn, the stream at this location drains an area of Siluro-Devonian dolomite. About 3 miles upstream from the sediment sample there is a barite occurrence. The zinc in this stream is probably derived from the vicinity of this occurrence.

Sediment sample 75-51 comes from Glacier creek and it is high in Zn (250ppm), Mo (8ppm),Ag (2.5ppm) and U (F-6.9ppm, NA 9.4ppm). The material in this stream is cemented with brown iron carbonate and undoubtedly there is a spring source up stream. A sample of stream water (#75-3051) from this creek has a pH of 7.01 and it contains above average amounts of F (155 ppb), SiO_2 (4.58ppm), Fe (9.4ppb),U (34ppb) and SO_4(340ppm) this is the highest value for U found in the water samples taken during this study.

Geologically the area is underlain by phyllite. Several small granitic and syenitic stocks intrude this rock unit in the St Cyr Range and it is suggested that the source of the

* F=fluorimetric analysis

* NA=Neutron Activation Analysis

metal in this stream may be related to the latter type of intrusion. Uraniferous, fluorine bearing syenites are known to the southeast (see McConnell River results). Additional work is warranted in Glacier Creek area.

Samples of Tertiary sedimentary rocks (75-2006,7,15, 16,17) taken west of Ross River do not contain abnormally high amounts of uranium.

McConnell River Results:

The analyses of the rock samples (Table 3C) from McConnell River drainage show that the fluorite bearing Mississippian (?) syenites are uraniferous(UF-8 to 12.5ppm,U NA-19.5 to 226ppm). In addition they contain anomalous amounts of Pb, Zn, Mn, Fe and Mo. Also maximum U (F-16.1ppm, NA-25.7ppm) and Mo (22ppm) values occur in a quartz-fluorite vein within the syenite. Also a quartz vein (#75-2027) containing coarse blebs of galena is relatively low in U (F-0.2ppm, NA-4.7ppm) and enriched in Pb (26000ppm), Zn (4520ppm) and Ag (13.5ppm). This sample should be analyzed also for Au.

The stream sediment results (Table 3A) show that values for U (Neutron Activation) in excess of 6ppm are present in the streams draining the fluorite bearing syenite from around peak 6541. The results for uranium analyzed fluorimetrically are considerably lower than those analyzed by the neutron activation technique thus suggesting that much of the uranium is associated with the resistate minerals. The sediment samples from this area are also abnormally high in

Pb (47-101ppm), Zn (229,520ppm), Mo (6-19ppm), Mn (1070, 1750ppm) and Fe (3.70-5.38%). These results effectively reflect the metal associations found in the rock samples from the vicinity of peak 6541.

An examination of Table 3A shows that the background for Pb in the area sampled is high and the known geology supports this as there are some 10 known lead occurrences in this portion of the St Cyr Range. Samples that are high in lead and which are derived from streams draining known Pb deposits include those from White Creek; the three sediment samples (75-3066, 68, 69) from the upper 4 or 5 miles of this creek all contain in excess of 51ppm Pb and 3%Fe.Sample 75-3072, from a tributary at the head of McConnell River, contains 114ppm Pb, 195ppm Zn and 3.35% Fe, high values here probably are related to a Pb-Ag occurrence some 4 miles upstream. In addition high metal values in samples 75-0073 (Pb, Zn, Mo, Mn, Fe) and 75-0077 (Cu, Pb, Zn, Mo, Fe, U) are probably caused by undiscovered mineral deposits and they should be followed up.

pHs of the stream waters from upper McConnell River are alkaline, one sample has a pH of 6.51 and pHs of the remaining 19 samples range from 7.44 to 8.27. The presence of fluorine-uranium bearing syenites are indicated by values in excess of 100ppb F and 1ppb U. The base metal content of the waters is uniformly low in this area and this might be expected because of the high pHs. Interestingly enough Ag increases from a normal of about 0.2ppb to 1.5 and 2.0ppb in samples 75-3069 and 3068 at the head of White Creek. This 10 fold increase is probably caused by Pb, Ag showings which are known to occur here. The SO_4 content of the waters vary from 10 to 98ppm,to determine the significance of these results will require additional research.

In summary: 1.) the fluorite bearing syenites of the area are uraniferous and they contain above normal amounts of Pb, Zn, Mo, Mn and Fe, 2.) low density (1 sample per 5 square miles) stream sediment and water surveys in this part of Yukon Territory can be effective in delineating metal rich areas, 3.) little difficulty was encountered in finding suitable helicopter landing sites. Tree line is at about 4500 feet ASL but the major valleys and stream courses are sufficiently wide and clear so as to permit helicopter landings.

Bacon Creek Results:

Stream sediment samples (Table 3A) from the upper parts of Bacon Creek contain higher than normal U (F-6.3 to 13.4ppm, NA-12.8 to 22.5ppm). The source of this uranium is probably the micaceous quartzose gneisses (Unit C, Wheeler 1960*) which are in contact with Cretaceous granites at the headwaters of Bacon Creek. Additional work should be done here to evaluate the significance of these uranium results.

Rock samples (75-2029 to 35) taken from a section of late Precambrian phyllites and quartzites on the north side of upper Bacon Creek contained background values in uranium.

The pH of the waters from Bacon Creek (Table 3B) are alkaline and range from 7.67 to 8.23, in general uranium is low

*Wheeler, J.O. (1960) Quiet Lake, G.S.C. Map 7-1960

(0.26 to 0.82ppb). However one stream water sample (73-3085) contains anomalous amounts of Fe (11.1ppb) and Cu (10.7ppb).

In summary low density stream sediment sampling in this area will define uraniferous areas, a dispersion train of some 4 miles has been indicated for U in stream sediments. No difficulty was encountered in landing the helicopter in the stream beds.

4. ROSS RIVER-FARO AREA NTS 105K

The results shown in Tables 4A, 4B and 4C are from stream sediment, spring water and rock samples collected from areas underlain by Tertiary acid intrusive and sedimentary rocks and from areas underlain by Cambro-Ordovician shales and phyllites which are the host rocks for the Zn-Pb deposits of the Faro area.

The two stream sediment samples (75-55 and 56) and one spring sediment sample (75-57) taken from Vangorda creek and upper Rose Creek all have anomalous amounts of Pb (52-63ppm), those from Rose Creek are high also in Zn (166,231ppm). These anomalous Pb-Zn results are probably related to the favorable host rocks (Cambrian-Ordovician phyllites) in which the stratiform Pb-Zn deposits of the area occur. A spring water (75-3057) from this area has a pH of 7.37 and contains above normal amounts of F (108 ppb) and SiO_2 (5ppm).

The anomalous U values (F-8.8ppm, NA-11.4ppm) in sediment sample 75-56 are probably derived from the Cretaceous granitic rocks which make up Mount Mye.

Two rock samples (75-2013,109) taken from the Faro area contain above normal amounts of Pb and Zn. Sample 2013 which is a phyllitic grit from the bank of Vangorda Creek contains 209ppm Pb and 1320ppm Zn and a sample of granite (#2109) contains 79ppm Pb and 345ppm Zn. Additional rock geochemistry would have to be done in the area before the significance of these results can be evaluated. Neutron activation analyses for U in the two granite samples (2014 and 2109) are slightly above normal (7.1 and 9.4ppm).

Results from stream sediment samples in other parts of the map sheet show that above normal values in Cu, Pb and Zn occur in sediments (75-118,119) from streams draining Ordovician black shales in the southeast part of the area. Blusson* reports the presence of zinc in this area. Because of the occurrence of major Pb-Zn deposits (Faro,Grum,Vangorda and Swim) in this sector of the map area, research into the applicability of exploration geochemical techniques to finding additional deposits should be carried out. Much of the favorable geology is covered by glacial deposits.

Rock samples of Tertiary sedimentary rocks (Table 4C) contain normal amounts of U but they tend to show some enrichment in Cu (40-79ppm) and Pb (32-40ppm), in addition Zn (165, 223ppm) and Fe (8.05 and 7.2%) are higher in the siltstones.

A sample of tuffaceous rock associated with Tertiary igneous rocks in Tintina Valley contains above normal amounts of U (F-6.2ppm; NA-13.5ppm) and Pb (47ppm).

*Blusson, S.L. (1976) Selwyn Basin, Yukon and District of Mackenzie:Report of Activities Part A: GSC Paper 76-1A - pp131-132.

TABLE 4A: Stream Sediments from NTS 105K

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-00 53	29	26	144	5	500	0.8	2.26	1.7	3.7	Grew Cr.
54	14	21	101	4	970	0.9	1.44	1.0	2.6	" "
55	28	63	129	4	410	0.6	1.89	1.0	2.2	Faro Area
56	23	52	231	3	505	0.8	2.71	8.8	11.4	" "
57	36	60	166	4	1275	1.0	5.37	3.0	5.1	" "
118	47	47	261	5	360	0.8	2.47	2.8	5.2	Canol Rd
119	64	28	207	4	660	1.2	2.46	2.5	4.7	" "
120	30	21	158	2	640	0.8	1.83	1.5	3.5	" "
121	36	24	291	4	440	0.9	1.66	1.3	3.5	Hwy 9
122	24	31	146	3	590	0.8	1.86	0.9	3.0	" "
123	19	32	150	5	320	0.7	1.53	1.5	4.6	" "

1) Fe in %, all other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

TABLE 4B: Spring Water from NTS 105K

Sample No.	pH	F	SiO_2[1]	Cl	Mn	Fe	Cu	Zn	Ag	Pb	U	SO_4
75-3057	7.37	108	5.00	0.19	2.5	5.0	0.2	1.0	0.2	1.2	0.80	8.0

1) SiO_2, Cl, SO_4 in ppm, other elements in ppb.

TABLE 4C: Rock Samples from 105K

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-2008	5	26	81	2	955	1.0	1.51	0.9	7.3	Tert. Feld. Porph.
2108	3	47	48	4	145	0.1	0.63	6.2	13.5	Tert. Tuff
2009	40	42	165	3	6090	0.9	8.05	2.5	5.5	Tert. slsn.
2010	73	32	22	1	22	<0.1	0.37	0.9	5.5	Tert shle. concretion
2011	70	37	29	1	12	0.1	0.43	2.1	7.5	Tert Snds.
2012	79	40	223	2	1435	1.1	7.20	0.9	5.0	Tert slsn.
2013	19	209	1320	1	325	0.8	0.73	0.5	6.8	Ord. Grit-phyllitic
2014	2	17	25	1	1010	0.2	2.18	2.1	9.4	Cret. Grnt.
2109	8	79	345	5	835	0.5	2.08	<0.1	7.1	Cret. Peg-Grnt.
2028	13	74	126	2	220	0.7	1.18	2.0	6.2	Tert. Q.F. Porph.
2076	22	35	12	2	230	0.5	1.20	0.7	3.2	Ord. blk. shle.
2078	26	22	116	2	255	0.5	2.18	1.4	3.9	Ord. blk. shle.

1) Fe in %, all other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

In summary the Cretaceous granites around Mount Mye and Tertiary tuffs in Tintina valley show a slight enrichment in U. Pb and Zn are enriched in some of the rocks in the Faro area. Additional rock geochemistry studies might be useful here in delineating favorable stratigraphic horizons for Pb-Zn deposits of the district.

Tertiary sedimentary rocks from Tintina Valley show enrichment in Cu and to a lesser extent in Pb and Zn.

Logistically low density stream sediment surveys could be carried out effectively in the main streams, however tree cover below an elevation of 4000 feet would make it difficult to sample samller stream. Technically regional stream sediment surveys should be effective in the mountainous terrains, but in areas of more subdued topography galcial cover would tend to reduce their effectiveness. Research should be initiated to evaluate the geochemical techniques that would be most effective in delineating ore zones in the Anvil Pb-Zn belt.

5. CANOL ROAD NTS 105J

18 stream sediment samples and 1 rock sample were taken along the Canol Road and 3 rock samples were obtained from a section of Ordovician rocks in the Selwyn Basin northwest of Traffic Mountain.

The results of the stream sediment sampling (Table 5A) show high values in Cu, Zn, Mo and Ag (#75-100 to 106) from streams draining Ordovician black shales. The samples (75-100 to 103) from near South Macmillan River are particularly high in these metals and they also show an increase in uranium. These black shale units are economically important because they are the host rocks for the Pb-Zn deposits of the Selwyn Basin (Blusson*).

*Blusson, S.L. (1976) Selwyn Basin, Yukon and District of Mackenzie-Report Activities Part A pp131-132 GSC Paper 76-1A

TABLE 5A: Stream Sediment from NTS 105J

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks	
75-100	89	26	985	12	570	1.9	2.48	8.3	11.7	Canol	Rd.
101	83	22	462	10	1015	1.5	2.73	4.4	8.1	"	"
102	108	21	770	14	560	2.3	2.62	7.4	11.0	"	"
103	49	27	187	2	920	1.3	2.24	2.5	5.0	"	"
104	46	29	282	2	2410	1.1	2.53	1.3	4.2	"	"
105	39	24	143	1	540	0.6	2.04	2.1	5.4	"	"
106	51	22	175	2	960	0.9	2.17	2.3	3.7	"	"
107	48	22	146	3	1090	0.6	2.18	1.7	4.4	"	"
108	35	23	107	2	840	0.6	2.53	0.9	3.1	"	"
109	24	22	92	1	380	0.6	2.00	1.5	3.7	"	"
110	24	25	110	0	1030	0.8	2.21	1.5	3.8	"	"
111	21	18	120	1	300	0.6	1.60	1.3	3.5	"	"
112	21	20	125	1	500	0.7	2.08	1.7	3.9	"	"
113	18	21	122	2	360	0.5	1.93	1.3	4.4	"	"
114	26	24	157	2	360	0.7	1.90	2.1	5.1	"	"
115	26	23	144	1	315	0.7	1.65	1.3	3.9	"	"
116	19	16	93	2	445	0.5	1.41	3.9	6.1	"	"
117	11	7	39	2	170	0.3	0.69	1.8	3.3	"	"

1) Fe in % all other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

TABLE 5B: Rock Samples from NTS 105J

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-2036	24	20	85	2	91	0.5	2.41	2.1	4.2	Lmsn (ORD)
37	45	28	74	6	470	1.2	1.28	2.1	5.2	Blk. shle. (ORD)
38	56	22	94	2	165	0.6	2.64	2.1	5.0	" " "
75	4	15	20	<1	62	<0.1	0.86	0.5	1.6	QRTZ. (PC)

1) Fe in % all other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

Rock samples (75-36 to 38) from an Ordovician section at the south part of the basin are not anomalous for the elements tested.

Little difficulty would be experienced in carrying out low density helicopter supported stream sediment and water surveys in the hilly portions of this sheet. However the central portion of the sheet is relatively flat, treed and covered by glacial deposits. Additional studies would be required here to test the practicability and effectiveness of regional exploration geochemical techniques.

6. SELWYN MOUNTAINS NTS 105I

Access to all samples sites in this area was by helicopter. Work was concentrated in areas underlain by black shale sequences and Precambrian conglomerates and quartzites.

Yusezyu River

One stream sediment sample (75-85) and one sample of Precambrian quartzite (75-2039) were taken at this site; all results are low.

Flat Lake

At this location a section of pyritiferous Ordovician shale and barite rich Devonian shale was sampled. Blusson* reports a zinc occurrence in the rocks from this area.

A stream sediment sample (75-0087) from a creek draining the above section is high in Cu (99ppm), Zn (2800ppm) and Mo (32ppm), some enrichment in Ag (1.7ppm) and U (F-9.2ppm, NA 12.2ppm) also is apparent. The rock samples (Table 6C,2040-43) taken upstream from the stream sediment sample are high in Mo (6-11ppm). According to Blusson*farther upstream the shales contain zinc mineralization and the stream sediment results indicate this. Also a water sample (75-3087) taken at the stream sediment site is high in Fe (26.8ppb) and Zn (86.0ppm).

Summit Lake area

Except for a slight increase in copper in a sample of limestone (#2047-76ppm) and green shale (#2049-108ppm) the Precambrian rocks sampled in this area are low in the elements tested (Table 6C, 2044-55).

*Blusson, S.L. (1976) op. cit.

TABLE 6A: Stream Sediments from 105I

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-0086	25	25	82	2	440	0.4	2.68	2.1	4.2	Yusezyu R
87	99	32	2800	32	555	1.7	2.88	9.2	12.2	Trib. Flat L.
88	79	700	1680	20	355	1.6	3.30	6.3	11.7	Dynasty Prop.

1) Fe in %, other element in ppm

2) Fluorimetric U

3) Neutron Activation U

TABLE 6B: Stream Waters from 105I

Sample No.	pH	F	SiO_2[1]	Cl	Mn	Fe	Cu	Zn	Ag	Pb	U	SO_4
75-3087	7.60	55	1.35	0.29	2.5	26.8	o.2	86.0	0.2	1.2	0.20	22.7

1) SiO_2, Cl and SO_4 in ppm, other elements in ppb

By contrast the Ordovician black shales of the Road River Formation (#2051 and 2052) are enriched in Cu, Pb, Zn, Mo and U. A rock sample, (#2053) taken from Dynasty's property and made up of a band of sphalerite and galena in black shale contains 69ppm Cu, 44000ppm Pb, 64000ppm Zn, 9ppm Mo and 2.4ppm Ag. The stream sediment sample (75-88) just below this showing contains 79ppm Cu, 700ppm Pb, 1680ppm Zn, 20ppm Mo, 1.6ppm Ag, 6.3 and 11.7ppm U. About 1.5 miles north of here Canex-Placer is evaluating a large lead-zinc deposit in Ordovician black shale. The discovery was made in 1972 during follow-up work on a low density geochemical stream sediment survey.

Pelly River Noranda's property: Oro Claims

Several samples of Devonian shale known to contain beds of barite were sampled from outcrops and drill core at

25/...

TABLE 6C: Rock Samples from 105I

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe [1]	U [2]	U [3]	Remarks
75-2039	6	17	30	2	63	0.3	1.16	1.2	2.6	Qtzite-PC
40	18	17	100	7	12	0.1	1.49	1.4	4.1	Shale O-Dev
41	27	12	69	11	51	0.4	2.16	2.4	5.1	" /py O-Dev
42	35	13	17	10	28	0.5	1.99	2.1	4.3	"/py & barite Dev
43	30	13	48	6	69	0.5	2.82	1.2	2.6	Barite-Dev
44	39	34	120	2	205	1.1	4.30	1.4	4.1	Shale-PC "
45	8	12	10	1	170	0.2	0.58	0.7	1.4	Cglm-PC "
46	23	19	95	2	300	0.5	3.44	1.6	3.7	Shale-PC "
47	76	35	74	4	1060	1.3	1.88	0.9	3.4	Lmsn-PC "
48	4	15	95	<1	595	0.3	1.93	0.5	3.0	Blk.Shale-PC
49	108	16	140	<1	685	0.5	2.50	0.7	4.1	Green " "
50	24	38	108	1	1655	0.6	4.00	0.2	3.0	Red " "
51	75	28	324	36	175	1.4	1.23	3.9	11.7	Blk " - Ord
52	134	131	162	4	81	1.2	1.57	11.0	13.3	" " "
53	69	44000	64000	9	57	2.4	0.78	4.4	5.5	Gal-sph in shale-Ord
54	16	25	35	4	5	<0.1	0.42	1.2	2.7	Shale-Dev
55	19	22	10	6	2	0.1	0.45	0.4	2.3	" "
56	8	65	58	4	23	0.3	1.03	0.9	3.3	" -blk - Dev
57	32	10	186	4	28	0.2	0.72	0.4	1.1	Barite-Dev
58	98	16	930	27	75	3.2	1.53	11.2	16.6	Shale-Blk-Dev

1) Fe in %, other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

shales was sampled on a detailed scale in 1976. Preliminary analytical results for stream waters substantiates the earlier work by Gleeson and Jonasson. In general the complete stream system has abnormally high contents of uranium and fluorine with concentrations ranging up to 3.30 and 9000 ppb, respectively. The high correlation between uranium and fluorine suggests that certain horizons of the Road River shales may be phosphatic. The high content of uranium and fluorine in stream waters suggests that they are present in the shale in a readily leachable form, possibly in apatite, which would be soluble under acidic conditions.

The oxidation of pyrite, which is commonly observed in certain horizons of the Road River shales, generates pH values as low as 2.9 (762046) in stream waters.

Preliminary analytical data for the Road River shales indicate strongly that certain beds may well be phosphatic, and consequently analogous to uraniferous phosphatic shales described elsewhere (Swanson, 1961). Additional analytical data for stream sediments and waters, and rocks in areas underlain by Ordovician shales in both the Richardson and Ogilvie Mountains will facilitate further interpretation of their uranium potential. Bedrock geochemistry of selected geological sections will then be necessary to delineate horizons favorable for the accumulation of uranium and base metals.

Conclusions

On the basis of U, F and pH in stream waters, known uranium occurrences were outlined in addition to other areas showing uranium potential. The geological environments showing uranium potential include the following:-

(1) Proterozoic sedimentary and volcanic rocks which are hosts to known occurrences of uranium and copper mineralization.

(2) Ordovician Road River shales which have shown potential as a low grade high tonnage source of uranium.

(3) Cretaceons (or younger) alkali granites, syenites and quartz monzonites which were shown to contain areas of high uranium and fluorine concentration within a given stock.

(4) Major stratigraphical and structural breaks (i.e. unconformities, faults, etc.) between Helikian rocks and younger Proterozoic and Paleozoic rocks.

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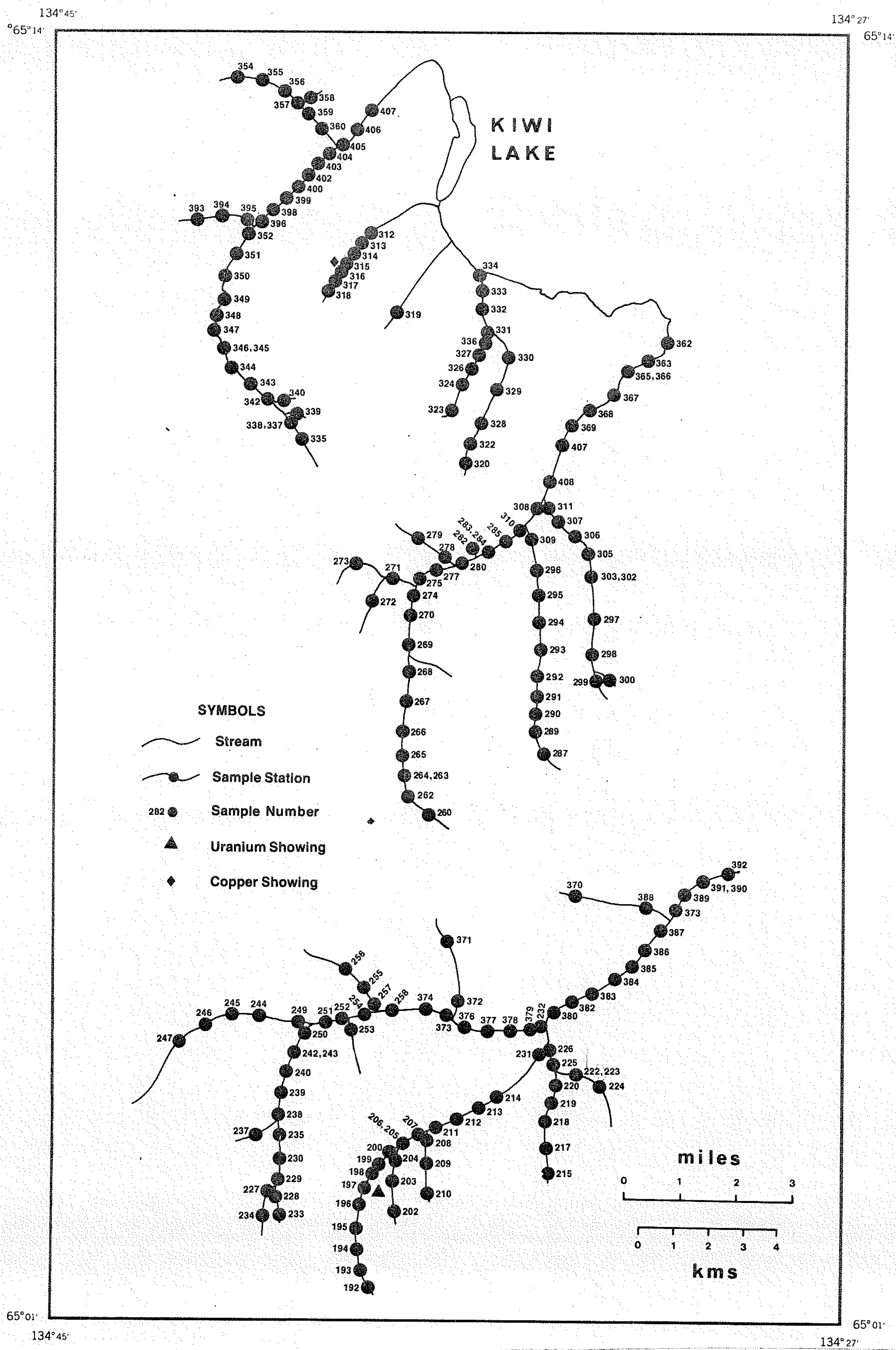
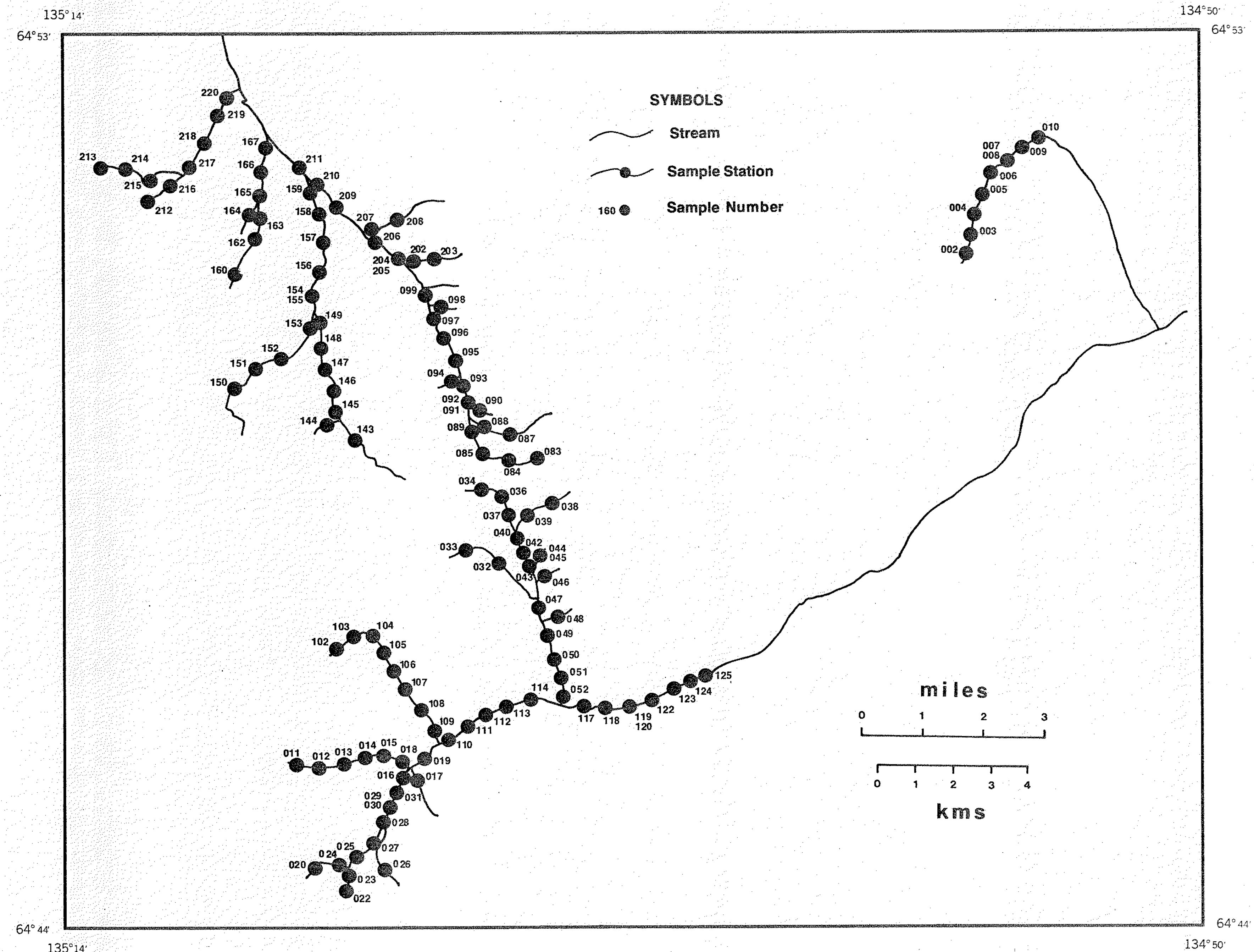
APPENDIX I

Location of Stream Water Samples

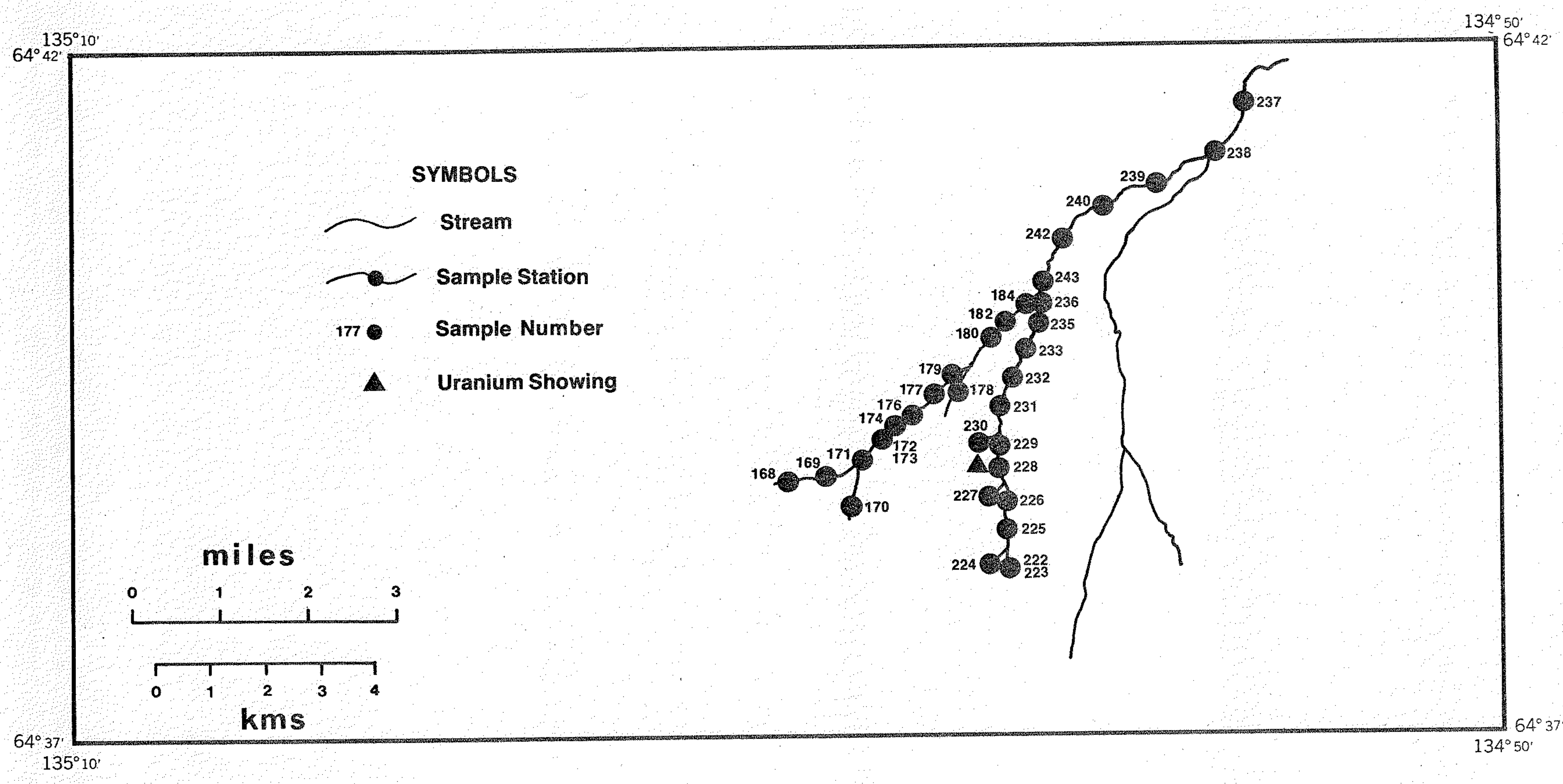
Collected in each Detail Area



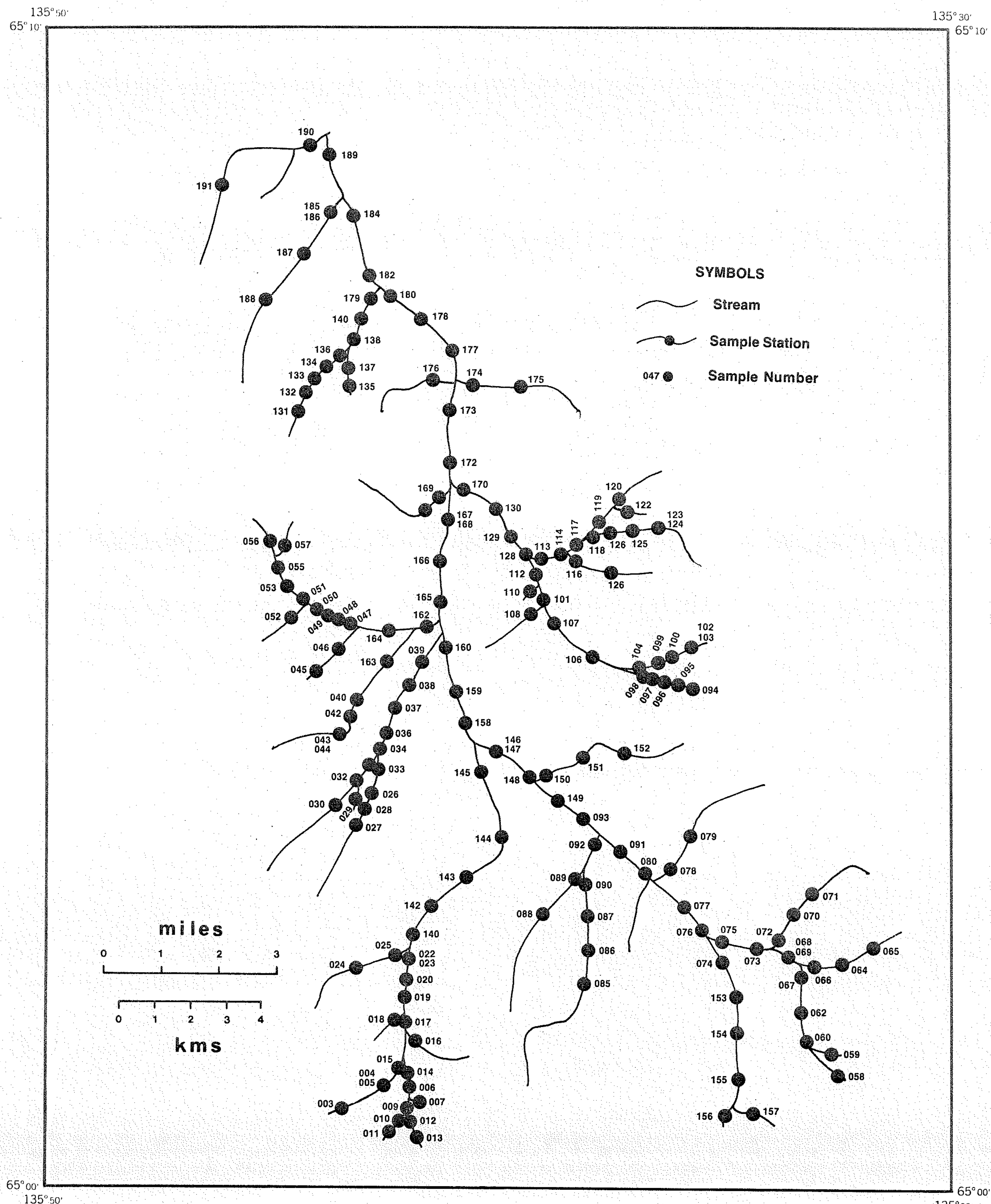
Area No. 1 (106E/2) sample number locations (764 - series).



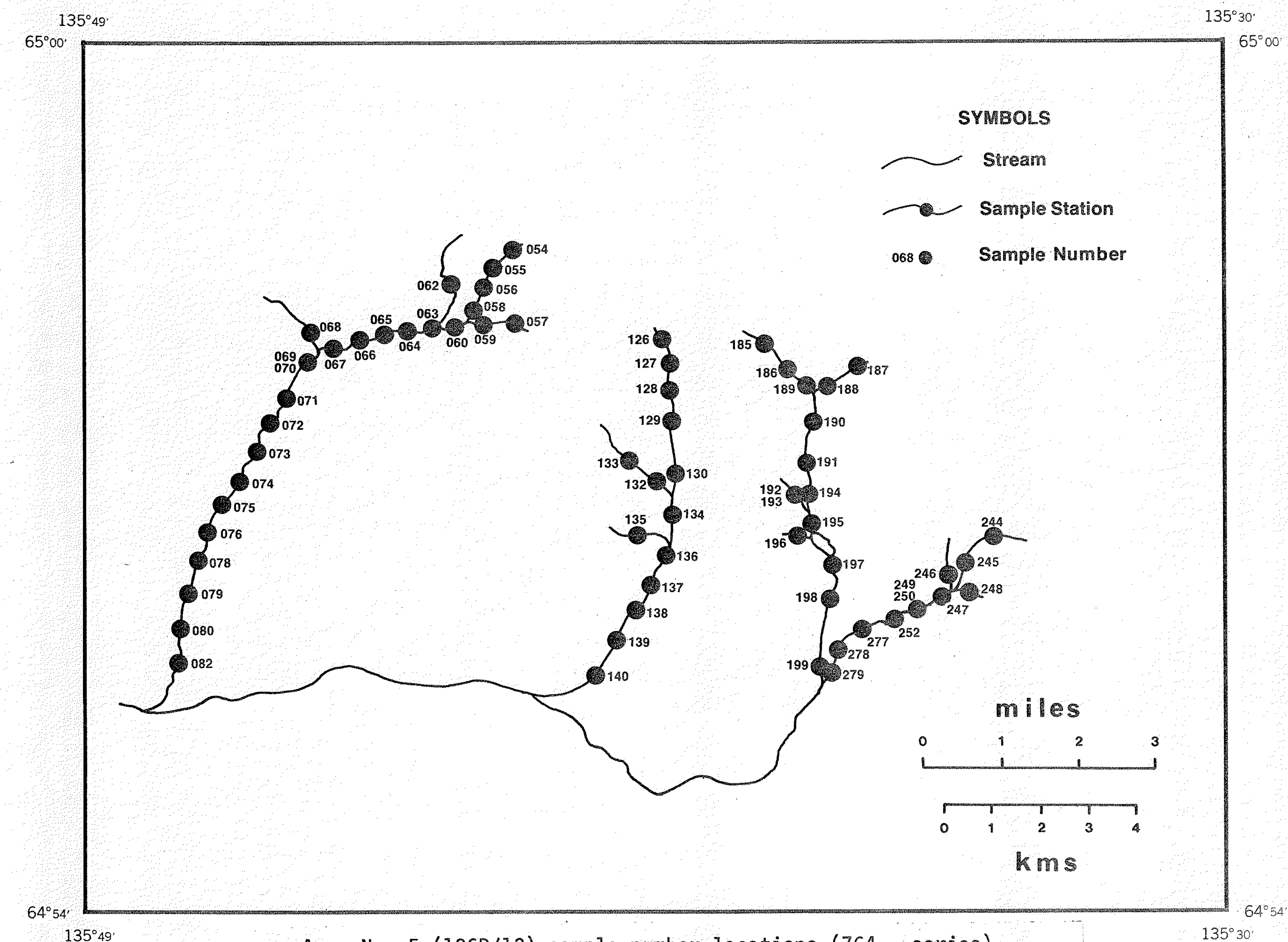
Area No. 2 (106D/14,15) sample number locations (764 - series).



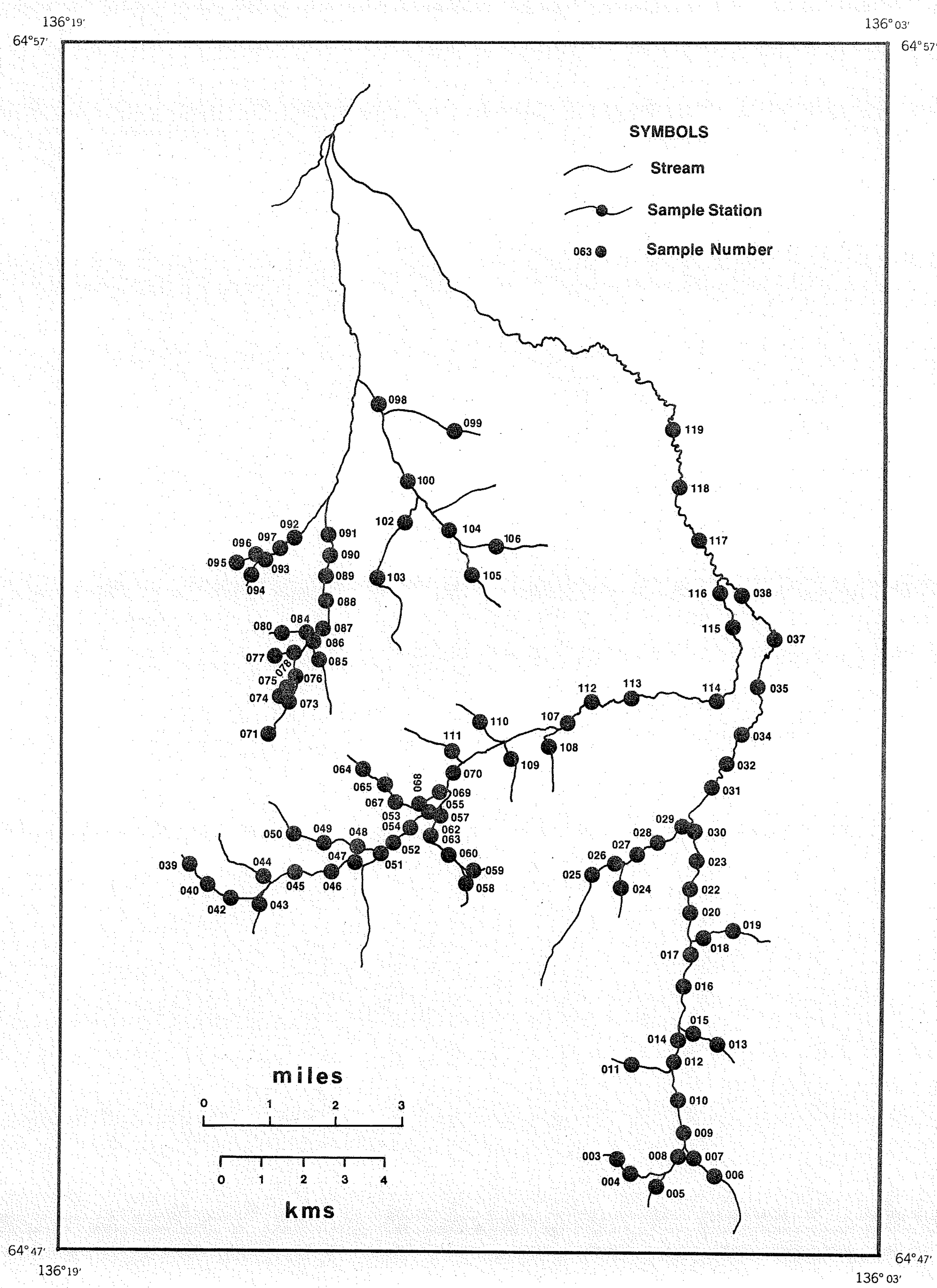
Area No. 3 (106D/10) sample number locations (764 - series).



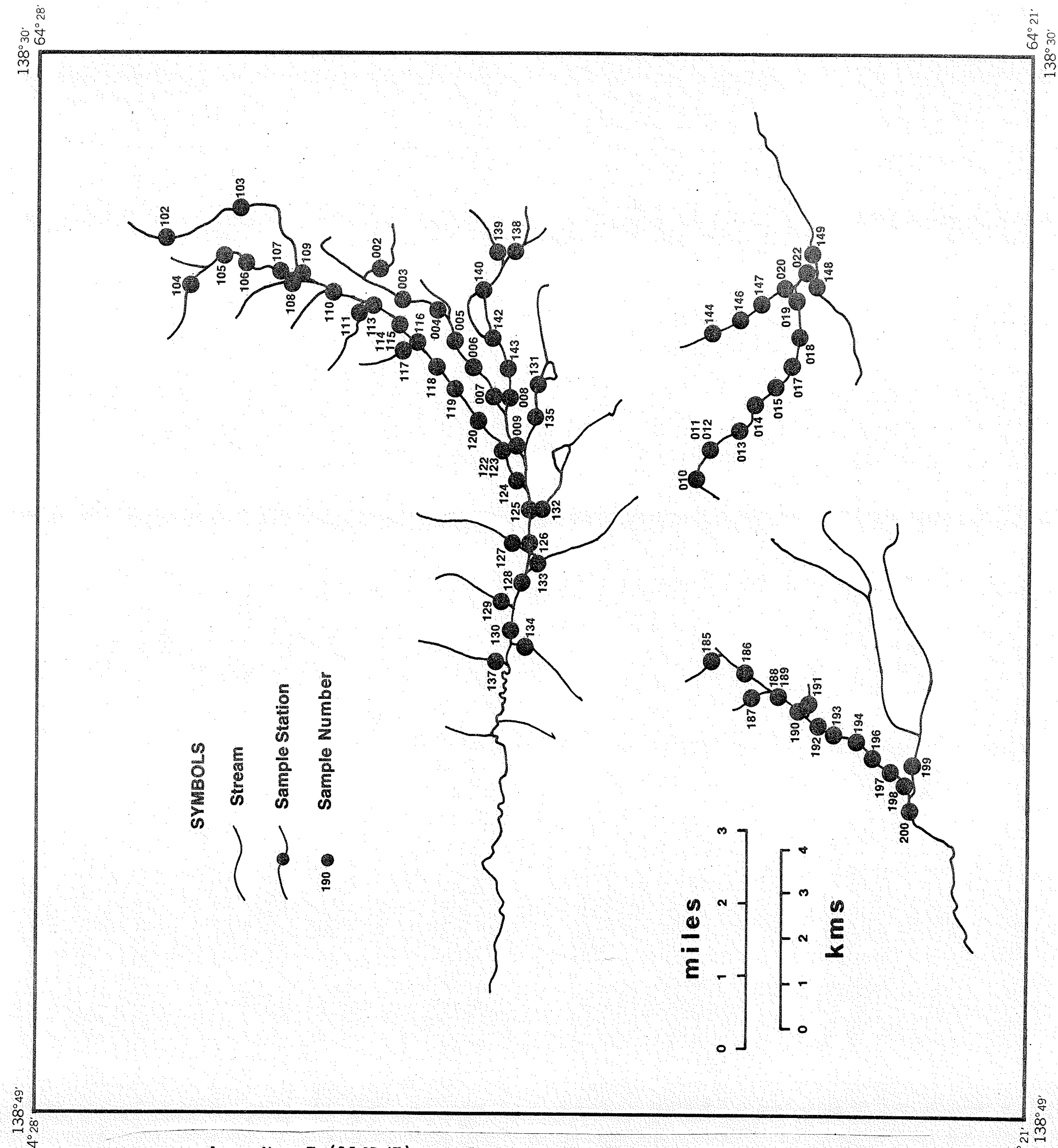
Area No. 4 (106E/4) sample number locations (764 - series).



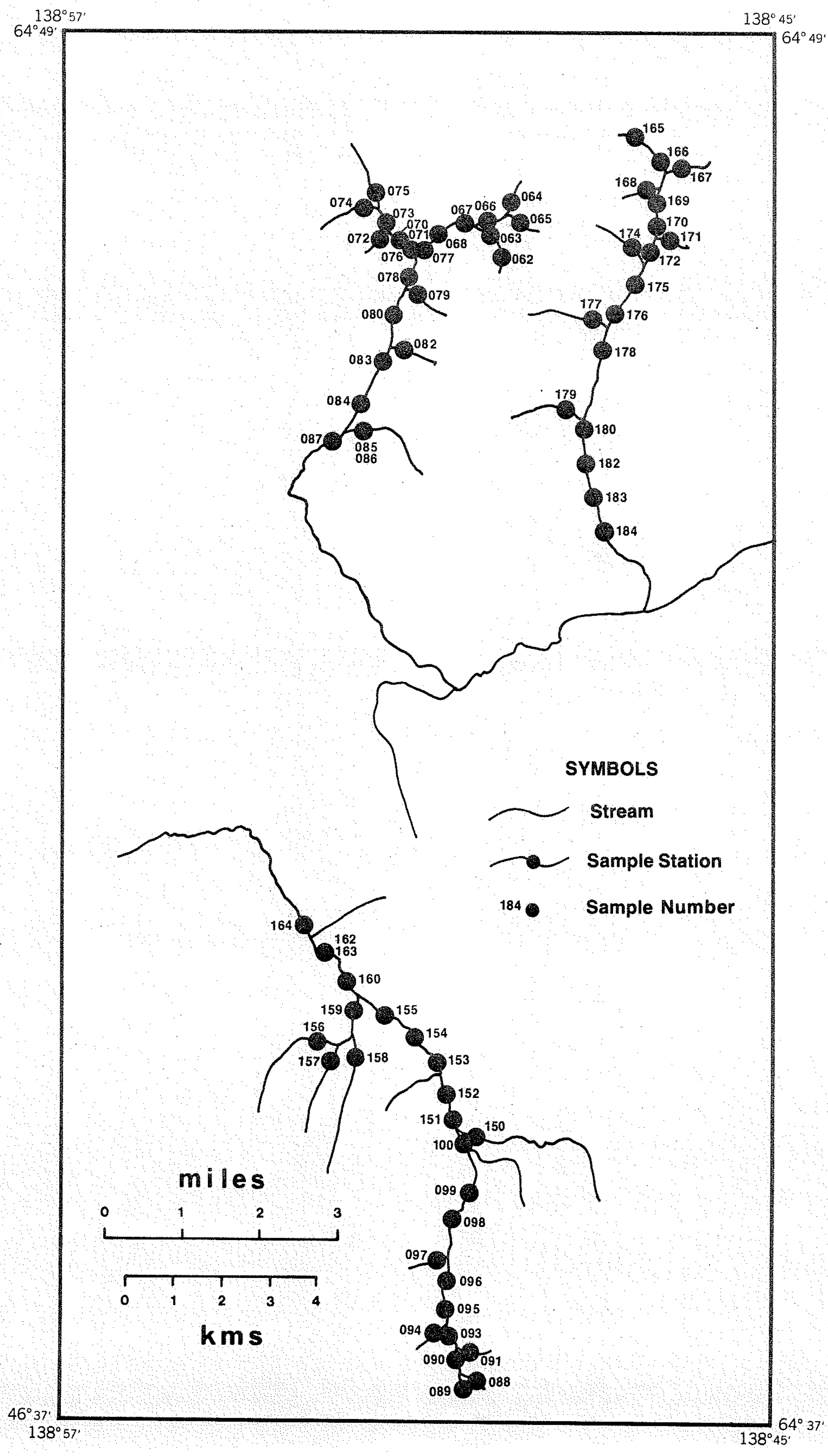
Area No. 5 (106D/13) sample number locations (764 - series)



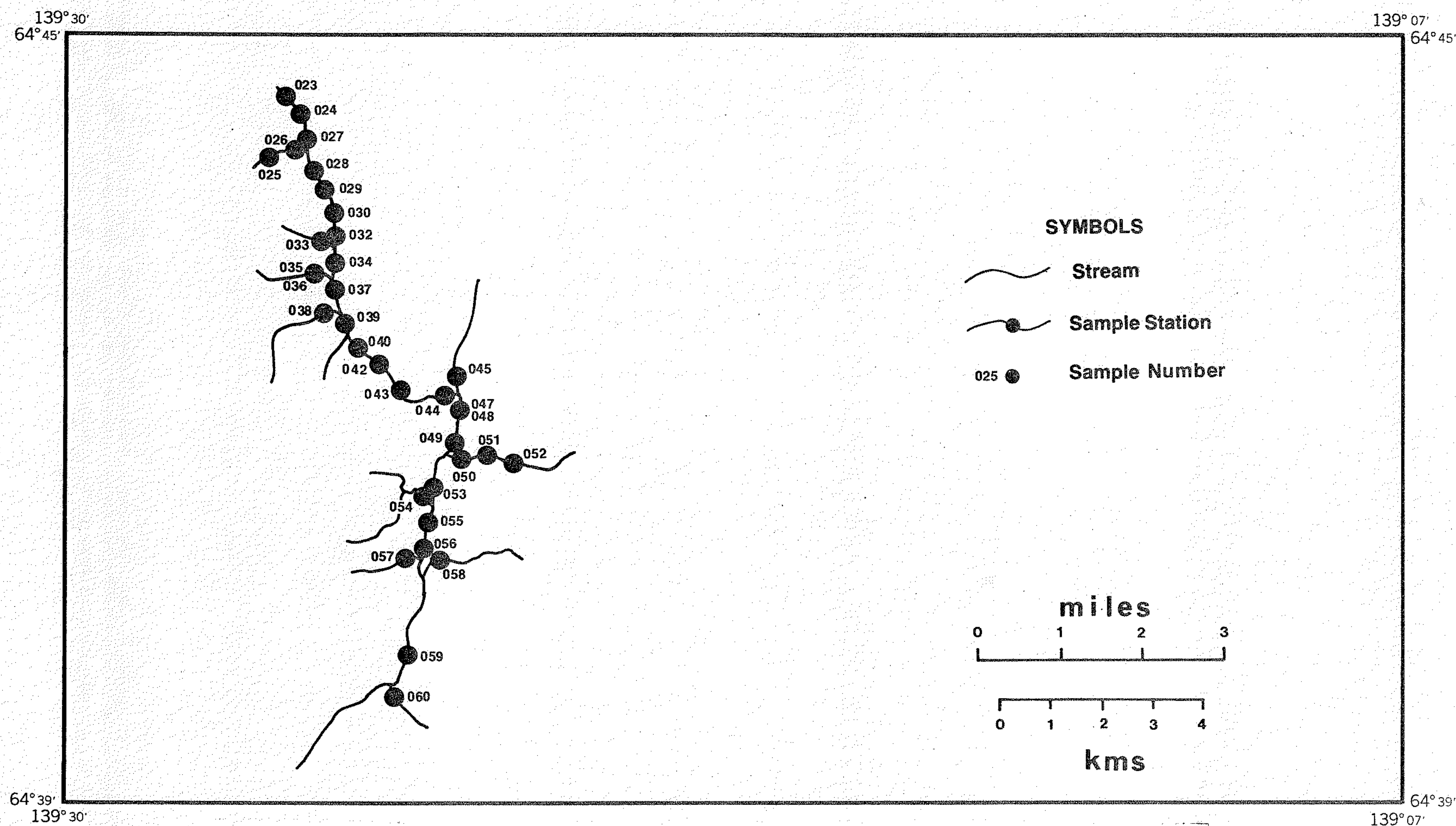
Area No. 6 (116A/16) sample number locations (764 - series).



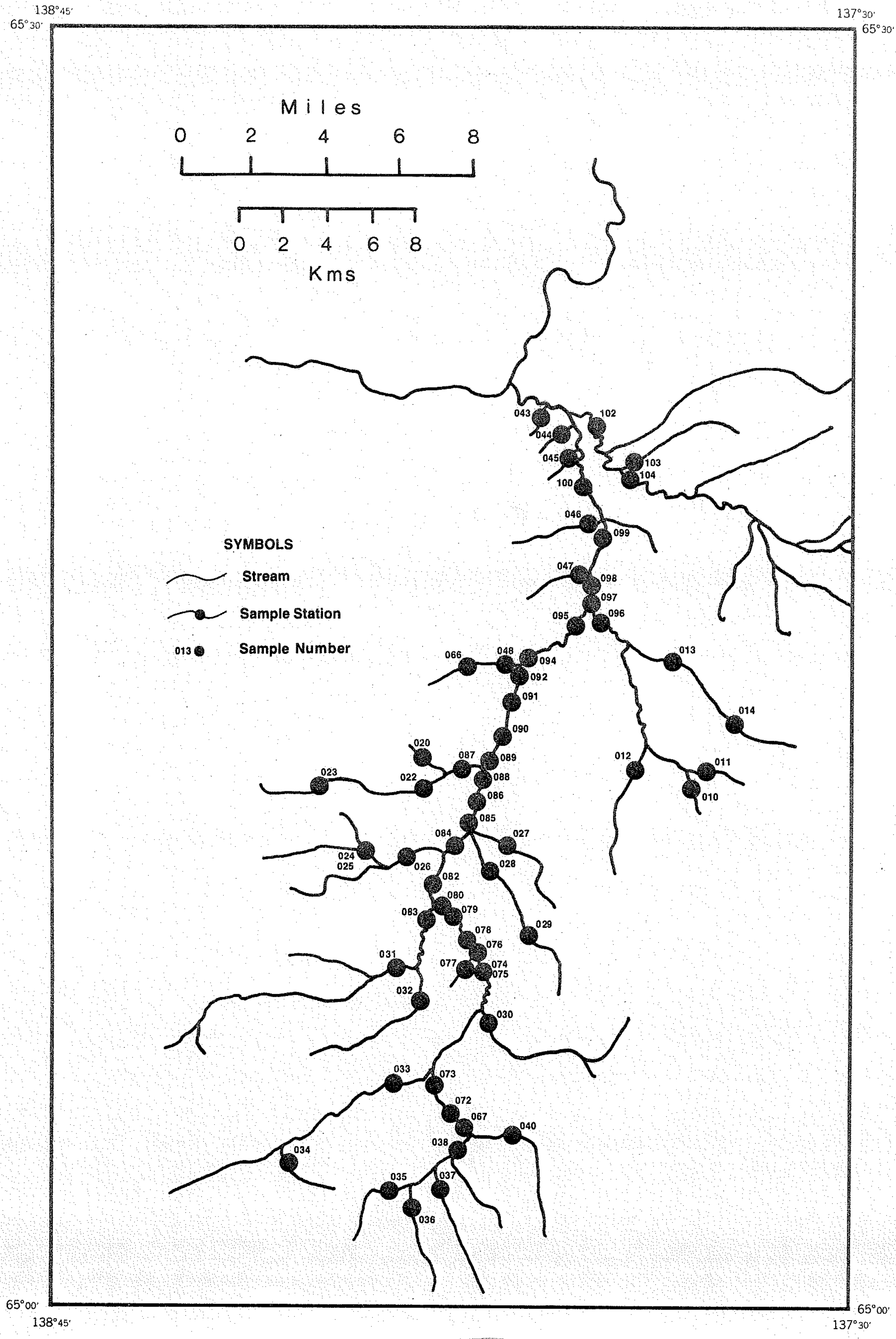
Area No. 7 (116B/7) sample number locations (764 - series).



Area No. 8 (116B/10) sample number locations (764 - series).



Area No. 9 (116B/11) sample number locations (764 - series).



Area No. 10 (116G/1) sample number locations (762 - series).

APPENDIX II

U, F and pH in Stream Waters from each Detail Area (U and F determined by fluorimetric and specific ion electrode methods, respectively).

DETAIL AREA NO. 1 (106E/2)

SAMPLE	U-PPB	F-PPB	PH
764192	0.02	10	8.3
764193	0.02	10	8.3
764194	0.02	10	8.2
764195	0.04	10	8.3
764196	0.02	10	8.4
764197	0.08	10	8.3
764198	0.16	10	8.3
764199	0.20	10	8.3
764200	0.24	20	8.3
764202	0.06	10	8.3
764203	0.18	10	8.3
764204	0.08	10	8.3
764205	0.10	26	8.3
764207	0.10	24	8.3
764208	0.04	10	7.7
764209	0.04	10	7.7
764210	0.06	10	8.1
764211	0.14	20	8.4
764212	0.16	20	8.3
764213	0.10	22	8.4
764214	0.12	20	8.4
764215	0.06	10	7.3
764217	0.08	10	7.4
764218	0.10	10	7.2
764219	0.08	10	7.2
764220	0.16	20	7.3
764222	0.08	10	7.8
764224	0.08	10	7.7
764225	0.08	10	7.6
764226	0.08	10	8.4
764227	0.16	10	8.3
764228	0.08	10	8.4
764229	0.32	10	8.4
764230	0.08	10	8.2
764231	0.52	20	8.3
764232	0.34	20	8.3
764233	0.12	20	8.3
764234	0.10	10	8.3
764235	0.12	10	8.3
764237	0.12	20	8.0
764238	0.12	20	8.2
764239	0.12	20	8.2
764240	0.16	22	8.3
764241	0.26	22	8.2
764242	0.12	24	8.3
764244	0.10	26	8.3
764245	0.08	26	8.4
764246	0.08	26	8.3
764247	0.06	22	8.2
764249	0.08	26	8.2

SAMPLE	U-PPB	F-PPB	PH
764250	0.16	26	8.2
764251	0.12	26	8.3
764252	0.14	26	8.2
764253	0.72	20	8.2
764254	0.02	24	8.0
764255	0.52	22	8.3
764256	0.58	22	7.8
764257	0.44	20	7.8
764258	0.02	22	8.2
764259	0.02	10	7.1
764260			
764262	0.02	10	7.2
764263	0.02	10	7.1
764265	0.02	10	6.9
764266	0.02	10	6.9
764267	0.02	10	6.6
764268	0.02	10	7.0
764269	0.04	10	7.0
764270	0.06	10	7.3
764271	0.02	10	7.0
764272	0.02	10	7.1
764273	0.02	10	7.2
764274	0.04	10	7.1
764275	0.06	20	7.2
764277	0.06	10	7.3
764278	0.06	10	7.7
764279	0.02	10	7.4
764280	0.12	10	7.4
764282	0.02	20	7.3
764283	0.08	10	7.3
764285	0.06	10	7.2
764286	0.14	22	7.8
764287	0.02	10	7.4
764289	0.02	10	7.4
764290	0.02	10	7.3
764291	0.02	10	7.2
764292	0.02	10	7.3
764293	0.06	10	7.2
764294	0.02	10	7.3
764295	0.02	10	7.5
764296	0.02	20	7.3
764297	0.10	24	7.4
764298	0.02	24	7.4
764299	0.06	26	7.5
764300	0.06	28	7.5
764302			
764305	0.08	26	7.5
764306	0.08	20	7.8
764307	0.12	22	7.5
764308	0.08	20	7.1

SAMPLE	U-PPB	F-PPB	PH
764309	0.02	22	7.5
764310	0.06	10	7.5
764311	0.06	24	7.5
764312	0.08	44	7.4
764313	0.02	38	7.4
764314	0.02	34	7.3
764315	0.02	36	7.4
764316	0.02	34	7.2
764317	0.04	36	7.1
764318	0.02	28	6.8
764319	0.04	10	6.7
764320	0.02	10	6.8
764322	0.08	10	7.0
764323	0.02	10	6.9
764324			
764326	0.06	10	7.4
764327	0.02	10	7.2
764328	0.02	10	7.0
764329	0.16	10	6.9
764330			
764331			
764332			
764333			
764334			
764335	0.02	10	6.7
764336	0.06	10	6.8
764337	0.10	20	6.7
764339	0.08	10	6.9
764340	0.02	26	7.2
764342	0.02	24	7.3
764343	0.02	24	7.3
764344	0.14	28	7.4
764345	0.08	28	7.3
764347			
764348			
764349			
764350			
764351	0.02	30	7.3
764352	0.02	34	7.5
764353			
764354	1.20	50	6.6
764355	1.60	82	6.7
764357	1.60	92	6.8
764358	11.80	142	6.7
764359	2.60	132	6.8
764360	2.00	164	7.0
764362			
764363			
764365	0.08	24	7.5
764367	0.02	10	7.5

DETAIL AREA NO. 1 (106E/2)

SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH
764368	0.06	10	7.5								
764369	0.02	20	7.5								
764370	1.06	10	7.9								
764371	0.40	48	7.8								
764372	0.88	10	8.0								
764373	0.20	10	8.2								
764374	0.10	30	8.3								
764375	0.06	28	8.3								
764376	0.14	30	8.2								
764377	0.12	30	8.3								
764378	0.16	28	8.3								
764379	0.14	30	8.3								
764380	0.22	28	8.3								
764382	0.10	28	8.3								
764383	0.10	28	8.2								
764384	0.14	26	8.2								
764385	0.30	34	8.4								
764386	0.56	34	8.2								
764387	0.48	34	8.3								
764388											
764389	0.72	32	8.3								
764390	0.88	32	8.3								
764392	0.84	38	8.4								
764393	0.02	36	7.9								
764394	0.22	24	8.1								
764395	0.24	28	8.2								
764396	0.04	34	7.8								
764398	0.08	22	8.0								
764399	0.10	34	8.0								
764400	0.26	36	8.0								
764402	0.24	46	8.0								
764403	0.16	50	8.0								
764404	0.20	54	7.9								
764405	0.24	54	7.8								
764406	0.14	44	7.7								
764407	0.04	28	7.5								
764408	0.04	20	7.4								

DETAIL AREA NO. 2 (106D/1415)

SAMPLE	U-PPB	F-PPB	PH
764002	0.26	10	7.4
764003	0.18	10	7.8
764004	0.22	10	7.7
764005	0.14	10	7.7
764006	0.14	10	7.8
764007	0.20	10	7.8
764009	0.06	10	7.9
764010	0.18	10	7.9
764011	0.22	10	8.0
764012	0.50	10	8.0
764013	0.38	10	8.0
764014	0.22	20	8.0
764015	0.02	20	8.0
764016	0.40	22	8.0
764018	0.16	10	8.1
764019	0.16	28	8.1
764020	0.02	10	8.0
764022	0.10	10	8.1
764023	0.02	10	8.0
764024	0.14	10	8.1
764025	0.08	10	8.0
764026	0.18	10	8.0
764027	0.28	10	8.0
764028	0.24	10	8.1
764029	0.08	10	8.1
764031			
764032	0.12	10	8.1
764033	0.12	36	8.1
764034	0.02	10	8.0
764036	0.02	10	8.1
764037	0.10	10	7.7
764038	0.04	10	8.0
764039	0.02	10	8.0
764040	0.04	10	7.9
764042	0.02	10	7.9
764043	0.06	10	7.8
764044	0.02	20	8.0
764046	0.02	10	8.0
764047	0.04	24	8.1
764048	0.02	10	8.0
764049	0.02	20	8.0
764050	0.06	20	8.1
764051	0.02	20	8.1
764052	0.02	20	8.1
764083	0.02	10	8.0
764084	0.02	10	8.0
764085			
764087	0.02	36	8.0
764088	0.08	38	8.0
764089	0.16	20	7.9

SAMPLE	U-PPB	F-PPB	PH
764090	0.02	58	7.7
764091	0.14	34	7.8
764092	0.12	34	7.9
764093	0.12	34	7.9
764094	0.18	34	7.9
764095	0.20	36	8.0
764096	0.14	36	8.1
764097	0.16	44	7.9
764098	0.06	30	7.6
764099	0.12	38	7.8
764100	0.12	60	7.9
764102	0.18	10	8.0
764103	0.08	24	7.5
764104	0.20	20	7.9
764105	0.10	10	8.0
764106	0.16	10	8.0
764107	0.20	24	8.1
764108	0.04	28	8.0
764109	0.02	28	8.3
764110	0.16	26	8.2
764111	0.02	28	8.1
764112	0.02	28	8.2
764113	0.02	28	8.3
764114	0.02	28	8.2
764115	0.04	28	8.3
764117	0.08	26	8.1
764118	0.10	26	8.2
764119	0.12	28	8.2
764122	0.10	28	8.2
764123	0.10	28	8.2
764124	0.08	30	8.2
764125	0.10	30	7.8
764143	0.02	10	8.2
764144	0.02	20	7.7
764145	0.06	20	8.1
764146	0.10	20	8.1
764147	0.06	20	8.1
764148	0.08	20	8.2
764149	0.04	22	8.1
764150	0.04	20	8.2
764151	0.04	10	8.2
764152	0.06	10	8.2
764153	0.06	10	8.2
764154	0.06	22	7.9
764156	0.12	24	8.0
764157	0.08	26	8.1
764158	0.06	29	8.1
764159	0.02	28	8.1
764160	0.02	28	8.2
764162	0.06	32	7.2

SAMPLE	U-PPB	F-PPB	PH
764163	0.02	30	7.3
764164	0.02	26	8.0
764165	0.10	30	8.0
764166	0.12	30	8.0
764167	0.10	36	8.1
764202	0.10	60	8.0
764204	0.06	44	7.9
764206	0.08	52	8.2
764207	0.06	46	8.2
764208	0.04	44	8.0
764209	0.14	52	8.0
764210	0.04	56	7.7
764211	0.04	60	8.0
764212	0.02	44	8.2
764213	0.06	24	8.2
764214	0.08	24	8.2
764215	0.06	28	8.3
764216	0.06	30	8.2
764217	0.06	32	8.2
764218			
764219	0.06	42	8.2
764220	0.10	46	8.2

DETAIL AREA NO. 3 (106D/10)

SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH
764168	0.02	24	8.2								
764169	0.02	20	8.2								
764170	0.06	10	8.2								
764171	0.02	10	8.2								
764172	0.04	10	7.9								
764174	0.10	10	8.2								
764176	0.04	10	8.2								
764177	0.06	10	8.2								
764178	0.04	10	8.2								
764179	0.04	10	8.3								
764180	0.06	10	8.3								
764182	0.08	22	8.3								
764184	0.14	24	8.3								
764222	0.04	22	8.4								
764224	0.02	38	8.3								
764225	0.04	20	8.2								
764226	0.02	10	7.9								
764227	0.06	20	8.0								
764228	0.10	10	8.1								
764229	0.14	10	8.1								
764230	0.20	20	8.2								
764231	0.10	20	8.2								
764232	0.10	22	8.3								
764233	0.12	24	8.3								
764235	0.16	28	8.3								
764236	0.20	28	8.2								
764237	0.28	32	8.2								
764238	0.20	30	8.2								
764239	0.10	30	8.1								
764240	0.08	28	8.3								
764242	0.02	28	8.3								
764243	0.02	30	8.3								

SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH
764002	0.02	22	7.6	764060	0.02	10	7.5	764119	0.02	30	8.0
764003	0.12	22	7.7	764062	0.02	10	8.3	764120	0.02	32	8.2
764004	0.06	10	7.4	764064	0.02	10	8.3	764122	0.02	10	8.4
764006	0.04	26	7.6	764065	0.02	10	8.1	764123	0.16	10	8.1
764007				764066	0.02	10	8.0	764125	0.08	10	8.0
764009	0.10	24	7.8	764067	0.02	10	7.6	764126	0.16	10	8.1
764010	0.12	26	7.7	764068	0.02	10	8.0	764127			
764011	0.20	30	7.7	764070	0.10	10	8.0	764128	0.02	26	8.0
764012	0.04	30	7.9	764071	0.02	10	7.9	764129	0.02	30	8.0
764013	0.08	32	7.9	764072	0.02	10	8.3	764130	0.06	30	8.1
764014	0.04	28	7.7	764073	0.02	10	8.1	764131	0.20	10	7.6
764015	0.02	10	7.7	764074	0.06	10	8.0	764132	0.08	10	7.6
764016	0.04	26	7.8	764075	0.04	10	8.1	764133	0.08	10	7.9
764017	0.02	26	7.5	764076	0.90	10	8.0	764134	0.08	10	7.9
764018	0.12	10	7.9	764077	0.02	10	8.0	764135	0.02	10	8.0
764019	0.10	24	7.6	764078	0.02	10	8.0	764136	0.04	10	8.3
764020	0.10	24	7.8	764079	0.02	10	7.8	764137	0.02	10	8.0
764022	0.06	26	7.8	764080	0.02	10	8.0	764138	0.04	10	8.2
764024	0.10	22	7.4	764082	0.02	10	7.4	764140	0.10	20	7.6
764025	1.80	20	7.4	764085	0.04	10	8.0	764142	0.08	10	7.8
764026	0.04	10	6.5	764086	0.04	10	7.9	764143	0.12	10	7.9
764027	0.02	10	6.5	764087	0.06	10	7.9	764144	0.16	26	7.9
764028	0.04	10	6.4	764088	0.02	10	7.6	764146	0.08	20	7.9
764029	0.40	10	6.5	764089	0.06	10	7.5	764148	0.08	10	8.0
764030	0.02	10	6.8	764090	0.02		8.0	764149	0.12	10	8.1
764031	0.08	10	6.8	764091	0.06	10	7.9	764150	0.04	10	8.3
764032	0.02	20	6.8	764092	0.06	10	7.8	764151	0.04	10	8.2
764033	0.02	10	6.9	764093	0.02	10	7.9	764152	0.02	10	8.2
764034	0.14	10	6.9	764094	0.02	10	7.7	764153	0.06	10	7.9
764036	0.02	22	6.9	764095	0.02	10	7.9	764154	0.04	10	8.0
764037	0.02	22	6.9	764096	0.02	10	8.1	764155	0.04	10	7.9
764038	0.02	22	7.0	764097	0.02	10	8.1	764156	0.02	10	7.5
764039	0.02	22	6.9	764098	0.02	10	8.0	764157			
764040				764099	0.08	10	8.0	764158	0.10	20	8.0
764042	0.02	10	7.2	764100	0.04	10	7.9	764159	0.06	20	8.0
764043	0.06	10	6.8	764102	0.06	10	8.1	764160	0.04	20	8.1
764045	0.02	20	6.6	764104	0.06	10	8.0	764162	0.10	24	7.7
764046	0.02	22	6.8	764105	0.02	10	8.1	764163			
764047	0.02	10	7.5	764106	0.02	10	8.1	764164	0.02	22	7.6
764048	0.04	20	7.5	764107	0.08	24	8.3	764165	0.08	22	8.2
764049	0.06	10	7.4	764108	0.02	38	7.7	764166	0.04	22	8.1
764050	0.12	10	7.5	764109	0.08	36	8.2	764167	0.06	22	8.1
764051	0.02	10	7.8	764110	0.04	46	7.6	764169	0.12	22	8.2
764052	0.02	10	6.6	764111	0.04	36	8.2	764170	0.10	28	8.3
764053	0.02	10	7.8	764112	0.10	38	8.1	764172	0.08	20	8.1
764055	0.04	26	7.9	764113	0.02	30	8.1	764173	0.58	22	8.0
764056	0.02	10	8.0	764114	0.02	38	8.2	764174	0.08	10	7.2
764057	0.02	22	8.1	764116	0.02	28	8.2	764175	0.06	10	7.1
764058	0.06	22	7.9	764117	0.02	28	8.2	764176			
764059	0.02	10	7.8	764118	0.02	20	8.1	764177	0.02	20	8.2

SAMPLE	U-PPB	F-PPB	PH
764178	0.04	20	8.1
764179	0.02	20	8.3
764180	0.02	26	7.9
764182	0.04	24	8.2
764184	0.06	22	8.2
764185	0.02	20	8.2
764187	0.02	10	8.2
764188	0.02	10	8.1
764189	0.02	20	8.2
764190	0.02	24	8.2

SAMPLE	U-PPB	F-PPB	PH

SAMPLE	U-PPB	F-PPB	PH

DETAIL AREA NO. 5 (106D/13)

SAMPLE	U-PPB	F-PPB	PH
764054	0.08	20	7.8
764055	0.04	10	7.9
764056	0.50	20	8.0
764057	0.02	20	7.9
764058	0.02	22	7.9
764059	0.12	22	7.9
764060	0.14	26	8.0
764062	0.04	24	7.6
764063	0.04	26	7.9
764064	0.10	24	8.0
764065	0.08	26	8.2
764066	0.14	24	8.2
764067	0.24	26	8.1
764068			
764069	0.12	24	8.1
764071	0.10	26	8.1
764072	0.12	24	8.1
764073	0.18	28	8.1
764074	0.10	26	8.2
764075	0.12	26	7.9
764076	0.12	24	8.0
764078	0.10	10	8.0
764079	0.10	10	8.0
764080	0.10	10	8.0
764082	0.20	10	8.0
764126	0.02	10	8.2
764127	0.02	10	8.2
764128	0.02	10	8.0
764129	0.02	10	7.7
764130	0.04	10	8.0
764132	0.08	10	8.1
764133	0.06	10	8.1
764134	0.06	10	8.2
764135	0.06	10	8.0
764136	0.10	20	8.1
764137	0.02	20	7.2
764138	0.06	20	8.2
764139	0.06	10	8.3
764140	0.04	10	8.2
764185	0.04	20	8.2
764186	0.04	22	8.0
764187	0.02	10	8.1
764188	0.02	10	8.1
764189	0.02	20	8.1
764190	0.02	20	8.1
764191	0.02	22	8.2
764192	0.06	22	8.4
764194	0.02	10	8.3
764195	0.02	20	8.2
764196	0.02	22	8.2
764197	0.02	20	8.1
764198	0.04	20	8.1
764199	0.02	20	8.2
764244	0.02	22	8.0
764245	0.02	20	7.9
764246	0.02	10	7.6
764247	0.02	20	7.7
764248	0.02	24	7.9
764249	0.02	20	7.9
764250	0.02	20	7.8
764252	0.02	22	7.8
764277	0.02	20	7.9
764278	0.02	10	8.0
764279	0.02	20	7.7

SAMPLE	U-PPB	F-PPB	PH

DETAIL AREA NO. 6 (116A/16)

SAMPLE	U-PPB	F-PPB	PH
764003	0.02	10	7.5
764004	0.02	20	7.0
764005	0.02	10	7.1
764006	0.02	20	7.3
764007	0.02	22	7.4
764008	0.02	10	7.2
764009	0.02	20	7.5
764010	0.02	20	7.5
764011	0.02	10	7.4
764012	0.04	30	7.6
764013	0.02	20	7.4
764014	0.02	22	7.5
764015	0.02	10	7.4
764016	0.04	22	7.6
764017	0.04	22	7.5
764018	0.08	10	8.1
764019	0.04	10	8.1
764020	0.02	20	7.7
764022	0.02	20	7.7
764023	0.02	22	7.5
764024	0.02	10	7.5
764025	0.02	10	7.9
764026	0.02	10	7.7
764027	0.02	10	7.6
764028	0.04	10	7.8
764029	0.02	10	7.9
764030	0.02	22	7.6
764131	0.08	10	7.8
764032	0.04	22	7.8
764033	0.04	20	7.8
764034	0.12	20	7.8
764035	0.08	20	7.9
764037	0.06	20	7.9
764038	0.08	22	7.9
764039	0.14	10	7.0
764040	0.02	10	7.4
764042	0.02	10	7.5
764043	0.02	10	7.4
764044	0.02	10	7.3
764045	0.06	10	7.4
764046	0.02	10	7.5
764047	0.02	10	7.4
764048	0.04	10	7.7
764049	0.02	10	7.6
764050	0.02	10	7.7
764051	0.04	10	7.4
764052	0.06	10	7.5
764053	0.02	10	7.4
764055	0.02	10	7.6
764057	0.02	10	8.1

SAMPLE	U-PPB	F-PPB	PH
764058	0.02	10	8.1
764059	0.02	10	8.3
764060	0.02	10	7.8
764062	0.04	10	8.1
764064	0.02	10	7.6
764065	0.02	10	7.6
764067	0.02	10	7.7
764068	0.04	10	7.3
764069	0.02	10	6.9
764070	0.02	10	7.4
764071	0.02	10	6.9
764072	0.02	10	7.1
764073	0.02	10	7.0
764074	0.02	10	6.3
764075	0.02	10	6.6
764076	0.02	10	7.1
764077	0.02	10	7.8
764078	0.02	10	8.2
764079	0.02	10	7.5
764080	0.02	10	8.0
764083	0.02	10	8.1
764085	0.02	10	7.5
764086	0.02	10	7.4
764087	0.02	10	7.5
764088	0.02	10	7.7
764089	0.02	10	7.8
764090	0.02	10	7.7
764091	0.02	10	7.7
764092	0.02	10	8.1
764093	0.02	10	8.3
764094	0.02	10	8.3
764095	0.02	10	8.1
764096	0.02	10	8.1
764097	0.02	10	8.2
764098	0.12	10	8.4
764099	0.02	30	8.3
764100	0.14	10	8.4
764102	0.02	10	8.0
764103	0.02	10	8.1
764104	0.16	10	8.2
764105	0.02	10	8.2
764106	1.40	36	8.5
764107	0.08	10	8.1
764109	0.02	10	8.1
764110	0.06	10	8.1
764111	0.02	10	8.1
764112	0.02	10	7.8
764113	0.08	10	7.9
764114	0.22	10	7.9
764115	0.08	10	7.9

SAMPLE	U-PPB	F-PPB	PH
764116	0.10	10	7.9
764117	0.04	10	7.9
764118	0.12	10	7.6
764119	0.04	10	7.7

DETAIL AREA NO. 7 (116B/7)

SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH
764002	0.08	290	7.4	764139	0.92	280	7.1				
764003	0.22	300	7.3	764140	0.56	330	7.2				
764004	0.08	300	7.3	764142	0.24	300	7.0				
764005	0.08	380	7.4	764143	0.26	330	7.0				
764006	0.04	400	7.3	764144	0.04	400	6.6				
764007	0.10	410	7.3	764146	0.20	440	7.0				
764008	0.14	340	7.2	764147	0.10	460	6.7				
764009	0.12	400	7.3	764185	0.02	220	7.3				
764010	0.12	310	7.3	764186	0.02	220	7.2				
764011	0.60	370	7.1	764187	0.02	84	7.4				
764013	0.04	210	7.1	764188	0.02	260	7.3				
764014	0.06	400	7.3	764190	0.02	280	7.3				
764015	0.10	450	7.4	764191	0.10	120	7.8				
764017	0.12	490	7.3	764192	0.02	240	7.4				
764018	0.10	550	7.5	764193	0.02	240	7.5				
764019	0.12	570	7.4	764194	0.02	240	7.5				
764020	0.08	500	7.1	764196	0.02	230	7.5				
764022	0.06	560	7.4	764197	0.02	240	7.5				
764102	0.02	26	6.5	764198	0.02	240	7.4				
764103	0.02	24	6.2	764199	0.02	60	7.9				
764104	0.04	30	6.6	764200	0.02	56	7.6				
764105	0.02	36	6.8								
764106	0.18	42	6.9								
764107	0.02	48	6.9								
764108	0.08	68	7.0								
764109	0.02	66	7.0								
764110	0.04	92	7.0								
764111	0.02	132	7.0								
764113	0.74	100	6.8								
764114	0.04	142	7.1								
764116	0.04	144	7.1								
764117	0.04	300	7.1								
764118	0.04	172	7.1								
764119	0.02	156	7.1								
764120	0.02	184	7.2								
764122	0.02	210	7.3								
764124	0.02	220	7.2								
764125	0.08	360	7.3								
764126	0.10	370	7.3								
764127	0.02	152	7.0								
764128	0.08	360	7.2								
764129	0.04	240	7.2								
764130	0.06	360	7.2								
764131	0.46	300	6.9								
764132	0.06	350	7.0								
764133	0.20	280	7.1								
764134	0.40	410	7.3								
764135	0.64	310	6.7								
764137	0.02	168	6.9								
764138	1.00	176	7.0								

DETAIL AREA NO. 8 (116B/10)

SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH
764062	0.04	28	8.1	764120	0.02	184	7.2	764178	0.02	26	8.3
764063				764122	0.02	210	7.3	764179	0.02	22	8.3
764064	0.06	24	8.2	764124	0.02	220	7.2	764180	0.02	24	8.5
764065	0.02	20	8.1	764125	0.08	360	7.3	764182	0.12	24	8.5
764066	0.04	20	8.2	764126	0.10	370	7.3	764183	0.02	22	8.3
764067				764127	0.02	152	7.0	764184	0.10	26	8.5
764069				764128	0.08	360	7.2				
764070	0.02	22	8.4	764129	0.04	240	7.2				
764072	0.02	22	8.3	764130	0.06	360	7.2				
764073	0.02	22	8.3	764131	0.46	300	6.9				
764074	0.02	24	8.4	764132	0.06	350	7.0				
764075				764133	0.20	280	7.1				
764076	0.02	28	8.4	764134	0.40	[illegible]10	7.3				
764077				764135	0.64	[illegible]10	6.7				
764078	0.02	30	8.5	764137	0.02	168	6.9				
764079				764138	1.00	176	7.0				
764080	0.02	30	8.4	764139	0.92	280	7.1				
764082	0.02	34	8.1	764140	0.56	330	7.2				
764083	0.02	34	8.2	764142	0.24	300	7.0				
764084	0.02	36	8.4	764143	0.26	330	7.0				
764085	0.02	30	8.4	764144	0.04	400	6.6				
764087	0.02	32	8.4	764146	0.20	440	7.0				
764088	0.02	28	8.1	764147	0.10	460	6.7				
764089	0.02	30	8.3	764148	0.02	72	7.6				
764090	0.02	36	8.2	764149	0.06	500	7.4				
764091	0.04	38	7.7	764150	0.06	112	8.2				
764093	0.06	36	8.1	764151	0.02	52	8.2				
764094	0.04	32	8.2	764152	0.02	48	8.1				
764095	0.04	36	8.2	764153	0.04	50	7.9				
764096	0.06	30	8.2	764154	0.06	52	8.1				
764097	0.04	34	8.1	764155	0.08	54	8.1				
764098	0.12	40	8.2	764156	0.02	54	7.8				
764099	0.10	36	8.2	764157	0.36	114	7.9				
764100	0.08	38	8.4	764158	0.08	116	7.9				
764102	0.02	26	6.5	764159	0.10	88	8.0				
764103	0.02	24	6.2	764160	0.08	54	8.1				
764104	0.04	30	6.6	764162	0.30	56	8.1				
764105	0.02	36	6.8	764164	0.14	58	8.0				
764106	0.18	42	6.9	764165	0.02	22	7.7				
764107	0.02	48	6.9	764166	0.02	10	8.3				
764108	0.08	68	7.0	764167	0.02	10	8.3				
764109	0.02	66	7.0	764168	0.02	10	8.1				
764110	0.04	92	7.0	764169	0.02	10	8.3				
764111	0.02	132	7.0	764170	0.02	10	8.0				
764113	0.74	100	6.8	764171	0.02	20	8.2				
764114	0.04	142	7.1	764172	0.02	10	8.3				
764116	0.04	144	7.1	764174							
764117	0.04	300	7.1	764175	0.02	28	8.4				
764118	0.04	172	7.1	764176	0.02	28	8.4				
764119	0.02	156	7.1	764177	0.02	30	8.3				

DETAIL AREA NO. 9 (116B/11)

SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH
764023	0.04	52	8.2								
764024	0.08	38	8.3								
764025	0.12	24	8.2								
764026	0.40	22	8.1								
764027	0.16	28	8.4								
764028	0.30	22	8.3								
764029	0.24	20	8.2								
764030	0.22	10	8.2								
764032	0.10	22	8.2								
764033	0.10	24	8.3								
764034	0.10	22	7.8								
764035	0.16	48	8.2								
764037	0.16	36	8.2								
764038	0.08	40	8.2								
764039	0.16	36	8.2								
764040	0.12	42	8.2								
764042	0.14	38	8.2								
764043	0.18	40	8.3								
764044	0.12	36	8.3								
764045	0.18	38	8.2								
764047	0.32	38	8.3								
764049											
764050	0.14	58	8.3								
764051	0.12	62	8.3								
764052	0.08	58	8.3								
764053	0.26	40	8.4								
764054	0.08	42	8.2								
764055	0.20	38	8.3								
764056	0.24	36	8.3								
764057	0.16	40	8.4								
764058	0.18	50	8.5								
764059	0.18	38	8.5								
764060											

DETAIL AREA NO. 10 (116G/1)

SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH	SAMPLE	U-PPB	F-PPB	PH
762010	0.16	112	8.2	762094	2.20	580	7.6				
762011	0.06	76	7.7	762095	1.58	440	8.2				
762012	0.78	260	8.1	762096	1.00	164	8.2				
762013	0.48	82	8.0	762097	0.72	200	8.2				
762014	1.00	108	7.9	762098	1.84	400	8.3				
762020	1.32	360	8.0	762099	1.44	420	8.2				
762022	0.24	96	8.3	762100	1.44	370	8.2				
762023	0.16	94	8.3	762102	0.02	32	8.0				
762024	1.26	184	8.2	762103							
762026	1.92	184	8.2	762104	0.02	46	7.9				
762027	1.00	134	8.1								
762028	0.60	1050	3.9								
762029	0.46	92	8.0								
762030	0.12	92	7.9								
762031	1.72	520	7.5								
762032	0.10	330	3.8								
762033	1.68	320	8.0								
762034	0.02	56	8.2								
762035	0.02	54	8.1								
762036	0.02	28	8.2								
762037	0.02	24	8.3								
762038	0.02	32	8.2								
762040											
762043	0.04	1400	7.9								
762044	0.22	78	8.4								
7620[illegible]5	0.24	112	8.3								
762046	0.42	9000	2.9								
762047	1.54	200	8.1								
762048	1.00	180	8.0								
762066	0.08	92	7.8								
762067	2.50	240	8.4								
762072	1.08	192	8.4								
762073	0.20	88	8.2								
762074	1.12	168	8.2								
762076	1.00	180	7.9								
762077	0.54	380	8.4								
762078	2.00	184	8.3								
762079	4.00	178	8.1								
762080	2.20	180	8.1								
762082	3.00	260	8.1								
762083	1.24	420	7.9								
762084	2.00	280	8.2								
762085	3.20	300	8.2								
762086	3.30	300	8.2								
762087	1.88	136	8.2								
762088	1.82	500	7.7								
762089	2.00	320	8.1								
762090	2.80	320	8.1								
762091	2.20	340	8.2								
762092	2.00	360	8.3								

The stream sediment results shown in Table 14A confirm the presence of anomalous quantities of U in the area, Zn also tends to be high. Two bulk sediment samples were taken, sized (-10+100 mesh and -100 mesh) and separated into heavy and light fractions using bromoform. The results shown in Table 14B indicate that U is abundant in the heavy fractions. The amount of U in the -10+100 mesh heavy fraction is less then found in the -100 mesh heavy fraction. Hence uranium probably occurs in a relatively soft or friable heavy mineral (eg fluorite). Other elements which show marked increases in the heavy mineral concentrates include Pb, Zn, Mo, Mn,Ag and Fe. A molybdenum showing is present at the top of the creek from which sample 75-8181 was taken. The heavy mineral portions of this sample are high in Mo but there are no Mo stream sediment anomalies. In this area particulate dispersion may be contributing as much or more metal to the stream systems as chemical or hydromorphic dispersion.

The water sample results shown in Table 14C indicate near neutral or slightly alkaline pHs for most stream waters. F and SiO_2 are high and anomalous values for Zn (ie$\geq$2ppb) occur in the upper parts of the creeks. Also there is a high value of 7.5ppb Pb in sample 75-161. No lead occurrences are known in the area but they probably exists because the heavy mineral concentrates also contain high Pb and Ag values. Some of the stream water samples contain abnormally high U (ie$\geq$1ppb) but the distribution of anomalous values seem to be more erratic than in the stream sediments.

Table 14D shows the results of 5 granite samples taken at the head of a small tributary from which sediment samples 75-161 and 162 were taken. The results are low for all elements tested.

TABLE 14A: Stream Sediment Samples, Klotassin Area 115J

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]
75-161	17	30	274	1	520	0.5	1.98	10.8	15.7
162	8	17	115	2	300	0.1	1.41	15.4	24.9
163	15	32	140	2	400	0.3	1.78	12.7	22.2
164	8	19	116	3	600	0.2	1.60	8.0	19.3
165	11	24	141	2	650	0.4	1.63	12.9	26.8
166	16	22	122	1	750	0.5	2.02	28.0	33.8
167	10	20	106	3	325	0.4	1.60	12.2	28.0
168	8	16	90	2	235	0.3	1.28	9.0	25.2
169	19	18	91	2	225	0.4	1.96	4.5	7.3
170	32	19	117	4	560	0.7	2.50	5.1	8.0
171	16	22	120	2	505	0.5	2.00	9.7	16.7
172	19	25	142	2	570	0.6	2.22	15.2	21.3
173	16	27	107	2	430	0.4	1.86	14.1	21.8
174	15	26	91	3	205	0.5	1.75	8.7	13.8
175	19	28	360	2	655	0.6	2.63	21.0	25.7
176	17	32	170	2	285	0.6	2.19	13.8	18.8
177	12	33	212	2	290	0.5	1.67	18.5	28.5
178	13	26	198	1	270	0.4	1.45	17.5	20.1
179	14	25	155	3	260	0.5	1.87	22.0	26.4
180	12	23	176	2	275	0.4	1.67	15.8	23.9
181	15	14	53	1	385	0.2	1.68	0.5	3.0

1) Fe in %, other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

Without additional field work it is not possible to assess the economic significance of the stream sediment and water anomalies outlined in this area.

TABLE 14B: Heavy Mineral Samples Klotassin Area 115J

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-8168	2	11	57	2	215	0.3	0.79	2.3	4.8	-10+100 mesh frac.
	17	334	550	30	3320	1.6	22.80	25.0	112	Hvs(-10+100 mesh)
	3	9	59	<1	170	0.1	0.58	2.3	3.6	Lts (" ")
	8	18	126	4	285	0.3	1.36	7.9	21.5	-100 mesh fraction
	4	42	92	8	155	0.2	2.08	66.0	530	Hvs (-100mesh)
	8	16	125	2	285	0.2	1.15	7.2	8.8	Lts (-100 mesh)
75-8181		not analyzed								-10+100 mesh frac
	45	260	1360	23	4200	2.0	20.40	19.3	79.4	Hvs (-10+100 mesh)
	5	20	87	<1	275	<0.1	0.71	3.7	5.0	Lts (-10+100 mesh)
	13	32	174	1	485	0.3	1.47	10.6	14.1	-100 mesh fraction
	102	6300	276	29	2490	18.5	16.9	66.0	178	Hvs (-100 mesh)
	21	100	363	4	1075	1.7	7.60	7.5	14.2	Lts (-100 mesh)

1) Fe in %, other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

In this region little difficulty will be encountered in carrying out low density, helicopter supported geochemical drainage surveys. The results of this study and past experience has proven the value of reconnaissance and detailed geochemical methods in delineating metal rich zones in this unglaciated environment. One of the targets for uranium in Yukon Plateau should be the Tertiary alaskite granites which are common in this sector of Yukon Territory.

TABLE 14C: Stream Water Samples, Klotassin Area 115J

Sample No.	pH	F	SiO_2[1]	Cl[1]	SO_4[1]	Mn	Fe	Cu	Zn	Ag	Pb	U
75-3161	7.50	120	3.62	0.05	1.6	2.5	5.0	0.2	3.9	0.5	7.5	0.14
62	7.40	235	5.39	0.25	1.6	↓	10.3	↓	1.0	0.2	1.3	1.26
63	7.40	315	5.00	0.19	3.1	↓	12.8	↓	3.5	↓	↓	0.94
64	7.27	225	5.39	0.10	4.6	↓	28.1	↓	0.5	↓	↓	0.48
65	6.98	365	5.55	0.10	2.7	↓	14.3	↓	↓	↓	↓	1.18
66	6.96	640	5.60	0.19	2.7	↓	10.3	↓	↓	0.5	↓	0.86
67	6.96	460	5.91	0.10	3.5	↓	16.5	↓	↓	0.2	↓	1.24
68	6.96	975	6.50	0.05	7.1	↓	25.6	↓	↓	↓	↓	0.98
69	6.88	580	5.81	0.10	3.5	↓	13.4	↓	↓	↓	↓	1.60
70	6.98	385	5.55	0.19	5.5	↓	9.7	↓	↓	↓	↓	0.10
71	7.00	650	6.03	0.05	3.5	↓	17.1	↓	↓	↓	↓	0.54
72	7.04	450	5.75	0.10	2.5	↓	11.9	↓	↓	↓	↓	0.34
73	7.00	740	6.35	0.12	3.4	↓	14.7	↓	1.0	↓	↓	0.46
74	7.06	640	6.71	0.10	1.8	↓	19.1	↓	2.5	↓	↓	0.24
75	7.05	670	4.50	0.10	2.5	↓	6.7	↓	3.2	↓	↓	0.18
76	7.00	750	4.91	0.10	2.0	↓	5.0	↓	2.0	↓	↓	0.26
77	6.95	910	4.75	0.05	1.5	↓	5.0	↓	3.1	↓	↓	0.40
78	6.80	990	3.31	0.05	2.3	↓	6.4	↓	5.0	↓	↓	5.80
79	6.93	1000	4.70	0.10	2.3	↓	5.0	↓	3.5	↓	↓	1.12
80	6.97	860	4.95	0.05	2.5	↓	10.7	↓	0.5	↓	↓	0.78
81	6.96	780	4.39	0.05	5.2	↓	13.9	↓	0.5	↓	↓	1.24

1) SiO_2, Cl, SO_4 in ppm, all other elements in ppb.

TABLE 14D: Rock Samples, Klotassin area 115J

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]
75-2095	0	11	69	2	135	0.1	0.56	3.0	5.6
2096	2	12	74	2	120	0.1	0.72	2.8	6.0
2097	2	11	60	2	83	0.0	0.70	4.4	8.5
2098	2	11	67	2	102	0.3	0.71	2.0	5.7
2099	1	10	52	2	110	0.1	0.72	4.6	7.7

1) Fe in %, other elements in ppm.

2) Fluorimetric U.

3) Neutron Activation U.

15. AMPHITHEATRE MOUNTAIN NTS 115G

A series of 6 stream, 1 water and 4 rock samples were taken from the vicinity of Amphitheatre Mountain. This area was selected because it is underlain by Tertiary sandstones, conglomerates and coal measures.

The results of the stream sediment sampling (Table 15A) show that all elements tested for are present in near normal amounts. The one water sample (#3182, Table 15B) taken contains above normal Fe (51.2ppb), F (165 ppb) and U (1.8ppb).

The conglomerate and coal samples (Table 15C) are also low in all metals except Cu (77-92ppm).

TABLE 15A: Stream Sediment Samples Amphitheatre Mountain NTS 115G

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]
75-182	22	18	62	2	515	0.4	2.66	0.9	3.6
183	32	19	85	3	735	0.6	3.61	0.7	2.9
184	52	24	91	1	635	0.8	3.60	1.0	2.5
185	44	21	86	1	700	0.6	3.45	0.9	2.8
186	28	20	69	2	565	0.6	2.73	0.9	3.1
187	27	19	69	2	610	0.5	2.91	0.5	2.7

1) Fe in %, other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

TABLE 15 B: Stream Water Samples Amphitheatre Mountain NTS 115G

Sample No.	pH	F	SiO_2[1]	Cl[1]	SO_4[1]	Mn	Fe	Cu	Zn	Ag	Pb	U
75-3182	6.93	165	2.85	0.05	15.5	2.5	51.2	0.2	0.5	0.2	1.3	1.80

1) SiO_2, Cl, SO_4 in ppm, other elements in ppb

Most of the geochemical results from this area are low and the potential for U in these Tertiary sedimentary rocks appears to be poor. But in view of the uranium mineralization observed in similar rocks in southern B.C., some interest should be retained. Further work is needed.

In general low density, helicopter supported geochemical drainage surveys could be carried out over this map

TABLE 15C: Rock Samples Amphitheatre Mountain NTS 115G

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-2100	92	22	61	3	1060	0.8	3.25	0.5	1.1	Cngl-Tert
2101	88	24	96	3	260	0.7	1.92	3.4	4.2	Coal "
2102	77	12	18	4	100	0.3	0.87	2.3	2.7	" "
2103	12	31	54	4	1415	0.9	3.33	2.0	1.5	Cngl+Coal Tert

1) Fe in %, other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

sheet with little difficulty. Because of the presence of ice fields in the southwest part of this sheet regional coverage here would be incomplete.

SUMMARY AND RECOMMENDATIONS

In carrying out this pilot study samples of stream sediments, waters, and rocks have been obtained from 15 map sheets (1:250000) in the southern part of Yukon Territory. Areas of potential interest for uranium include:

1. fluorite bearing syenites in Pelly, Selwyn and Oglivie Mountains,
2. fluorite bearing Tertiary miarolitic granites in the Dawson, Nisling, Ruby and Boundary Ranges,
3. black shale units in Ogilvie and Selwyn Mountains; these rocks are also hosts for lead,zinc and barite deposits.

Samples obtained from areas underlain by Tertiary and younger Precambrian sedimentary rocks are low in U.

Helicopter supported regional stream sediment and water surveys can be carried out with relative ease in the mountains. However in the plateau, plain and valley areas some difficulty may be encountered below elevations of 4000 feet ASL because of tree cover.

The presence of extensive glacial deposits in some of the valleys, plains and plateaus might prove to be a problem and to test the effectiveness of geochemical exploration in these environments more detailed geochemical studies will have to be carried out.

Recently Blusson* has reported on occurrences of anomalous quantities of U_3O_8 in older Precambrian tuffaceous rocks of Wernecke Mountains (106E). Future reconnaissance stream sediment and water surveys in Yukon Territory should be carried out in areas underlain by these Precambrian sedimentary and volcanic rocks.

In 1968 a uranium occurrence was supposed to have been found in the Keno Hill Area (105M/15; $63^{\circ}59'$N, $134^{\circ}51^{\circ}$W) by G. McLeod of Whitehorse, Y. T. The presence of this showing has never been substantiated. In view of this the stream sediment samples from the Keno Hill project should be analyzed for uranium as well as the heavy mineral concentrates from Project Klondike.

*Blusson, S.L. (1976) (op. cit.)

This pilot study covered only about half of the road network in Yukon Territory, regional stream sediment, water and rock sampling should be continued along the remainder of the roads.

Submitted by

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February 6,1976

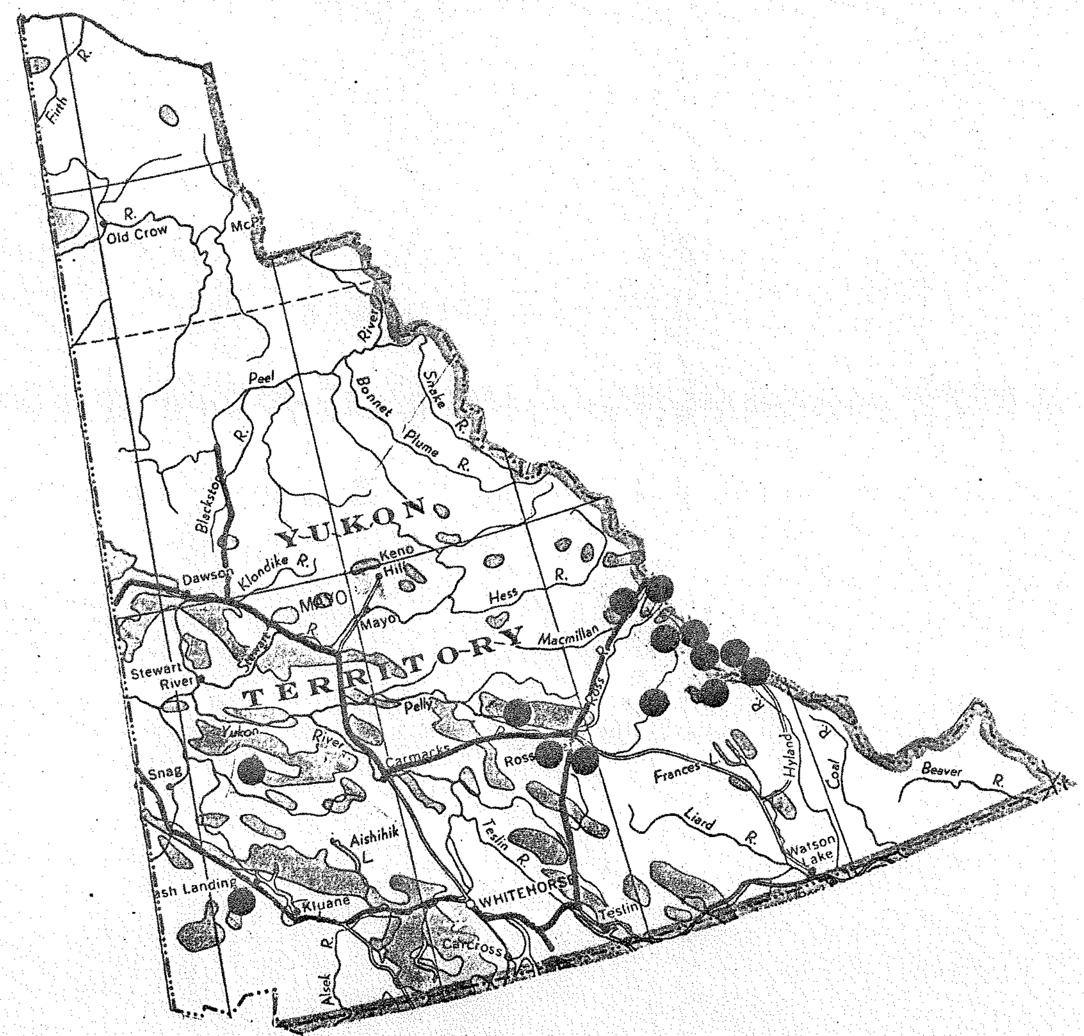

Fig. 1

Sample location map

● helicopter traverses
/ road traverses

APPENDIX

MAP	SAMPLE	ZONE	EASTING	NORTHING
105D10	750001	8	500000	6721200
105D10	750002	8	500500	6721000
105D10	750003	8	502500	6718500
105D10	750004	8	504800	6718000
105D10	750005	8	522000	6716000
105D10	750006	8	524000	6715300
105D09	750007	8	533500	6712000
105D08	750008	8	539000	6707000
105D08	750009	8	543000	6701500
105D08	750010	8	549000	6695000
105C05	750011	8	556000	6688000
105C05	750012	8	569000	6696000
105C05	750013	8	578800	6701000
105C11	750014	8	595900	6708000
105C11	750015	8	598900	6710500
105C11	750016	8	600300	6714000
105C11	750017	8	603000	6714200
105C11	750018	8	605000	6718000
105C11	750019	8	606800	6720500
105C11	750020	8	607400	6723000
105C11	750021	8	608500	6727900
105C14	750022	8	604500	6738000
105C14	750023	8	605000	6740200
105C15	750024	8	609200	6750800
105C15	750025	8	609200	6754000
105F03	750026	8	606000	6772000
105F03	750027	8	604500	6786500
105F07	750028	8	607000	6792100
105F07	750029	8	607500	6793000
105F06	750030	8	606900	6793500
105F07	750031	8	608000	6798000
105F06	750032	8	604500	6806800
105F06	750033	8	603000	6808400
105F06	750034	8	603500	6810800
105F06	750035	8	603000	6815800
105F11	750036	8	602900	6821400
105F11	750037	8	601000	6825600
105F11	750038	8	602000	6827700
105F11	750039	8	602000	6829100
105F11	750040	8	601000	6830500
105F11	750041	8	603800	6835200
105F11	750042	8	603000	6842100
105F11	750043	8	601400	6845000
105F14	750044	8	600400	6848000
105F14	750045	8	600800	6850200
105F14	750046	8	602000	6853200
105F15	750047	8	607500	6858000
105F15	750048	8	607000	6858900
105F15	750049	8	608900	6860400
105F15	750050	8	609600	6860300
105F15	750051	8	614000	6863000
105F15	750052	8	625800	6873500
105K02	750053	8	611500	6881000
105K02	750054	8	612200	6880900
105K03	750055	8	584800	6900500
105K06	750056	8	591000	6907500
105K06	750057	8	591100	6907600
105F09	750058	8	636000	6822000
105F10	750059	8	632500	6823000
105F10	750060	8	632000	6823200
105F08	750061	8	633800	6818300
105F07	750062	8	631600	6818500
105F07	750063	8	633000	6816200
105F07	750064	8	632000	6816500
105F08	750065	8	636000	6816500
105F08	750066	8	639800	6818800
105F08	750067	8	640500	6816000
105F08	750068	8	643300	6818500
105F08	750069	8	645200	6820100
105F10	750070	8	632400	6824000
105F10	750071	8	632200	6826000
105F10	750072	8	628800	6832900
105F10	750073	8	630400	6833700
105F10	750074	8	630100	6834500
105F10	750075	8	631000	6836500
105F10	750076	8	629700	6837000
105F10	750077	8	626200	6837500
105F14	750078	8	589900	6850900
105F14	750079	8	590150	6851200
105F14	750080	8	589400	6850300
105F14	750081	8	589200	6849850
105F14	750082	8	590900	6849000
105F14	750083	8	593500	6850500
105F14	750084	8	596000	6851300
105F14	750085	8	595700	6851000
105I03	750086	9	490100	6877600
105I01	750087	9	531500	6881500
105I06	750088	9	489400	6925500
105O01	750089	9	442700	7003200
105O01	750090	9	442700	7003700
105O01	750091	9	442000	7003800
105O01	750092	9	441700	7003500
105O01	750093	9	442000	7003900
105O01	750094	9	442000	7004200
105O01	750095	9	438300	7001800
105O01	750096	9	439000	6996000
105O01	750097	9	434500	6990800
105O01	750098	9	431000	6989800
105O01	750099	9	429000	6987300
105J16	750100	9	424800	6979000
105J15	750101	9	407000	6970900
105J14	750102	9	398000	6965800
105J11	750103	9	396500	6958000
105J11	750104	9	390600	6951500
105J11	750105	9	390000	6951000
105J11	750106	9	387000	6947500
105J11	750107	9	383500	6945800
105J11	750108	9	382800	6945300

MAP	SAMPLE	ZONE	EASTING	NORTHING
105J11	750109	9	378000	6933000
105J06	750110	9	376000	6928500
105J05	750111	9	368000	6916000
105J05	750112	9	365800	6915000
105J05	750113	9	363400	6913500
105J05	750114	9	361000	6910800
105J04	750115	9	358000	6904000
105J04	750116	9	355400	6900400
105J04	750117	9	345000	6886000
105K01	750118	8	654000	6883500
105K01	750119	8	653200	6883000
105K01	750120	8	638500	6882200
105K02	750121	8	621500	6876500
105K03	750122	8	589800	6893500
105K04	750123	8	573000	6899000
105L01	750124	8	548700	6894500
105L01	750125	8	536500	6896500
105L01	750126	8	532600	6897000
105L01	750127	8	531900	6897000
105L01	750128	8	524000	6896800
115I01	750133	8	446300	6884500
115I01	750134	8	440500	6887000
115I01	750135	8	437700	6888000
115I08	750136	8	432100	6706000
115P13	750137	8	373300	7074000
115P13	750138	8	373800	7073600
115P13	750139	8	369100	7073300
116G08	750140	7	626000	7250700
116G08	750141	7	629500	7242500
116G08	750142	7	628000	7241700
116G01	750143	7	624000	7232200
116G01	750144	7	623800	7232000
116G01	750145	7	624000	7231000
116G01	750146	7	622800	7230800
116B09	750147	7	624000	7173500
116B09	750148	7	625000	7169000
116B09	750149	7	627000	7166000
116B09	750150	7	633000	7161300
116B09	750151	7	634000	7156500
116B08	750152	7	635000	7151500
116B08	750153	7	632000	7149000
116B08	750154	7	629500	7145000
116B08	750155	7	624500	7139000
116B08	750156	7	623000	7136500
116B08	750157	7	621700	7133700
116B08	750158	7	620800	7130500
116B02	750159	7	618000	7119300
116B02	750160	7	618000	7114500
115J07	750161	7	610600	6915500
115J07	750162	7	609500	6915300
115J07	750163	7	608800	6915000
115J07	750164	7	608600	6916900
115J07	750165	7	608600	6916700
115J07	750166	7	608200	6918400

MAP	SAMPLE	ZONE	EASTING	NORTHING
115J07	750167	7	608200	6918100
115J07	750168	7	605400	6919200
115J07	750169	7	605100	6919400
115J07	750170	7	605400	6920300
115J07	750171	7	605600	6920300
115J07	750172	7	606500	6920900
115J07	750173	7	606600	6920500
115J07	750174	7	608400	6920800
115J07	750175	7	613500	6915800
115J07	750176	7	613300	6915200
115J07	750177	7	615300	6915600
115J07	750178	7	616500	6916400
115J07	750179	7	616500	6916700
115J07	750180	7	619600	6916100
115J07	750181	7	619000	6914750
115G06	750182	7	586500	6796100
115G06	750183	7	587000	6795500
115G06	750184	7	586200	6796800
115G06	750185	7	588000	5797000
115G06	750186	7	589000	6797000
115G06	750187	7	593800	6796300
105L02	750129	8	524000	6896500
105L02	750130	8	508700	6897300
105L03	750131	8	496000	6893500
105L03	750132	8	488000	6888500
105001	751504	9	442000	7003800
105001	751514	9	441700	7003600
105001	751524	9	442000	7004200
115P13	751534	8	373300	7074000
115P13	751544	8	373800	7073600
116G08	751555	7	626000	7250700
116G08	751564	7	629500	7242500
116G01	751574	7	624000	7231000
116B09	751584	7	627000	7166000
115J07	754168	7	605400	6919200
116G08	751565	7	629500	7242500
115014	751594	7	582000	7095000
105F06	752001	8	603000	6815000
105F11	752002	8	601000	6825600
105F11	752003	8	604200	6835500
105F15	752004	8	614000	6863000
105F15	752005	8	614000	6863000
105F16	752006	8	630500	6873800
105F16	752007	8	630500	6873000
105K02	752008	8	613200	6880100
105K02	752108	8	613200	6880100
105K02	752009	8	612000	6882800
105K02	752010	8	612100	6881500
105K02	752011	8	611200	6880000
105K02	752012	8	611200	6880000
105K03	752013	8	584800	6900900
105K05	752014	8	589200	6907000
105K05	752109	8	590000	6907300
105F15	752015	8	628500	6873800

MAP	SAMPLE	ZONE	EASTING	NORTHING
105F15	752016	8	628500	6873800
105F15	752017	8	628500	6873800
105F08	752018	8	635000	6819000
105F08	752019	8	635000	6819100
105F08	752020	8	635000	6819200
105F08	752021	8	635000	6819300
105F08	752022	8	635000	6819500
105F08	752023	8	635000	6819600
105F08	752024	8	635000	6819700
105F08	752025	8	635000	6819800
105F08	752026	8	635000	6819400
105F08	752027	8	635000	6819100
105K05	752028	8	560500	6910500
105F14	752029	8	592800	6852000
105F14	752030	8	592700	6852000
105F14	752031	8	592000	6851900
105F14	752032	8	591900	6851500
105F14	752033	8	591500	6851000
105F14	752034	8	591000	6850900
105F14	752035	8	590800	6850800
105J07	752036	9	411000	6904000
105J07	752037	9	411500	6904400
105J07	752038	9	412000	6904800
105I03	752039	9	490500	6877000
105I01	752040	9	531300	6882000
105I01	752041	9	531300	6882000
105I01	752042	9	531300	6882000
105I01	752043	9	531300	6882000
105I07	752044	9	501000	6905000
105I07	752045	9	501250	6905000
105I07	752046	9	501500	6905000
105I07	752047	9	501750	6905000
105I07	752048	9	502000	6905000
105I06	752049	9	482000	6906500
105I06	752050	9	482000	6906500
105I06	752051	9	489000	6926000
105I06	752052	9	489400	6925800
105I06	752053	9	489400	6925500
105I12	752054	9	460000	6942800
105I12	752055	9	460000	6942800
105I12	752056	9	460000	6925800
105I12	752057	9	460000	6925800
105I12	752058	9	460000	6925800
105001	752059	9	433900	7000300
105001	752060	9	433900	7000600
105001	752061	9	433900	7000900
105001	752062	9	433900	7001200
105001	752063	9	433900	7001500
105001	752064	9	433900	7001800
105001	752065	9	449000	7008000
105001	752066	9	449000	7008000
105001	752067	9	449000	7008000
105001	752068	9	449000	7008000
105001	752069	9	442000	7002700

MAP	SAMPLE	ZONE	EASTING	NORTHING
105001	752070	9	442500	7003000
105001	752071	9	442700	7003000
105001	752072	9	442500	7003000
105001	752073	9	442700	7003700
105001	752074	9	442000	7003800
105J11	752075	9	380500	6941000
105K01	752076	8	654000	6883700
105F16	752077	8	636500	6876400
105K04	752078	8	575000	6897000
105L04	752079	8	455800	6878500
115I01	752080	8	440500	6887000
115I01	752081	8	434200	6889500
115I01	752082	8	434200	6889500
115I01	752083	8	434200	6889500
115P14	752084	8	379000	7082500
115P14	752085	8	377000	7082000
115P13	752086	8	374900	7078700
115P13	752087	8	373200	7077600
115P13	752088	8	373200	7075000
115P13	752089	8	373400	7074800
115P13	752090	8	373400	7074800
115P13	752091	8	372900	7074200
116G08	752092	7	628000	7241700
116G01	752093	7	623800	7232000
116G01	752094	7	623800	7232000
115J07	752095	7	611100	6915500
115J07	752096	7	611200	6915500
115J07	752097	7	611300	6915500
115J07	752098	7	610900	6915500
115J07	752099	7	610800	6915600
115G06	752100	7	588000	6798000
115G06	752101	7	588000	6798000
115G06	752102	7	587000	6796900
115G06	752103	7	587000	6796900
115011	752104	7	591000	7065000
115011	752105	7	591000	7065000
115011	752106	7	591000	7065000
115011	752107	7	591000	7065000
115P13	752110	8	372900	7074200
105001	751500	9	442000	7003800
105001	751510	9	441700	7003600
105001	751520	9	442000	7004200
115P13	751530	8	373300	7074000
115P13	751540	8	373800	7073600
116G08	751550	7	626000	7250700
116G08	751551	7	626000	7250700
116G08	751560	7	629500	7242500
116G01	751570	7	624000	7231000
116G01	751575	7	624000	7231000
116B09	751580	7	627000	7166000
115J07	755168	7	605400	6919200
115J07	756168	7	605400	6919200
115J07	757168	7	605400	6919200
115J07	758168	7	605400	6919200

MAP	SAMPLE	ZONE	EASTING	NORTHING
115J07	755181	7	619000	6914750
115J07	759168	7	605400	6919200
116G08	751554	7	626000	7250700
115J07	756181	7	619000	6914750
115J07	757181	7	619000	6914750
115J07	758181	7	619000	6914750
115J07	759181	7	619000	6914750
115014	751590	7	582000	7095000
115014	751591	7	582000	7095000
116G08	751552	7	626000	7250700
115J07	754181	7	619000	6914750
105F15	753051	8	614000	6863000
105K06	753057	8	591100	6907600
105F09	753058	8	636000	6822000
105F10	753059	8	632500	6823000
105F10	753060	8	632000	6823200
105F08	753061	8	633800	6818300
105F07	753062	8	631600	6818500
105F07	753063	8	633000	6816200
105F07	753064	8	632000	6816500
105F08	753065	8	636000	6816500
105F08	753066	8	639800	6818800
105F08	753067	8	640500	6816000
105F08	753068	8	643300	6818500
105F08	753069	8	645200	6820100
105F10	753070	8	632400	6824000
105F10	753071	8	632200	6826000
105F10	753072	8	628800	6832900
105F10	753073	8	630400	6833700
105F10	753074	8	630100	6834500
105F10	753075	8	631000	6836500
105F10	753076	8	629700	6837000
105F10	753077	8	626200	6837500
105F14	753078	8	589900	6850900
105F14	753079	8	590150	6851200
105F14	753080	8	589400	6850300
105F14	753081	8	589200	6849850
105F14	753082	8	590900	6849000
105F14	753083	8	593500	6850500
105F14	753084	8	596000	6851300
105F14	753085	8	595700	6851000
105I01	753087	9	531500	6881500
105I01	753089	9	442700	7003200
105001	753090	9	442700	7003700
105001	753091	9	442000	7003800
105001	753092	9	441700	7003600
105001	753093	9	442000	7003900
105001	753094	9	442000	7004200
105001	753096	9	439000	6996000
115P13	753137	8	373300	7074000
115P13	753138	8	373800	7073600
115P13	753139	8	369100	7073300
116G08	753140	7	626000	7250700
116G08	753141	7	629500	7242500

MAP	SAMPLE	ZONE	EASTING	NORTHING
116G08	753143	7	624000	7232200
116G01	753144	7	623800	7232000
116G01	753145	7	624000	7231000
116G01	753146	7	622800	7230800
116B09	753149	7	627000	7166000
116B09	753150	7	633000	7161300
115J07	753161	7	610600	6915500
115J07	753162	7	609500	6915300
115J07	753163	7	608800	6915000
115J07	753164	7	608600	6916900
115J07	753165	7	608600	6916700
115J07	753166	7	608200	6918400
115J07	753167	7	608200	6918100
115J07	753168	7	605400	6919200
115J07	753169	7	605100	6919400
115J07	753170	7	605400	6920300
115J07	753171	7	605600	6920300
115J07	753172	7	606500	6920900
115J07	753173	7	606600	6920500
115J07	753174	7	608400	6920800
115J07	753175	7	613500	6915800
115J07	753176	7	613300	6915200
115J07	753177	7	615300	6915600
115J07	753178	7	616500	6916400
115J07	753179	7	616500	6916700
115J07	753180	7	619600	6916100
115J07	753181	7	619000	6914750
115G06	753182	7	586500	6796100

PART 2

Detailed Geochemical Surveys In the Central Yukon - 1976

by

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G.S.C. OPEN FILE 388

INTRODUCTION

The reconnaissance survey of 11,000 mi^2 of the Central Yukon (Fig. 1) was undertaken during the summer of 1976 in support of the Uranium Reconnaissance Program (Darnley et al., 1975). Since this was the first year of this program in the Yukon, water and sediment from streams intersecting a variety of terrains in different physiographical and geological regions were collected at an average density of one sample per five mi^2.

Detailed surveys of ten selected stream systems were carried out in conjunction with the reconnaissance survey to aid in the interpretation of the geochemistry in the secondary environment. During these detailed studies, which followed a pilot orientation study of the Yukon by Gleeson and Jonasson in 1975, (Jonasson and Gleeson, Part I - this Open File), approximately 1000 stream sediment and water samples were collected at an average interval of ¼ mile. Rock samples were also collected to provide information on background levelsfor uranium and a selection of other elements in the different rock units. Rocks and stream sediments collected from known mineral occurrences will also be used for mineralogical examination and leachability studies. The detailed program was designed to provide quantitative information on the availability of uranium and other elements and the processes affecting their migration and fixation in the secondary environments underlain by rocks with and without known mineralization.

Water samples were shipped to Barringer Laboratories in Whitehorse in order to obtain a rapid turn-around of U, F and pH determinations. Upon completion of U, F and pH analyses, the samples were shipped to G.S.C. laboratories in Ottawa to be analysed at a later date for Zn, Cu, Co and Ni. The stream sediments and rocks were shipped directly to G.S.C. Ottawa to await analyses for U (to be determined by neutron activation and fluorimetric methods), Zn, Cu, Pb, Ni, Co, Ag, Mn, Fe, Mo, W, Ba and P.

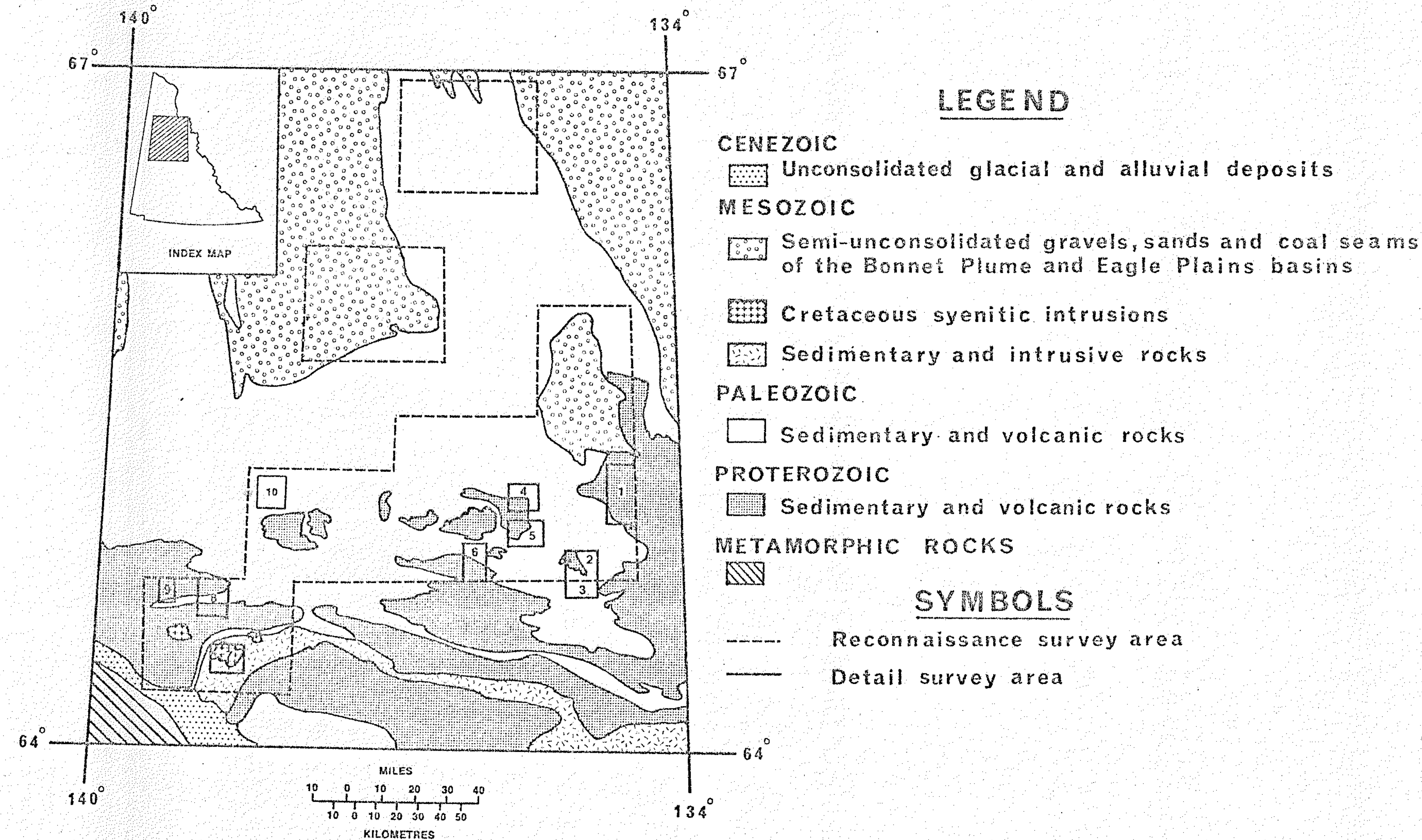

Fig. 1 General geology of the Central Yukon with the outline of the reconnaissance and detail survey areas (after Green, 1972 and Norris, 1975).

To date, complete analytical results for U, F and pH in stream waters have been received for the detailed areas. These data are presented with sample location diagrams in Appendices I and II. Incomplete analytical results for uranium (neutron activation) in stream sediments have also been received.

The preliminary interpretation of the stream water data relies heavily on the more extensive analyses of stream sediment and water, and rocks presented in the first section of this Open File for the orientation study carried out by Jonasson and Gleeson during the summer of 1975.

PHYSIOGRAPHY AND GEOLOGY

The detailed survey areas include segments of the Wernecke and Ogilvie Mountains which lie within the Northern Plateau and Mountain Area of the Interior System of the Canadian Cordillera (Bostock, 1961).

The Wernecke Mountains which are formed from resistant Proterozoic argillite, quartzite and dolomite, and Paleozoic limestone and dolomite, are characterized by jagged ridges and deeply-incised stream valleys with numerous cirques. The Ogilvie Mountains are generally less rugged than the Wernecke Mountains except in areas containing syenitic intrusions such as the Tombstone Mountains where the intrusive rocks form jagged peaks. Both the Ogilvie and Wernecke Mountains have relief in excess of 5000 feet.

Streams intersecting both the Wernecke and Ogilvie Mountains are generally torrential and transport large quantities of talus-derived material down the mountain side to form large deltaic deposits of poorly sorted sediment at the break in slope. A break in slope usually occurs at the intersection with large U-shaped valleys partly filled with unconsolidated Quaternary glacial and alluvial gravels and sands. Stream sediment is commonly found in small eddies, under boulders and near the stream bank. In areas where the streams are torrential and/or the underlying rock is very resistant and contributes very little sediment to the stream system, moss which is commonly found along the stream bank, serves to trap fine sediments.

Stream water sampling poses no problem except in the later stages of the summer when many streams are dry. Also, the size and velocity of streams are subject to seasonal variations which may have a significant dilution effect on the level of element concentrations in a given stream system.

The geology of the detailed survey areas (Fig. 1) is based on geological maps prepared by Green (1972) and Norris (1975) for areas of the Central Yukon.

The detailed areas are underlain by rock formations ranging in age from Proterozoic to Cenozoic with most periods represented (Fig. 1). Known uraniun occurrences in the survey area are restricted to the Proterozoic (Helikian) argillites, slates, quartzites and volcanic rocks where they may occur either in barite-magnetite-hematite or quartz-pyrite veins filling fractures in the older rocks. Uranium mineralization has also been reported to occur as brannerite in clerty breccias with a hematitic matrix. The older (?) Proterozoic rocks are commonly rich in brannerite which often occurs as knobs protruding from the iron formation matrix. The mineralogy of uranium in what has been regarded as younger Proterozoic rocks is as yet uncertain although pitchblende has been reported.

Rock units in the Phanerozoic underlying detailed survey areas include the Ordovician Road River shales which are host to large tonnage high grade Pb, Zn and Ba deposits farther to the east. These shales are of particular interest in light of their potential as low grade high tonnage sources of uranium.

Other Phanerozoic sedimentary rocks underlying detailed areas and considered to have uranium potential include the Silurian-Devonian shales (Green, 1972) as a host for primary uranium mineralization and the Cambrian conglomerates and sandstones as host for secondary uranium deposited from circulating ground waters containing high concentrations of uranium, vanadium and other metals.

Intrusive rocks underlying one detail survey area include the Cretaceous syenitic and quartz-monzonitic stocks of the Tombstone Mountains (Templeman-Kluit, 1970). Previous geochemical surveys by Garrett (1971) and Jonasson and Gleeson (Part 1 of this Open File) have demonstrated that these rocks have above normal uranium content compared to rocks of similar age and composition elsewhere in the Southern Yukon.

Detail Survey Areas

The detailed survey of selected stream systems underlain by a range of geological environments were carried out in an effort to better understand the processes affecting the migration and fixation of different elements in the secondary environment. Stream sediments and waters, were collected at an average interval of ¼ mile to determine the processes whether they be mechanical, chemical or a combination of both affecting element migration from known base metal and uranium occurrences. From detailed sampling, it is possible to document the length and intensity of uranium dispersion trains reflected in stream waters and the various size-fractions of stream sediments. Rock samples representing the range of lithologies and mineral occurrences present in detail survey areas were also collected in an effort to obtain information on the availability of uranium and base metals to the stream system.

Although stream sediments and rocks were collected in detail survey areas, analytical data for stream waters is presently available and will be discussed for each survey area below. The locations and general geology of each detail survey area is shown in Figure 1. Sample number locations and corresponding analytical data for stream waters are presented in Appendices I and II.

Detail Area No. 1 (106E/2)

This area is underlain mostly by Lower Proterozoic phyllitic argillites and quartzites except in the southwest area where Lower Cambrian limestone and Middle and Upper Cambrian clastics unconformably overlie the Proterozoic rocks (Norris, 1975).

Uranium occurrences are present in this area, the most notable being the Igor occurrence (Appendix I). The uranium occurs within a barite-magnetite-hematite mineral assemblage which has been reported to represent a vein-type of occurrence. Chalcopyrite and associated secondary copper minerals are also present but only as accessory minerals. Although the presence of uranium is clearly reflected in the stream waters, no uranium minerals have been identified suggesting a portion of the radioactivity may reflect the presence of radium, possibly in the form of a radium barite. The high radioactivity appears to be associated with barite specimens that have a red coloration.

Radioactive rocks of the Central Yukon commonly contain barite and visible chalcopyrite which may be significant considering the number of copper showings in Helikian rocks. To evaluate further the possible association of copper and uranium, a chalcopyrite-hematite occurrence with low radioactivity was included in the detail survey area (Appendix I).

Analytical results for uranium show a subtle yet uniform anomaly that ranges up to 0.24 ppb U (compared with less than 0.06 ppb U for background) in streams draining the uranium showing and extending not less than three miles down stream. Past the confluence with the main stream, the high uranium is derived from streams draining both the uranium showing and the north slope of the main stream valley where small uranium showings are reported to occur. The source of uranium in a large segment of the north slope of the stream valley is as yet unexplained. Fluorine shows a close relation to uranium in stream waters increasing from a background of 10 ppb F (which represents a detection limit) to 24 ppb F immediately below the uranium occurrence, and 48 ppb F in one stream draining the north slope of the stream valley.

The pH of stream waters is strongly influenced by the underlying geology. For example the pH of streams intersecting carbonate-free Proterozoic shales ranges from 6.5 to 7.0 depending on the pyrite content, while streams draining carbonates are generally buffered at a pH between 8.0 and 8.3.

A second area of interest is the area drained by a small stream situated immediately west of Kiwi Lake where the uranium and fluorine concentrations

(11.8 ppb U; 142 ppb F) are several orders to magnitude greater than their concentrations (0.24 ppb U; 24 ppb F) in streams draining the known uranium occurrence. Although the source of uranium is unknown, uranium concentrations up to 237 ppm U in stream sediments from this area suggests the possibility of uranium mineralization further upstream.

The stream draining the known copper occurrence immediately southwest of Kiwi Lake has a low uranium content which is supported by the lack of significant radioactivity in associated rocks. Thus, although uranium occurrences in this area commonly contain copper minerals, the converse is not necessarily true. An association of copper mineralization with fluorine-bearing minerals is indicated by the high fluorine levels (44 ppb F) in this stream.

Detail Area No. 2 (106D/14, 15)

Proterozoic argillite, slate, pyllite and quartzite; Ordovician, Silurian and Devonian limestone and dolomite; Silurian (?) to Devonian black limestone and shale; and Quaternary unconsolidated glacial and alluvial deposits underlie this area (Green, 1972).

No uranium occurrences have been reported from here. Of interest are streams draining Proterozoic rocks where stream water in samples (764002 to 764010) range up to 0.26 ppb U and 58 ppb F. The presence of copper mineralization reported to occur in this area is considered to enhance the uranium potential of these Proterozoic rocks.

Stream water samples (764002 to 764010 and 764011 to 764015) underlain by Proterozoic and Devonian rocks have uranium concentrations that range up to 0.50 ppb U but contain only detectable levels of fluorine. The source of uranium may in part be the Silurian-Devonian shales underlying the southwest section of the area.

As in previously discussed areas, the pH is clearly influenced by the underlying geology. The direct relation between pH and bicarbonate content in stream waters is significant considering the high mobility of uranium as a carbonate complex.

Detail Area No. 3 (106D/10)

This area is underlain by Proterozoic argillite, slate, phyllite, quartzite and minor metavolcanic rocks; Ordovician and Siluvian limestone and dolomite; and Quaternary unconsolidated glacial and alluvial deposits (Green, 1972).

Two areas of uranium mineralization are present in this area. The first consists of vein occurrences siderite and quartz with minor amounts of chalcopyrite and pyrite. The second occurrence consists of radioactivity associated with iron and manganese staining of meta-volcanic rocks (Appendix I).

The uranium content of stream water represents apparent background concentrations (less than 0.06 ppb U) until the uranium occurrence is intersected where it increases up to 0.20 ppb U in a dispersion train extending three miles down stream. The distribution of fluorine in stream waters is similar to uranium although it is more erratic. The increase in fluorine and uranium farther down stream may reflect their high concentrations in tributaries draining other uranium showings reported for this area.

The high pH (8.0 to 8.3) of this in this area is undoubtedly controlled by the underlying Ordovician and Silurian carbonates.

Detail Area No. 4 (106E/4

This area is underlain by Lower Proterozoic argillite, slate and quartzite; Cambrian limestone, dolomite, sandstone, conglomerate and shale; Ordovician and Silurian dolomite and limestone; and Quaternary glacial and alluvial deposits (Norris, 1975).

The absence of known occurrences of uranium in the Proterozoic rocks was the criterion used to select this area for detailed studies. In this way, it was possible to study chemical variation in the secondary environment reflecting lithological variation without the added influence of uranium mineralization.

The uranium and fluorine content of the majority of stream waters represents apparent background concentrations for Lower Proterozoic rocks. Nevertheless, stream waters (764009 to 764011 and 764019 to 764024) are anomalous in uranium (1.80 ppb) and fluorine (30 ppb) in the southwest section of the area. An additional area of interest are stream waters (764107 to 764120) draining Proterozoic rocks and containing high fluorine (46 ppb), and except for erratic highs, background levels for uranium. The association of high fluorine with low uranium in streams draining a copper occurrence in similar Proterozoic rocks near Kiwi Lake (Area 1, Appendix I) suggests that this area may have some potential for copper mineralization.

Detail Area No. 6 (116A/16)

Proterozoic slate, argillite and quartzite; Cambrian sandstone and conglomerate, Ordovician and Silurian shales, argillites and carbonates; and Quaternary glacial and alluvial deposits underlie most of this detail area.

Streams draining this area have mostly background concentrations of uranium and fluorine. One stream water (764106) underlain by Devonian carbonates has a high uranium (1.4 ppb) and fluorine (36 ppb) concentration although the source of uranium is unknown. One possible source is Road River shales present in the area.

Stream waters (764003 to 764023) draining Proterozoic rocks in the south-eastern section of the area have anomalous fluorine concentrations and background uranium concentrations. The source of fluorine is as yet unknown although there is potential for copper mineralization.

Detail Area No. 7 (116B/7)

The underlying geology is composed of Jurassic argillite, slate, phyllite and quartzite; Cretaceous syenite, quartz monzonite, diorite, gabbro and quartzite; and Quaternary glacial and alluvial deposits (Green, 1972).

This area was selected on the basis of previous studies which indicated relatively high uranium concentrations in rocks (Garrett, 1971) and stream sediments (Jonasson and Glesson, Part 1 - this Open File) from the Tombstone syenitic stock. No occurrences of uranium have been reported for this area although the geological environment is similar to the Bokan Mountain area of Alaska where Mesozoic peralkaline granite intrudes an older monzonite pluton. The uranium mineralization may occur as either primary segregation of uranium - thorium minerals, syngenetic deposits in pegmatite and aplite dykes or epigenetic hydrothermal open-space filling in the granite and surrounding clastic sedimentary rocks (Mackevett, 1973).

Streams draining the Tombstone Mountain syenite and quartz-monzonite stock have a large range of uranium (0.02 to 1.00 ppb) and fluorine (68 to 600 ppb) concentrations. Within the Cretaceous stock, streams draining the southeast margin have some of the highest uranium (1.00 ppb) and fluorine (420 ppb) concentrations. This section of the stock should be investigated further for uranium mineralization. The high fluorine in stream water is derived from fluorite which is readily visible in rock specimens.

Most streams draining the syenite stock have a pH between 7.0 and 7.3 pH units.

Detail Area No. 8 (116B/10)

This area is underlain by Proterozoic argillite, slate, phyllite, dolomite, limestone and conglomerate; Precambrian or later volcanic rocks, quartzite, conglomerate and shale; Ordovician and Silurian shales, conglomerates and sandstones; and Quaternary glacial and alluvial deposits (Green, 1972).

Except for water samples 764156 to 764158 from streams draining Road River shales, the remainder of the streams have background uranium concentrations. Fluorine, however, is above apparent background except in the stream draining the northeast area. The high fluorine (114 ppb F) in water samples (764150 to 764159) draining Paleozoic rocks in the south undoubtedly reflect the presence of the Road River shales which were shown by Jonasson and Gleeson (Part 1, this Open File) to contain high amounts of readily leachable fluorine. The source of fluorine in water samples (764062 to 764087) from streams draining Proterozoic carbonates and clastics is unexplained although an association with copper mineralization has been indicated elsewhere in Proterozoic rocks. Additional analytical results for stream waters, rocks and sediments are required, however, to determine the source of fluorine in this stream.

Most of the streams have a pH between 8.0 and 8.3 which is controlled by the underlying Proterozoic carbonates.

Detail Area No. 9 (116B/11)

Proterozoic argillite, slate, quartzite, phyllite, dolomite, shale and conglomerate; and Quaternary glacial and alluvial deposits comprise the underlying geology. Samples (764025 to 764043) from streams draining Proterozoic argillite, slate and phyllite (Unit 1, Green 1972) have uranium contents ranging up to 0.40 ppb which may be significant considering the magnitude of uranium concentrations in streams draining similar rocks which host the Igor and Bond Creek uranium occurrences. The uranium dispersion train extends for not less than eight miles downstream which reflects the generally high uranium content of tributaries in this area.

The fluorine content of stream waters, which is above apparent background concentrations for most samples, ranges up to 62 ppb. The source of fluorine remains unexplained.

The pH which ranges, for the most part, between 8.0 and 8.3, is undoubtedly influenced by the underlying Proterozoic carbonates.

Detail Area No. 10 (116G/1)

The geology of this area is composed of Ordovician Road River shales; Devonian limestones and dolomite; and Quaternary glacial and alluvial deposits.

Previous studies carried out by Gleeson and Jonasson in 1975 (Part 1, this Open File) indicated that the Road River shales are a potential source for uranium in addition to base metal metals which occur elsewhere in this unit. Two rock samples of Road River shales yielded up to 12.1 ppm uranium (neutron activation analysis) compared to 8.0 ppm uranium for the average black shale (Swanson, 1961). The uranium content of stream sediment and waters draining Road River shales ranged up to 26.7 ppm and 6.40 ppb respectively.

In order to further evaluate the uranium and base metal potential of the Road River shales in this area, Engineer Creek which is underlain by mostly Ordovician this location. The highest metal values occur in a sample of black shale from drill core. It contains 98ppm Cu, 930ppm Zn, 27ppm Mo, 3.2ppm Ag, 11.2 and 16.6 ppm U. The barite beds are relatively low in trace metals.

In summary, low density stream sediment and water surveys can be done with ease in this area. Large deposits of Pb-Zn are known in the black shales of the region and their discovery was a result of regional stream sediment surveys. Because of the fine grained nature of the Pb-Zn mineralization rock geochemical studies have proven essential in tracing favorable stratigraphic units and in outlining mineralized zones.

7: MACMILLAN PASS AREA NTS 105 O

In this area 11 stream sediment , 3 pan concentrate, 7 water and 16 rock samples were taken from terrain underlain mostly by Upper Devonian black shales. Economic interest in this region centers around a bedded lead-zinc-barite deposit which occurs in Upper Devonian black shales. The occurrence (Tom Deposit) reportedly contains 10 million tons of 15% combined lead and zinc.

Rocks:

For contrast, rock samples from two sections of unmineralized black shale were obtained east (#2065-68) and west (#2059 to 64) of Tom creek. There is little significant variation (Table 7C) in the trace metal content of the rocks from these areas. However increases in Cu, Zn, Mn, and Fe occur in a Cretaceous quartz feldspar porphyry that cuts the black shale section east of Tom Creek. The black shale sections (#2069,70) from Tom Creek area are also low in most trace

TABLE 7A: Stream Sediments from 105 O

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe [1]	U [2]	U [3]	Remarks
75-0089	74	178	57	28	25	4.0	10.81	3.0	5.7	Tom Cr.
90	16	51	5	15	5	1.0	0.79	1.5	3.5	" "
91	22	86	12	16	10	0.9	0.18	2.1	4.2	" "
92	32	42	54	26	35	1.6	7.10	3.5	6.5	" " trib.
93	3860	1340	4940	12	570	2.4	44.00	23.0	35.3	Fe ppt-Tom Adit
94	77	358	46	7	30	3.4	1.85	2.7	5.8	Tom Cr. trib.
95	73	30	242	9	205	0.7	2.94	10.8	15.2	drains south from extension of Tom zone.
96	77	60	610	14	240	1.0	4.25	6.7	10.7	S.Macmillan R, 8 mi.
97	55	20	602	4	485	0.8	3.69	1.8	4.8	
98	40	25	302	10	165	0.9	2.98	5.8	13.4	
99	22	17	284	2	295	0.5	2.26	0.9	3.8	
75-8091	162	162	300	70	81	2.5	13.40	3.9	11.1	Bromoform Heavies
	21	74	16	11	11	0.6	1.32	2.7	3.7	" " Lights
8092	72	33	298	42	130	1.0	10.30	4.5	15.5	" " Heavies
	24	29	36	21	16	0.8	2.58	3.2	5.0	" " Lights
8094	640	420	231	39	265	2.8	24.00	1.7	10.0	" " Heavies
	29	66	12	4	7	1.3	0.86	1.0	2.9	" " Lights

1) Fe in % all other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

TABLE 7B: Water Samples from 105 O

Sample #	pH	F	SiO_2[1]	Cl[1]	Mn	Fe	Cu	Zn	Ag	Pb	U	SO_4
75-3089	3.72	65	3.28	.38	43.8	699	37.5	26.5	.2	1.2	2.00	33.1
90	4.55	29	3.55	.12	19.8	8.4	4.4	3.1	.2	1.2	0.42	6.4
91	3.77	56	3.15	.19	38.6	279	47.8	68.0	.2	1.2	1.38	31.1
92	3.84	110	2.80	.12	58.9	797	64.0	234	.2	1.2	1.66	40.3
93	5.18	315	3.51	.11	882	867	1150	4250	.2	16.7	12.20	164.0
94	5.07	28	1.91	.12	19.3	5.0	6.5	20.5	.2	22.5	0.22	5.3
96	5.89	115	2.50	.10	31.9	63.2	2.0	101	.2	1.3	0.64	34.0

1) SiO_2,Cl and SO_4 in ppm, all other elements in ppb

elements, however Mo (·10ppm) exhibits a slight increase as compared to the shales east and west of Tom Creek. Also a sample of black shale (#2074) close to the strike projection of the Pb-Zn-Ba zone contains high values in Pb (214ppm), Zn (317ppm) and Mo (11ppm). Other rock samples from the vicinity fo the Tom deposit which contain anomalous amounts of metals includes a vuggy calcareous sinter (#2072) within the shale unit. This material contains above normal amounts of Cu (113ppm), Pb (58ppm), Mo (102ppm), Ag (2.3ppm), Fe (17.8%) and U (8.7, 14.7ppm). Also the stream bed of Tom creek and its tributaries above the adit are covered by a limonite precipitate which is 3 to 4 feet thick: it has cemented the stream sediments thus creating a limonitic conglomerate. A sample of this material (#2071) contains 187ppm Pb, 191ppmZn, 1.6ppm Ag and 28% Fe. Such limonite deposits are common in Yukon and they are formed in the vicinity of iron rich springs. A regional geochemical study of these iron precipitates should be done to determine the distinctive features of those associated with mineral deposits.

Waters:

The analytical results (Table 7B) of the waters from Tom Creek show that they are very acid, sulphate rich and charged

TABLE 7C: Rock Samples from 1050

Sample #	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U [2]	U[3]	Remarks
75-2059	28	18	84	5	51	0.1	1.97	1.2	4.1	Shale-blk.Dev-W Tom C
60	9	16	21	4	6	0.2	0.35	0.9	3.6	" " " " " "
61	5	16	4	2	3	1.2	0.31	2.0	2.5	" " " " " "
62	4	10	5	2	3	0.1	0.09	0.9	2.5	" " " " " "
63	11	12	8	2	10	0.7	0.85	0.7	1.7	" " " " " "
64	13	20	156	1	180	0.4	4.64	0.9	2.2	Slsn-Dev " "
65	7	10	11	<1	6	0.2	0.30	0.1	0.9	Cglm-Dev East/Tom Cr
66	4	18	8	4	8	0.3	0.35	1.2	4.0	Shale-blk-Dev " "
67	8	14	24	6	44	0.3	0.87	0.9	3.0	Slsn-Dev " "
68	49	24	116	1	1020	1.0	4.80	1.9	5.7	Qzfp.Cret " "
69	5	21	3	9	5	0.5	0.16	1.5	2.2	Shale-blk-Dev. " "
70	8	28	11	10	5	0.3	0.22	2.1	3.8	" " " " "
71	27	187	191	4	6	1.6	28.00	<0.1	5.8	Fe ppt-recent " "
72	113	58	33	102	8	2.3	17.80	8.7	14.7	Calc.sinter Dev." "
73	94	18	24	1	67	0.7	0.61	<0.1	0.8	Chert.cngl Dev " "
74	13	214	317	11	14	0.5	0.46	1.6	4.6	Slate-blk-Dev " "

1)Fe in %, other elements in ppm 2)Fluorimetric U 3)Neutron Activation U

with a variety of metals including Mn,Fe,Cu,Zn and U. In addition Pb(16.7ppb) is abundant in the adit water (#3093) and in sample 3094 (22.5ppb);the stream at the latter site drains the northeast extension of the Pb-Zn-Ba zone. The presence of F(315 ppb) and U (12.2ppb) in the adit water suggest that the shales could be cut by an acid prophyry dyke or the U may be derived also from calcareous sinter within the shales. A water sample (#3096)from South Macmillan River is also high in Mn(31.9ppb),Fe(6.3ppb),Cu(2ppb),Zn(101ppb) and SO_4(34ppm). In part,these values may be caused by metal rich water from Tom Creek,since it enters South Macmillan River some 6 miles upstream.However the whole district is underlain by metal-rich black shale and these high values in South Macmillan River reflect this.

Sediments:

The stream sediment samples from Tom Creek(75-89,90,91, 92,94) are low in zinc(5 to 57ppm) and this is due to the low acidity of the environment. Cu,Pb,Mo and Ag do not appear to be as affected by the low pH of the waters as is Zn. The high values for Cu (74ppm), Pb (178ppm), Mo (28ppm), Fe (10.81ppm) and Ag (4ppm) in sample 75-89 are interesting because they occur in a section of creek above the Tom deposit. It is possible that another Pb-Zn zone occurs upstream. Cu (77ppm), Pb (358ppm) and Ag (3.4ppm) are high in sample 75-94 which comes from a small tributary draining the northeast extension of the Tom deposit. The presence of Pb anomalies in the stream sediments appears to distinguish the Pb-Zn-Ba bearing shales from those that are not mineralized with these metals.

The iron precipitate from the adit water contains abundant Cu (3860ppm), Pb (1340ppm), Zn (4940ppm), Mo (12ppm), Fe (44%) and U (75ppm,35.3ppm). The source of the uranium is not known although the rock analyses show that the calcareous sinter (#2072) contains the highest uranium values (8.7 and 14.7ppm) and it is possible that more of this material occurs in or around the Pb-Zn-Ba zone.

Analytical results on the bromoform heavy mineral concentrates indicate that there is mechanical as well as chemical transport of metal in Tom Creek. The heavy mineral concentrates collected from the streams draining the Pb-Zn-Ba zone (#8091 and 8094) are distinctive in that they are high in Cu (162-640ppm), Pb (162-420ppm), Ag (2.5-2.8ppm) and Fe (13.4-24%).

Neutron activation U values for the heavy mineral concentrates vary from 10 to 15.5ppm while those done fluorimetrically range from 1.7 to 4.5ppm. This suggests that much of the uranium is tied to resistate minerals.

The high metal values (Cu, Zn and Mo) in sediment samples taken from streams crossing the Canol Road (75-95 to 99) southwest of Tom creek continue to reflect the presence of the Devonian black clastic unit. A sample from South Macmillan River (75-96) is high also in Pb (60ppm) and U (6.7 and 10.7ppm). More samples would have to be taken from the river to determine whether or not this is a reflection of the presence of the Tom deposit some 6 miles upstream.

Also more detailed geochemical studies will be required before the significance of above normal uranium values in samples 75-95 (10.8, 15.2ppm) and 75-98 (5.8, 13.4ppm) can be determined.

In summary low density helicopter supported stream sediment and water surveys can be carried out with ease in this area. Because of the low acidity of the waters in the streams it is advisable to sample both sediments and waters. Zinc may migrate considerable distances from its source before being sorbed by the stream sediments. However Pb and Ag do not seem to be as mobile and Pb-Zn-Ba mineralization such as found at the Tom deposit can be distinguished by high values for Pb and Ag in the sediments and heavy mineral concentrates from the streams. From the limited number of samples taken uranium does not appear to be abundant in this area.

8. ROSS RIVER-CARMACKS HIGHWAY 9 - NTS 105 L

One rock sample and a series of 9 sediment samples were taken from streams crossing this portion of Highway 9.

The streams drain a variety of geology including Mississippian(?) sedimentary, volcanic and metamorphic (schists) rocks along the north shore of Little Salmon Lake. West of the lake there is a Cretaceous granodiorite stock and the west boundary of the map sheet is underlain by Jurassic conglomerates, sandstones and siltstones.

For the most part the results (Table 8A, 8B) for all trace elements are relatively low.

In carrying out a low density, helicopter supported geochemical survey in this area some difficulty might be encountered on the smaller streams below 4000' ASL. In addition extensive glacial deposits cover the area east of Tatlmain Lake, the effectiveness of stream sediment and water surveys in this region are not known.

TABLE 8A: Stream Sediment Samples for 105 L

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]
75-124	13	19	69	2	330	0.4	1.94	2.0	4.3
125	21	27	142	4	400	0.6	1.80	1.8	3.5
126	24	24	78	2	320	0.5	2.07	2.0	4.8
127	11	19	56	2	320	0.3	1.80	1.8	5.6
128	25	29	92	1	340	0.3	2.22	1.3	3.1
129	16	19	53	2	400	0.4	1.79	1.0	3.3
130	24	23	67	2	440	0.6	1.54	0.9	2.2
131	16	16	51	2	450	0.3	1.54	0.5	1.8
132	10	12	40	1	320	0.1	1.08	0.5	2.2

1) Fe in %, other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

TABLE 8B: Rock Sample from 105 L

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-2079	48	20	53	1	510	0.6	3.41	1.0	1.9	Cglm-Jurassic

1) Fe in %, other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

9: CARMACKS AREA NTS 115 I

Sampling in this area was concentrated around a series of Jurassic sandstones containing coal measures. In total 4 stream sediment and 4 rock samples were taken from the vicinity of Tantalus Butte coal mine.

TABLE 9A: Stream Sediments NTS 115 I

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]
75-133	18	15	69	2	420	0.3	1.72	1.3	2.0
134	20	19	48	2	460	0.6	2.03	0.2	4.3
135	18	20	45	2	340	0.7	1.38	0.9	1.7
136	24	20	62	3	500	0.6	2.00	0.9	2.0

1) Fe in %, other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

The stream sediment and rock samples are low in uranium and most other elements (Tables 9A,9B). A slight increase in Cu (69ppm) and Fe (4.01%) occurs in a sample

TABLE 9B: Rock Samples NTS 115 I

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-2080	4	25	16	2	150	0.7	0.54	0.2	0.7	Snds-Jur
81	6	21	66	2	160	0.4	0.87	<0.1	0.5	Coal- "
82	69	24	85	1	565	0.5	4.01	1.1	2.5	Coaly snds-Jur
83	15	8	22	1	92	0.1	0.51	0.9	0.8	Cglm

1) Fe in %, other elements in ppm
2) Fluorimetric U
3) Neutron Activation U

(75-2082)of coaly sandstone from the Tantalus Butte mine. For the most part, low density helicopter supported stream sediment and water surveys can be carried out with little difficulty over this map sheet. However, tree cover below an elevation of 4000 feet ASL makes sampling with helicopter difficult on the smaller creeks. Extensive glacial deposits occur east of Yukon River and this might diminish the effectiveness of reconnaissance stream sediment and water surveys in this region. The terrain west of Yukon River is unglaciated.

10: CLEAR CREEK AREA NTS 115 P

Work on this sheet was concentrated around Henry Gulch on the right limit of Clear Creek because it was reported* that a strong airborne radiometric anomaly, supposedly related to uranium mineralization in a coarse grained granite, occurred

*Parker, Ace. R. (1970) Russ Group claims; Assessment Report on file with DINA, Whitehorse, Y.T.

here. In 1975 some 200 claims (Ura claims) were staked by Beach Gold Mines to cover the anomalous area.

During this study 8 rock, 3 stream sediment, 3 water and 2 heavy mineral samples were taken, these results are shown in Tables 10A,B and C.

The stream sediment results are low in uranium and other elements. There is a slight increase in U (10.8 and 12.4ppm) in the bromoform heavy mineral concentrate (8138) from Clear Creek. This suggests that some uranium is probably present in a resistate mineral such as allanite. Also the heavy mineral concentrate from Henry Gulch (75-8137) shows slight increases in Cu (58ppm), Pb (69ppm), Zn (161ppm), Mn (1585ppm), Fe (11.0%)and U (3.2 and 7.4ppm).

The fluorine values in the waters are in excess of 100 ppb and probably reflect the presence of granitic rocks in the drainage area. Increases in Mn (26.2ppb), Fe (1291ppb) and Cu (5.5ppb) in sample 3138 from Clear Creek might be related in part, to contamination from active placer operations upstream.

The results from the rock samples (Table 10C) are generally low. Maximum values for U (4.8,6.4 and 7.8,8.8ppm) occur in the porphyritic granite. The results obtained from this study suggests that the area is not particularly uraniferous.

Because of tree cover some difficulty will be encountered when carrying out low density, helicopter supported stream sediment and water surveys below an elevation of 3500 feet ASL. However, if sampling is restircted to the main branches of the stream, systematic coverage at a density of one sample

TABLE 10A: Stream Sediment Samples NTS 115P

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-137	12	15	45	1	340	0.3	1.30	1.6	5.3	Henry G.
138	24	21	75	1	520	0.4	2.28	2.3	3.7	Clear Cr.
139	16	18	57	<1	325	0.1	1.57	1.7	4.0	Barlow Cr.
75-8137	58	69	161	3	1585	1.3	11.00	3.2	7.4	Bromo. Hvs.
	8	13	40	1	435	0.3	1.23	0.9	1.6	" Lts.
75-8138	15	33	182	2	495	0.5	1.52	10.8	12.4	" Hvs.
	12	17	44	<1	405	0.4	1.42	1.7	2.7	" Lts.

1) Fe in %, other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

TABLE 10B: Stream Waters Samples NTS 115P

Sample No.	pH	F	SiO_2[1]	Cl	Mn	Fe	Cu	Zn	Ag	Pb	U	SO_4	Remarks
75-3137	6.20	145	5.91	0.12	2.5	5.0	0.2	1.0	0.2	1.3	0.44	17.2	Henry G
3138	6.35	120	3.82	0.05	26.2	1291	5.5	1.5	0.5	1.3	0.34	12.9	Clear Cr
3139	6.40	112	4.41	0.10	2.5	8.1	0.2	1.0	1.0	1.3	0.40	42.3	Barlow"

1) SiO_2, Cl and SO_4 in ppm, other elements in ppb.

per 5 square miles should be possible.

11: KLONDIKE AREA NTS 115 O

In this area one heavy mineral sample from a gold placer operation and 4 samples of Tertiary quartz conglomerate from McKinnon Creek were obtained. The heavy mineral sample consisted of 1 pan of concentrate from atop bedrock at the base of a Tertiary gravel terrace being worked by J. Archibald on the right limit of Bonanza Creek. The rock samples consisted of 3 samples of drill cuttings and 1 sample

TABLE 10C: Rock Samples NTS 115P

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-2084	15	22	272	3	385	0.1	1.79	1.4	2.4	Qtz-chl. Sch.
2085	4	8	11	2	16	<0.1	0.38	0.9	0.6	Qtzite
2086	8	14	15	1	240	<0.1	0.70	0.4	0.9	"
2087	8	55	24	1	365	0.1	0,93	1.0	1.7	"
2088	13	35	70	1	965	0.6	4.65	0.7	3.0	"
2089	1	16	18	<1	160	<0.1	0.50	6.4	7.8	Porph. grnt
2090	40	26	120	2	335	0.9	5.80	2.0	6.3	Qtzite.
2091	2	14	32	1	180	0.2	1.00	4.8	8.8	Porph. grnt./ Tour.

1) Fe in %, other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

TABLE 11A: Heavy Mineral Concentrate Results NTS 115 O

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-8200	127	280	251	7	560	29.5	21.90	3.9	14.8	Brom. Hvs.
	6	16	31	2	68	0.5	0.66	0.5	1.9	Brom Lts.
	5	47	40	1	265	1.7	31.90	2.5	0.7	Mag. fraction

1) Fe in %, other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

TABLE 11B: Rock Sample Results NTS 115 O-McKinnon Cr.

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-2104	40	11	19	2	22	<0.1	0.26	0.1	0.4	Cuttings,qtz-cngl.Tert.
2105	34	8	13	5	23	<0.1	0.32	0.1	0.3	" " " "
2106	38	40	112	3	820	0.6	3.50	3.2	8.4	" " " "
2107	1	7	4	<1	13	<0.1	0.05	<0.1	0.4	Qtz-cngl-Tert.

1) Fe in %, other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

of conglomerate from the KIN claims. These were obtained for the writers by Dr. D. Craig, resident geologist in Whitehorse, Y.T.

The results from the bromoform heavy mineral concentrate (75-8200, Table 11A) shows a marked increase in Ag (29.5), this is not suprising because gold is common in the sample. Increases also occur in Cu (127ppm), Pb (280ppm), Zn (251ppm), Mo (7ppm), Fe (21.9%) and U (3.9 and 14.8ppm). The higher U value was obtained by neutron activation analyses and indicates U associated with resistate minerals. It is difficult to draw any conclusion based on only one sample, however valuable additional information may be obtained if the GSC analyzed geochemically all of the heavy mineral concentrates collected by C.F. Gleeson* in 1961 and 1962.

Only one sample (2106,Table 11B) of the Tertiary conglomerate shows an increase in U (3.2 and 8.4ppm), this sample is also the highest of the 4 samples in Pb (40ppm), Zn (112ppm), Mn (820ppm), Ag (0.6ppm) and Fe (3.50%). These conglomerates are reported to contain non-economic amounts of gold. These low uranium values would suggest that their potential for uranium is also low.

12. SOUTH DEMPSTER HIGHWAY NTS 116B

In this area a series of 14 stream sediment, 1 pan concentrate and 2 stream water samples were taken from the creeks crossing the south section of Dempster Highway. The

*Gleeson, C.F. (1970) Heavy Mineral Studies in Klondike Area, GSC Bull 173.

streams drain a variety of rock units including Ordovician black shales (Road River Formation), Cretaceous (?) quartzite and Precambrain volcanic and sedimentary rocks. A Cretaceous syenite stock intrudes the Cretaceous (?) quartzites at Tombstone Mountain.

Increases in background values for Cu (44-63 ppm), Pb (31-48ppm), Zn (117-296ppm), Mn(700-1120ppm), Ag (0.6-1.2ppm) and Fe (2.91-6.50%) in stream sediment samples (Table 12A) 75-147 to 75-151 are probably related to the black shales of the Road River Formation. The high metal values for Cu (198ppm), Pb (195ppm), Zn (100ppm), Mo (13ppm), Mn (10400ppm), Ag (1.9ppm) and Fe (18%) in the heavy mineral concentrate (75-8149) from upper Blackstone River indicates possible Pb-Zn occurrences upstream.

Generally uranium is too low in the above samples to be of interest. The two highest uranium samples are 75-154 and 155, they contain 6.7, 10.5ppm and 8.6, 14.3ppm uranium respectively. These increases are probably related to Tombstone Mountain syenite stock which occurs at the heads of these creeks.

The increase in Cu (64ppm) in sample 75-156 could be caused by gabbroic sills which are common in the area drained by this stream.

The high Zn (11 and 18.5ppb) and SO_4 (65.2 and 24.0ppm) content in the two water samples probably are related to pyrite in the black shales. The area should be examined for the presence of bedded deposits of Pb-Zn.

TABLE 12A: Stream Sediment Samples Dempster Highway NTS 116B

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-147	54	31	143	3	950	1.1	6.50	0.8	3.1	
148	44	48	117	3	950	1.2	6.50	0.9	2.5	
149	48	41	275	4	875	0.6	2.91	1.7	4.4	
150	46	45	140	3	1120	0.6	3.53	1.7	4.6	
151	63	32	296	6	700	0.7	3.53	0.9	4.2	
152	25	26	91	3	175	0.5	2.33	1.5	3.8	
153	36	40	86	3	475	0.8	2.25	1.3	4.1	
154	32	29	79	3	550	0.6	2.34	6.7	10.5	
155	32	32	77	3	460	0.5	2.02	8.6	14.3	
156	64	18	83	1	370	0.3	2.78	0.9	1.8	
157	32	18	52	2	460	0.6	2.00	0.9	2.9	
158	22	16	73	2	260	0.2	1.71	0.9	2.6	
159	43	20	94	1	430	0.5	2.78	0.9	2.9	
160	16	16	71	2	650	0.2	1.61	0.7	3.5	
75-8149	198	195	1000	13	10400	1.9	18.00	<0.1	9.0	Hvs
	38	28	169	<1	1090	0.5	2.92	1.3	3.1	Lts

1) Fe in %, other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

TABLE 12B: Stream Water Samples, Dempster Highway NTS 116B

Sample No.	pH	F	SiO_2[1]	Cl[1]	Mn	Fe	Cu	Zn	Ag	Pb	U	SO_4[1]
75-3149	7.21	115	2.05	0.05	2.5	5.0	0.2	18.5	0.2	1.3	0.24	65.2
3150	7.13	124	3.12	0.05	2.5	5.0	0.2	11.0	0.5	1.3	0.14	24.0

1) SiO_2, Cl and SO_4 in ppm, other elements in ppb

Little difficulty will be encountered in carrying out helicopter supported low density regional geochemical stream sediment and water surveys in this area.

13. NORTH DEMPSTER HIGHWAY NTS 116G

Along this section of the Dempster Highway 6 stream sediment and water samples, 1 spring sediment and water sample, 3 heavy mineral concentrates and 3 rock samples were taken. This sampling was centered around an area underlain predominantly by Ordovician black shales of the Road River Formation.

Sediments in Engineer (Big) Creek from Red Creek (75-146) to Oglivie River are stained red from iron hydroxide precipitate originating from the oxidaton of pyrite in the black shales. In addition the stream sediments (Table 13A), waters (Table 13B) and heavy minerals (Table 13A) are anomalous in Zn for some 15 miles along Engineer Creek. Other elements such as Mo, Ag, Fe and U are also anomalous in the stream sediments and heavy mineral concentrates from this creek and Red Creek. The waters are slightly acid (pH 6.61-6.98) and contain above normal amounts of F, Cl, SO_4, Mn, Fe, Zn and U. Samples 75-143 and 3143 come from a sulphur spring which is depositing a white sulphur precipitate around its orifice. The spring water is marked by high values in Cl (112ppm), SO_4 (372ppm), F (1175 ppb), and SiO_2 (5.7ppm).

Results for three specimens of black shale are shown in Table 13C. Sooty black shale from sites 2093 and 2094 are coated with a yellow secondary mineral. These two samples contain high values in Mo (18, 38ppm) and U (12.4, 12.1 and 7.6, 8.9ppm).

TABLE 13A: Stream and Spring Sediment Results NTS 116G

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-140	32	32	505	20	220	1.4	1.48	7.0	9.5	
141	32	32	660	22	234	1.5	1.28	7.2	10.3	
142	22	40	192	16	43	1.7	18.0	8.1	10.5	
143	16	19	230	4	54	0.5	0.51	6.7	5.7	Sulphur Spring
144	32	45	4600	30	94	2.4	23.8	31.0	26.7	Fe Spring
145	38	32	900	29	285	1.7	1.66	8.8	12.7	
146	53	25	1160	42	225	1.6	2.42	12.7	17.7	
75-8140	93	76	1880	43	740	4.5	24.0	25.0	40.1	Hvs
	30	21	340	13	140	0.9	1.69	7.4	8.4	Lts
8141	68	41	1720	44	255	4.3	10.0	32.0	37.6	Hvs
	32	25	500	16	185	1.3	1.98	9.3	10.1	Lts
8145	90	59	2680	70	535	4.4	13.8	49.0	62.0	Hvs
	32	26	620	21	190	1.3	2.26	9.1	11.3	Lts

1) Fe in %, all other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

TABLE 13B: Stream and Spring Water Results NTS 116G

Sample No.	pH	F	SiO_2[1]	Cl[1]	Mn	Fe	Cu	Zn	Ag	Pb	U	SO_4[1]
75-3140	6.62	550	2.01	4.00	2.5	125	.2	57.0	.5	1.3	4.60	115
41	6.77	750	2.40	3.25	65.2	818	.2	206	.2	1.3	6.40	141
43	6.86	2350	5.70	112	7.7	11.2	.2	6.0	.2	1.3	2.40	372
44	6.61	1400	1.75	0.43	543	1753	.2	684	.2	1.3	0.70	308
45	6.91	700	2.50	3.25	58.4	660	.8	98.5	.2	1.3	7.20	158
46	6.98	920	2.92	3.63	119	2368	.5	256	.2	1.3	4.80	199

1) SiO_2, Cl, SO_4 in ppm, other elements in ppb

TABLE 13C: Rock Samples NTS 116G

Sample No.	Cu	Pb	Zn	Mo	Mn	Ag	Fe[1]	U[2]	U[3]	Remarks
75-2092	42	33	314	3	415	1.5	3.53	0.5	3.7	Blk.shle
93	80	17	113	18	65	0.8	3.25	12.4	12.1	" " /yellow stain
94	21	14	121	38	33	0.6	0.60	7.6	8.9	" " " "

1) Fe in % other elements in ppm

2) Fluorimetric U

3) Neutron Activation U

In summary, the geochemical results of the sediments, water and heavy mineral concentrates from the streams of this area indicated that there is a substantial amount of chemical and particulate transport of metals in these streams. Geochemically the area is extremely interesting and warrants further work.

Regional, low density, helicopter supported geochemical drainage surveys can be carried out with ease in this region.

14. KLOTASSIN AREA NTS 115J

In this area 21 stream sediment and water samples, 2 heavy mineral and 5 rock samples were taken using a Hughes 500C helicopter.

This location was selected for sampling because it is underlain by a Tertiary miarolitic granite. Fluorite and molybdenite occur in the granite and results from stream sediment samples taken by Canadian Occidental Petroleum Ltd. in 1971 showed that they were anomalous in uranium. The area forms part of the Dawson Range and it is unglaciated.