FIELD REPORT ON THE LIBERTY FALLS VOLCANOGENIC MANGANESE OCCURRENCE NEAR CHITINA, ALASKA

by

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UNITED STATES DEPARTMENT OF THE INTERIOR
Manuel Lujan, Jr., Secretary

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T S Ary, Director

INTRODUCTION

The Liberty Falls manganese occurrence was first sampled and described by Jasper (1967). However, no effort was made at that time to evaluate the occurrence. The Bureau's examination of this occurrence is part of a comprehensive project to evaluate the manganese resource potential of the State of Alaska.

The Liberty Falls manganese occurrence is located along a narrow northwest trending ridge (Cadastral Survey elevation 1643) west of Liberty Creek and 2,000 feet west-southwest of the Liberty Falls campground. The campground is located approximately 13 km west of Chitina along the Edgerton Highway. The occurrence is easily accessed from a trail system leading out of the campground (fig. 1)

GEOLOGY

Stratabound manganese mineralization is contained within poly-deformed greenschist/blueschist facies metamorphosed mafic volcanic rocks called the Liberty Creek schist (Winkler and others, 1981). A basaltic composition is suggested by the two whole rock analyses of host rocks collected above and below a lens of manganese mineralization (table 1). Schistocity is well developed and trends parallel to the narrow ridge on which the manganese mineralization occurs. Mapping to the southeast along the road to Chitina indicates that the Liberty Creek schist forms a north verging, asymmetric, anticlinorium. Mineralization has only been found on the north limb of the anticlinorium. The Liberty Creek schist is bound to the north by the Border Ranges Fault System which is buried under several hundred feet of alluvial gravel. Glaciation has scoured and exposed the bedrock at the deposit.

Manganese mineralization occurs within a thin (7 cm to 1.22 m), cherty, Mn-Fe-hydroxide-rich layer intercalated within greenschist. Multiple deformation events have complexly folded the schist resulting in multiple exposures of the mineralized layer along the glaciated ridge. Thin cross faults offset the layers nearly perpendicular to the strike (fig. 2). The mineralized layer was traced semi-continuously along the northwest trending ridge for 3,400 ft. Outcrops of the layer often strike at a small angle to the trend of the ridge. Along strike the layers disappear onto cliffs, into thick ground vegetation, or are offset by small faults. Nevertheless, the layer is remarkably intact considering the degree of metamorphism and deformation evident in the host rocks (greenschist:metabasalt). An effort to trace the mineralized layer on strike outside of the area of figure 2 was unsuccessful. Vegetative cover is thicker northwest and southeast of the ridge.

Table 2 lists consistently low manganese assay results for samples collected along the 3,400-ft-long exposure. Tables 3 and 4 list multi-element analyses of select samples of the Mn-Fe-hydroxide material which shows iron contents exceeding 10% in both samples. Hence, it appears that this stratiform occurrence is manganese- poor and iron-rich.

A small, 3-4 m, lens of manganese oxide-stained black chert outcrops in a road cut at Mile 26 of the Edgerton Highway, about 1.5 km west of the Liberty Falls campground (fig. 1). The Liberty Creek schist forms the bedrock. Minor amounts of chalcopyrite and only 5.52% Mn occur in this chert lens (sample MN27738, table 2).

CONCLUSIONS AND RECOMMENDATIONS

The Liberty Falls manganese occurrence appears to represent a low grade volcanogenic exhalative stratiform deposit that has undergone a greenschist to blueschist metamorphic event and several episodes of deformation. Only a small area of the Liberty Creek schist belt was examined and so it is difficult to discount the potential of the unexplored areas based upon the Liberty Falls manganese occurrence. Volcanogenic manganese deposits tend to be small. Therefore if further exploration for manganese is warranted the highlands to the south within the schist belt have much less vegetative cover and would be the likely place to explore for larger and hopefully richer manganese deposits.

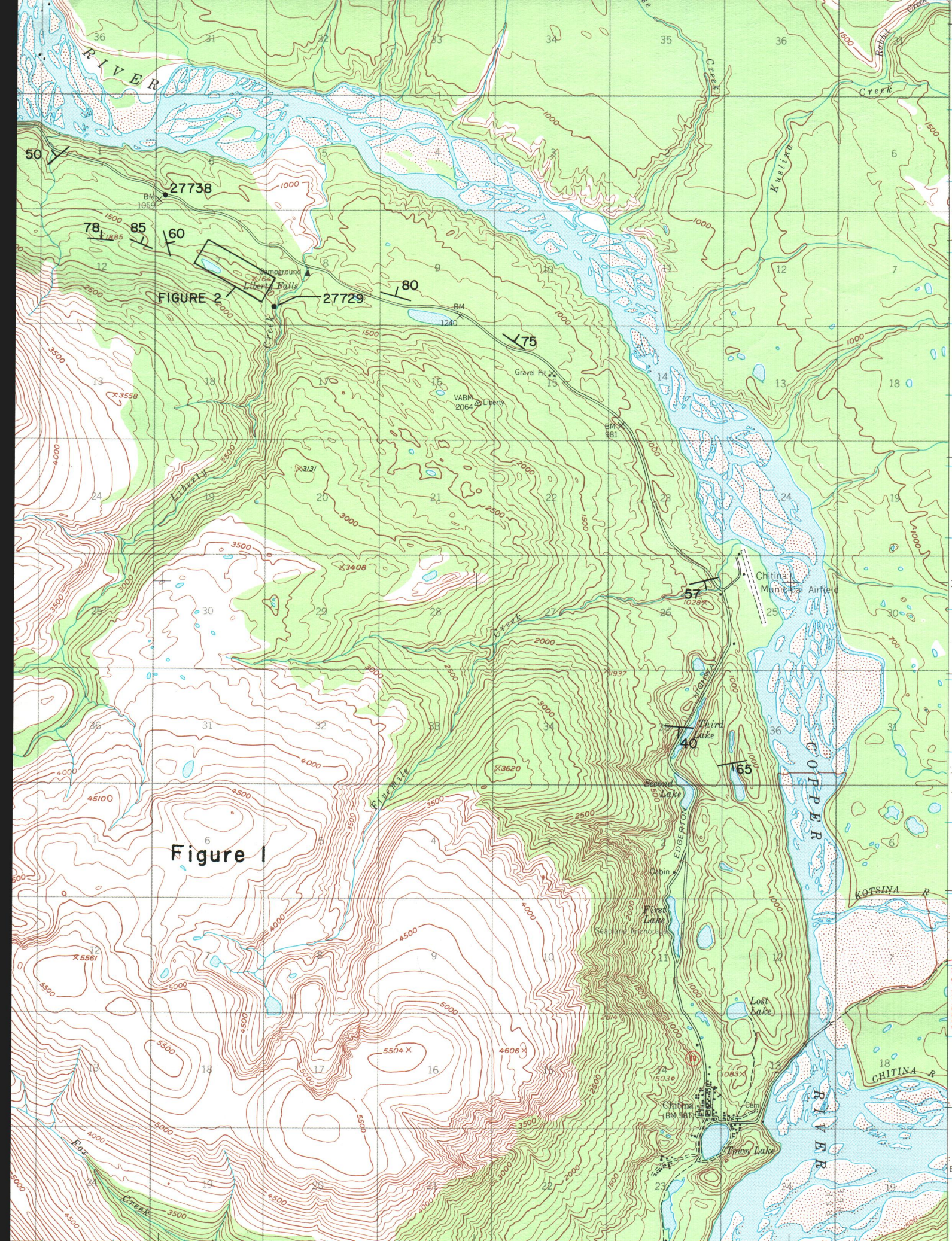


Figure 1
FIGURE 2
27738
27729
BM 1059
Campground
Liberty Falls
BM 1240
Gravel Pit
VABM 2064
Liberty
BM 981
Chitina Municipal Airfield
Third Lake
Second Lake
First Lake
Seasonal Impoundment
Cabin
Lost Lake
Chitina BM 981
Town Lake
Liberty Creek
Five Mile Creek
East Creek
Rabbit Creek
Kuslina Creek
EDGERTON HIGHWAY
COPPER RIVER
KOTSINA R.
CHITINA R.
STRELNA 12 MI
(VALDEZ C-1)
T. 2 S.
T. 3 S.
T. 3 S.
T. 4 S.
35'
30'
25'
R. 4 E.
35' R. 5 E. (VALDEZ B-2)
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1973
639000m. E.
6822000m
61°30'
144°22'30"

Table 1 --. Whole rock and trace element analyses of host rock adjacent to a mineralized layer

Sample Number	SiO_2 pct	TiO_2 pct	Al_2O_3 pct	Fe_2O_3 pct	MnO pct	MgO pct	Na_2O pct	K_2O pct	CaO pct	FeO pct
MN27739	47.82	1.52	14.37	11.28	0.28	5.78	4.18	0.36	10.02	3.6
MN27740	46.35	1.29	14.96	11.22	0.41	8.6	2.62	<0.05	10.43	3.73
	P_2O_5 pct	LOI pct	Total pct	Zr ppm	Y ppm	Rb ppm	Sr ppm	Nb ppm	Ba* ppm	
MN27739	0.1	4.62	100.33	90	34	13	111	<5	200	
MN27740	0.04	3.69	99.61	71	31	<1	206	<5	80	

Sample Descriptions	
MN27739	Grab; Host rock above sample MN27727; thinly interbedded (mm-scale) red-brown chert and greenstone
MN27740	Grab; Host rock below sample MN27727; greenstone

Table 2. --Manganese assay results for samples of the cherty Mn-Fe-hydroxide lenses.

Sample Number	Mn pct	Sample Description
MN27726	6.67	Random chip; 4.2 ft section of black, cherty, Fe- and Mn-oxide lens within greenstone
MN27727	4.78	Select grab; heavy Fe- and Mn-oxide lens within greenstone
MN27728	5.02	Continuous chip; 2 ft section across Fe- and Mn-oxide lens within greenstone
MN27729	1.35	Select grab; Cherty Mn-stained lens within greenstone
MN27730	4.78	Grab; 3-inch lens of cherty Fe- and Mn-oxides within greenstone
MN27731	2.44	Grab; 3-inch lens of cherty Fe- and Mn-oxides within greenstone
MN27732	3.50	Continuous chip; 12-inch Mn-stained chert bed within greenstone
MN27733	1.06	Continuous chip; 12-inch Mn-stained chert bed within greenstone
MN27734	2.96	Continuous chip; 48-inch Mn-stained chert bed within greenstone
MN27735	2.57	Continuous chip; 24-inch Mn-stained, massive to thinnly bedded chert within greenstone
MN27736	1.97	Continuous chip; ??-inch Mn-stained, massive to thinnly bedded chert within greenstone
MN27737	2.43	Continuous chip; 15-inch Mn-stained, massive to thinnly bedded chert within greenstone
MN27738	5.52	Select grab; Black, heavy chert lens with 2% chalcopyrite plus pyrrhotite; greenstone host rocks

Table 3. --Instrumental neutron activation analyses for samples of the cherty Mn-Fe-hydroxide lens.

Sample Number	Au ppb	Ir ppb	Ag ppm	Zn ppm	Co ppm	Cd ppm	As ppm	Sb ppm	Fe pct	Se ppm	Te ppm
MN27727	<5	<100	<5	680	100	<10	128	3.2	>10	<10	<20
MN27728	<5	<100	<5	430	62	<10	141	3.9	>10	<10	<20
	Ba ppm	Sn ppm	Cs ppm	La ppm	Sm ppm	Tb ppm	Yb ppm	Lu ppm	Sc ppm	Hf ppm	Ta ppm
MN27727	2600	<200	17	150	29.8	5	25	3.6	26	6	<1
MN27728	2700	<200	18	110	25.9	5	17	2.3	20	<2	<1
	U ppm	Na pct	Br ppm	Rb ppm	Zr ppm	Cr ppm	Eu ppm	Mo ppm	Ni ppm	Th ppm	W ppm
MN27727	1.0	2.20	3	25	<500	<50	11	<2	400	5.0	4
MN27728	0.7	0.88	2	24	<500	<50	7	<2	220	6.1	<2

Sample Descriptions	
MN27727	Select grab; heavy Fe- and Mn-oxide lens within greenstone
MN27728	Continuous chip; 2 ft section across Fe- and Mn-oxide lens within greenstone

Table 4. --Atomic absorption analysis of select samples of the cherty Mn-Fe-hydroxide lens.

Sample Number	Cu, ppm	Pb, ppm	Zn, ppm	Sample Description
MN27727	50	14	213	Select grab; heavy Fe- and Mn-oxide lens within greenstone
MN27728	54	28	263	Continuous chip; 2 ft section across Fe- and Mn-oxide lens

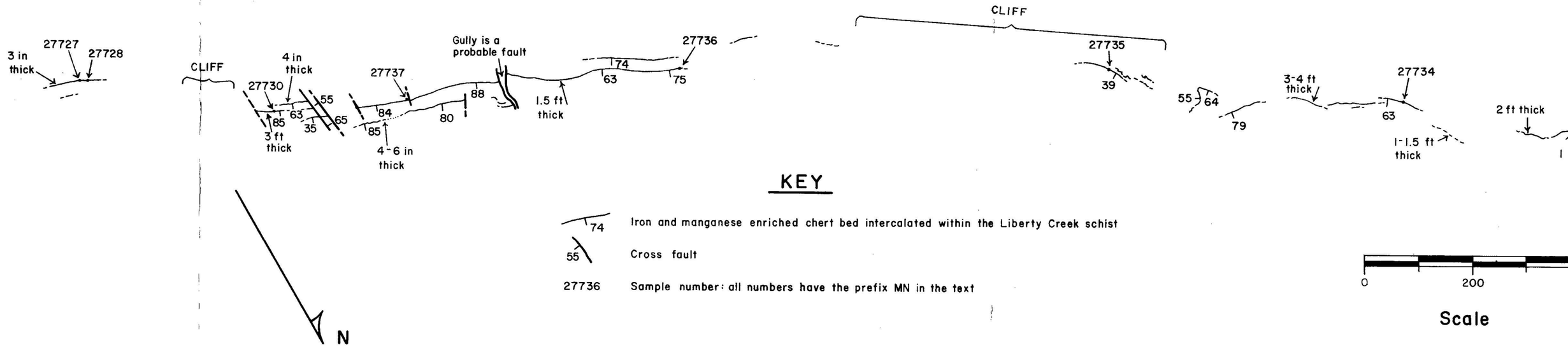
Table 5. --Inductively coupled plasma analysis of a stream sediment sample.

Sample Number	Ag ppm	Cu ppm	Pb ppm	Zn ppm	Mo ppm	Ni ppm	Co ppm	Cd ppm	Bi ppm	As ppm	Sb ppm
PC27953	<0.5	35	17	74	12	60	9	<2	16	109	25
	Fe pct	Mn ppm	Te ppm	Ba ppm	Cr ppm	V ppm	Sn ppm	W ppm	Li ppm	Ga ppm	
PC27953	2.82	207	<25	99	205	134	<20	<20	12	<10	

REFERENCES

Jasper, M.W.. Geochemical Investigations along the Valdez to Chitina Highway in Southcentral Alaska, 1966. State of Alaska Division of Mines and Minerals, Geochemical Report No. 15., April 1967.

Winkler, G.R., Miller R.J., and J.E. Case. Blocks and Belts of Blueschist and Greenschist in the Northwestern Valdez Quadrangle: in Albert, N.R.D., and Hudson, Travis, eds., The United States Geological Survey in Alaska: Accomplishments during 1979, U.S. Geological Survey Circular 823-B, 1981, p. B72-74.



Note: This map outline can be found on figure 1

Figure 2