PRELIMINARY INVESTIGATION OF LIMESTONE, QUARTZITE, AND DOLOMITE RESOURCES NEAR THE PROPOSED RAMPART DAM IN CENTRAL ALASKA

by Bruce I. Thomas

* open-file report

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ABSTRACT

Spot sampling of rock exposures, geologic reconnaissance, and preliminary laboratory tests show possible sources of limestone, silica, and dolomite 15 miles southwest of the proposed Rampart damsite in Central Alaska. These raw material sources are outside the reservoir area and could be made readily accessible to the damsite either by highway or railroad.

Sample analyses indicate some limestone pure enough to be used in calcium carbide production and excellent for use as the major ingredient in the production of cement. The discovery of high purity silica in low iron quartzites indicates a possible source of a material having many electrometallurgical, glass, and abrasive uses. Dolomites of a grade used in the ferrosilicon process of magnesium production were indicated by float and grab sampling.

1/ Mine examination and exploration engineer, Area VIII Mineral Resource ... Alaska.

Work ...

INTRODUCTION

Because of the intense public interest in the Rampart project of Central Alaska, the Bureau of Mines made a preliminary investigation of possible sources of cement raw materials near the proposed damsite. The large amount of cement required for dam and related construction may justify a nearby or an on-site cement plant. The investigation was a part of the project to evaluate known Alaskan mineral resources which would be affected by construction of Rampart dam and resulting low-cost hydroelectric power.

Reconnaissance sampling of limestones and quartzite beds outside of the reservoir area and 15 airline miles southwest of the damsite was done with helicopter support during August 9-11, 1964. Field work was confined to a belt, about 4 miles wide and 15 miles long, where rock assemblages appear favorable for the occurrence of the lime and silica components of cement raw materials. Other rocks, such as ferruginous clays, shales, and sandstones, also outside the reservoir but within 5 miles of this belt (small areas shown in blue on fig. 1), appear from visual inspection to be favorable sources for alumina and ferriferous components.

The sampling of frost elevated rock float and surface rock exposures followed by laboratory analyses was intended as a preliminary study only, the primary objective of which was to test for the presence of materials suitable for all types of portland cement. Raw materials suitable for electrometallurgical industries may have been found in the process. The physical, mining, and metallurgical characteristics of the deposits were not indicated by the preliminary study.

There is no published information on the occurrence of cement raw materials near the proposed Rampart damsite and, to date, no apparent detail work is being done to develop a source of raw material for an on-site cement plant.

LOCATION AND ACCESSIBILITY

The area containing the possible cement and electrometallurgical raw materials is in the Tanana quadrangle, Central Alaska, about 100 airline miles N 70° W of Fairbanks (fig. 1). It is a belt about 4 miles wide and 15 miles long northeast of the North Fork of Baker Creek between Roughtop Mountain and Baldry Mountain. The southwestern extremity of this belt is cut by the North Fork of Baker Creek and lies between Orum Creek on the north and Allen Creek on the south. From the North Fork of Baker Creek it trends northeast and abuts the south slope of Baldry Mountain.

Access to the area from Fairbanks is by the Steese and Elliot Highways to Eureka a distance of about 145 miles, thence from Eureka across country by foot-trail for about 18 miles. The area can be reached by tractor-truck trail from Eureka by following the base of the foothills along the North Fork of Baker Creek. Presently planned road extensions to Tanana follow this route.

Small fixed-wing aircraft with oversize tires could possibly land in the area on selected smooth gently sloping flat-topped ridges. Most of the area is readily accessible by helicopter.

The proposed site of the Rampart dam is about 15 airline miles N 60° W of the area. A water-grade route between the area and damsite is suitable for construction of either a highway or a railroad.

The location of the sampled area in relation to the Rampart Canyon dam-site and the powersite land withdrawal boundaries is shown in figure 1.

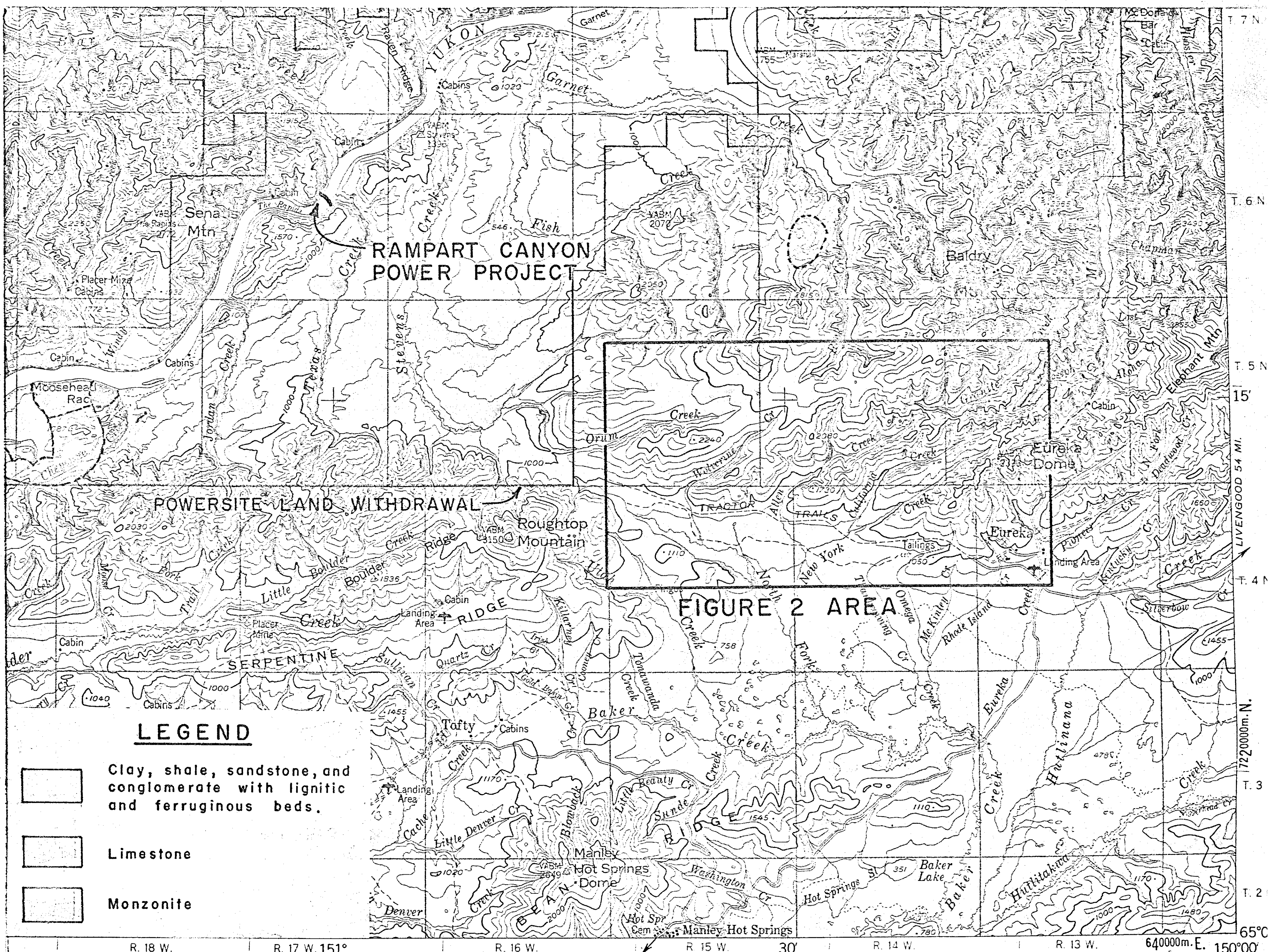

FIGURE 1.- Location Map.

Scale: 1 in = 4 mi

PROPERTY AND OWNERSHIP

The only mining claims in the area comprise a group of 12 unpatented placer claims and 3 unpatented lode claims. These claims are on the southwestern end of the ridge separating Orum and Wolverine Creeks, and were staked by James Dalton of Fairbanks, Alaska for and on behalf of Colorado Gas and Oil Co. Location certificates are recorded at both Rampart and Manley Hot Springs.

The approximate location of the mining claims is shown in figure 2.

TOPOGRAPHY AND VEGETATION

The topography of the area is mature as displayed by the numerous rounded and gently sloping, flat-topped ridges. Numerous streams that cut and drain the area outline a continuous but circuitious ridge from the North Fork of Baker Creek to Baldry Mountain. The altitude of this ridge ranges from 2,000 feet on the southwest to over 3,000 feet in the vicinity of Baldry Mountain. Most of the major stream valleys are asymmetrical in cross section with steep sloping walls facing north.

The crests of the flat-topped hills and ridges are covered with moss and scattered small patches of brush. Tussocks are numerous in places where there is little or no drainage. The vegetation conceals silt and loose rubble; where silt predominates the ground is perennially frozen a few inches beneath the moss.

Bedrock exposures are numerous only on crestlines and on steep slopes. They are in areas of higher altitude where steep slopes are predominant. Most of the exposed bedrock is covered by lichens.

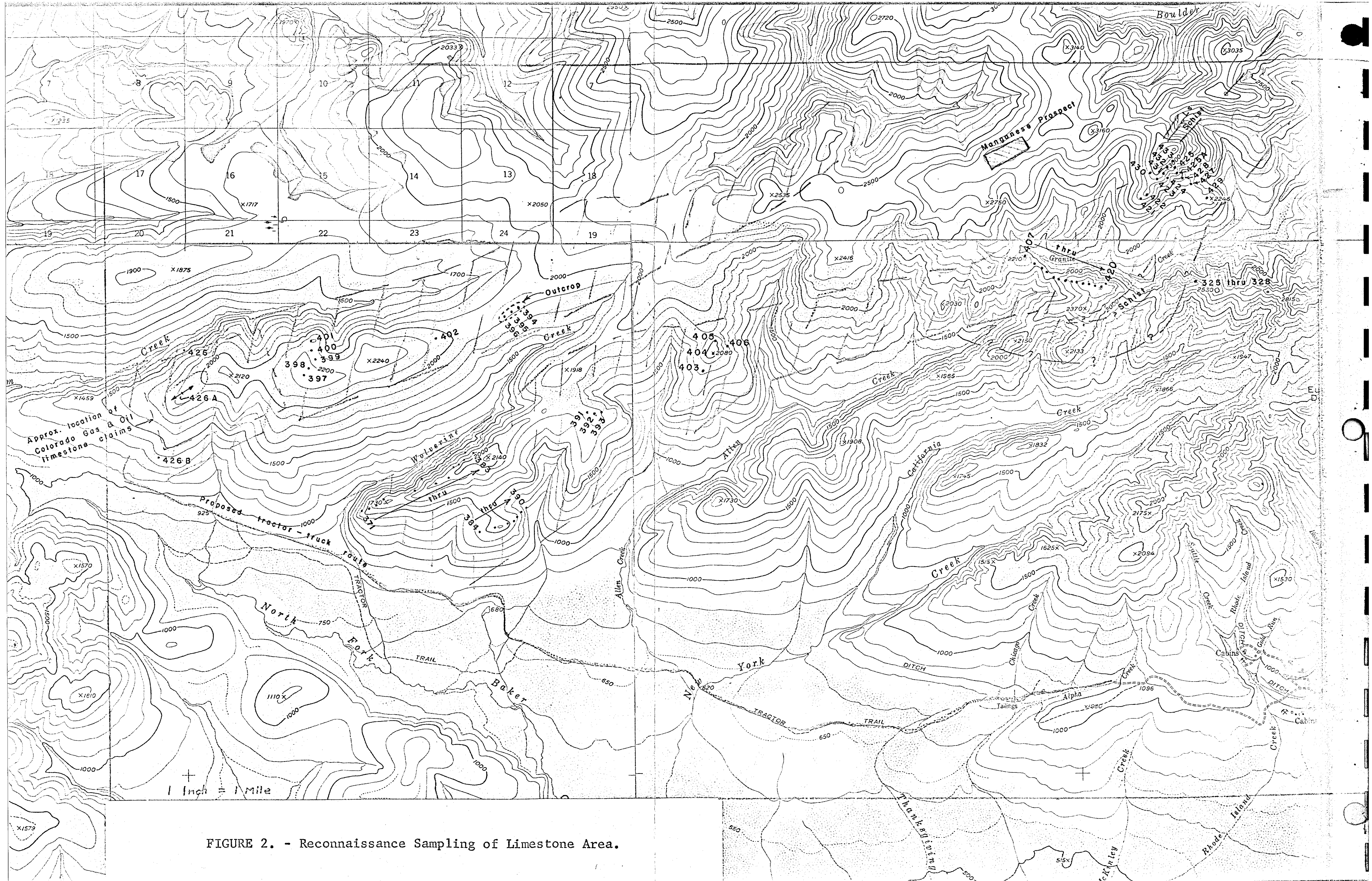

FIGURE 2. - Reconnaissance Sampling of Limestone Area.

Poplar, aspen, birch, and spruce grow below an altitude of 2,000 feet. Thickets of willow and alder grow along streambeds amidst deciduous and evergreen trees.

GENERAL GEOLOGY AND DESCRIPTION OF DEPOSITS

The light-colored limestone, quartzite, and dolomite sampled in this reconnaissance occur intermittently exposed over an area about 4 miles wide and 15 miles long northeast of the North Fork of Baker Creek between Baldry and Roughtop Mountains. These rocks are part of a unit of undifferentiated Mississippian rocks exposed near Tanana and extending 40 miles N 60° E as mapped by Eakin[2/] and later by Mertie.[3/] Present in the section are shale, slate, phyllite, sandstone, quartzite, several varieties of schist, chert, chert conglomerate, limestone, dolomite, greenstone, and their metamorphic equivalents.

2/ Eakin, Henry M. A Geologic Reconnaissance of a Part of the Rampart Quadrangle, Alaska. U.S. Geol. Survey Bull. 535, 1913, pp. 16-27.

3/ Mertie, J. B., Jr. The Yukon-Tanana Region, Alaska. U.S. Geol. Survey Bull. 872, 1937, pp. 111-115.

SAMPLE ANALYSIS AND RESULTS

A petrographic analysis was made of each sample to determine the mineral assemblages and rock type (table 1). From the results of this work, limestone samples were selected for chemical analysis to determine lime, silica, alumina, and iron components (table 2). Analysis of dolomite samples are shown in table 3 and analysis of quartzite samples in table 4.

TABLE 1. - Petrographic analyses[1/]

Dolomite	Dolomitic quartzite	Sandy dolomite	Dolomitic limestone	Limestone	Quartzite	Tectite	Chert
371	385	373	426B	394	372	402	325
374	386	375		395	378		326
376	392	384		396	390		327
379	403	387		426A	393		328
380	406	388			397		420
381		389			398		
400		391			399		
404		410			401		
405		411					
407		412					
408		413					
409		414					
417		415					
419		416					
421		418					
422		424					
423		428					
425							
425A							
426							
427							
429							

1/ 383, sample lost.

TABLE 2. - Chemical analyses of limestones

Sample No.	Percent				
	CaO	Al_2O_3	SiO_2	MgO	Fe_2O_3
394	53.56	0.62	2.66	0.15	0.33
395	52.36	.72	4.26	.13	.58
396	47.90	.62	3.30	4.56	1.02
426A	52.90	.92	1.76	1.08	.80
426B[1/]	47.80	.30	1.68	5.97	.71

1/ Dolomitic limestone.

TABLE 3. - Chemical analyses of dolomites

Sample No.	Percent				
	CaO	Al_2O_3	SiO_2	MgO	Fe_2O_3
374	35.98	0.20	0.98	16.90	0.44
376	29.63	1/	-	18.41	-
379	34.60	-	-	16.64	-
380	35.32	.24	1.30	16.60	.30
381	44.05	-	-	9.46	-
400	26.73	.62	16.44	16.80	.86
404	31.28	-	-	19.80	-
405	31.50	-	-	19.76	-
407	31.46	-	-	20.27	-
408	32.44	.06	<.05	20.10	.76
409	39.84	-	-	12.34	-
417	30.22	-	-	19.33	-
419	31.76	-	-	19.79	-
421	30.62	-	-	20.03	-
422	31.56	-	-	20.05	-
423	32.04	-	-	20.08	-
425	32.08	-	-	19.90	-
425A	32.06	-	-	20.10	-
426	31.46	-	-	20.56	-
427	31.73	-	-	20.10	-
429	32.30	-	-	19.38	-

1/ Not determined.

The results of petrographic and chemical analyses show a predominance of dolomite, dolomitic quartzite, and quartzite along the zone extending from the ridge between Wolverine and Allen Creeks toward Baldry Mountain (fig. 2). High lime with some high silica and low magnesia are characteristic of limestones between Orum and Wolverine Creeks. Chemical analysis also shows a high-silica low-iron quartzite in the Orum and Wolverine Creek area (table 4). This quartzite meets the qualification for silica in all electrometallurgical uses, all but first quality optical glass, and many abrasive uses.

TABLE 4. - Chemical analyses of quartzites

Sample No.	Percent				
	CaO	Al_2O_3	SiO_2	MgO	Fe_2O_3
372	1/	-	90.64	-	-
373	-	-	96.14	-	-
390	-	-	78.18	-	-
393	0.07	0.49	99.29	0.04	0.02
397	-	-	92.53	-	-
398	.02	.20	99.62	.06	.03
399	.09	.20	99.55	.04	.08
401	1.39	.64	96.96	.14	.07

1/ Not determined.

CONCLUSIONS AND RECOMMENDATIONS

Spot field tests and preliminary laboratory analyses of grab samples from rock exposures show low-magnesia limestone in the area between Orum, Wolverine, and Rock Creeks (fig. 2). Petrographic and chemical analyses show high quality quartzite which would probably be reserved for special uses and some lower grade quartzite which could be especially useful in controlling cement quality. Although dolomitic material is present, it does not appear to be as widespread as elsewhere along the belt. Ferriferous clays, shales, and sandstones within 5 miles of the limestone and quartzite are possible sources of alumina, iron, and silica.

The high quality silica, if present in quantity, would make a very desirable raw material for use in electrometallurgical industries, glass manufacture, and as abrasives.

Numerous samples of dolomite obtained in the reconnaissance indicate the presence of an important raw material for the ferrosilicon process in the production of magnesium. The quartzite and dolomites would be well situated for an electrometallurgical industry utilizing power from the Rampart project.

Detailed field and laboratory investigations of the raw materials necessary for a cement plant and of the potential electrometallurgical raw materials are recommended. Bulldozer trenching and bedrock sampling to expose the width and lineal extent of the deposits are recommended as initial steps. If bedrock investigations are successful, additional work should be done by core or other types of drilling to outline a 25-year supply of raw materials for a million-barrel-per-year on-site cement plant. The better deposits of dolomite and quartzite should also be tested by drilling.