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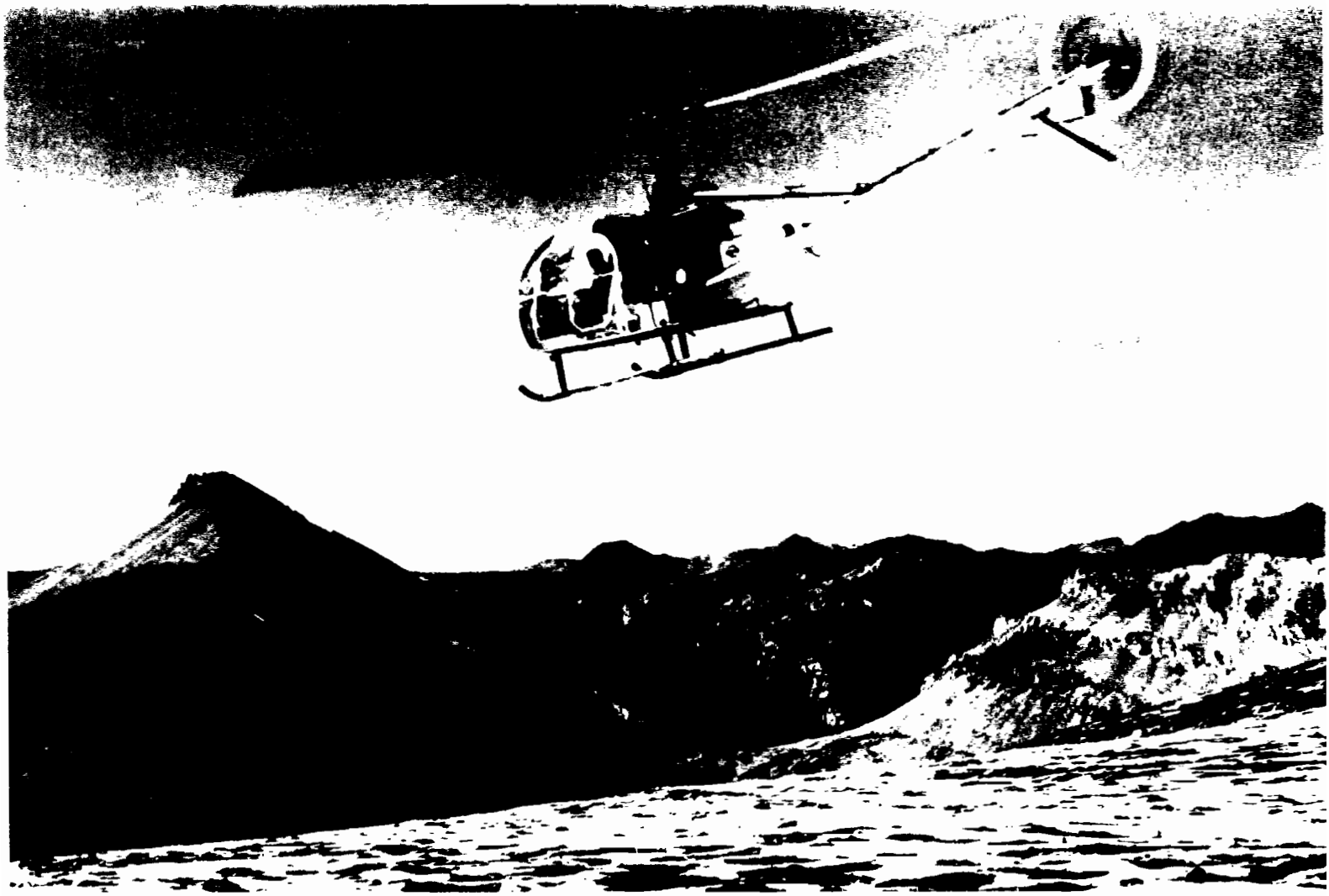
State of Alaska
Department of Natural Resources
DIVISION OF GEOLOGICAL SURVEY



ANNUAL REPORT
1971

STATE OF ALASKA

William A. Egan – Governor

DEPARTMENT OF NATURAL RESOURCES

Charles F. Herbert – Commissioner

DIVISION OF GEOLOGICAL SURVEY

William C. Fackler – Assistant Commissioner for Minerals

ANNUAL REPORT 1971

1972

P. O. Box 80007
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Anchorage, Alaska 99504

STATE OF ALASKA

WILLIAM A. EGAN, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL SURVEY

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ANCHORAGE 99501

March 15, 1972

The Honorable Charles F. Herbert
Commissioner
Department of Natural Resources
Pouch M
Juneau, Alaska 99801

Dear Commissioner Herbert:

It is my pleasure to submit this report of the Division of Geological Survey's 1971 activities.

Alaska's 1971 mineral production, excluding oil and gas, reached an all-time high of $69 million--a 38% increase over the 1970 figure of $43 million. One of the most significant production developments affecting this increase was the mining of uranium ore at Kendrick Bay; details are reported in Section V.

Division programs included mapping and sediment sampling near Walker Lake in the central Brooks Range, as reported in Section II; this project utilized full helicopter support, covering 1700 square miles in a known copper belt.

For the first time the Division used an airborne magnetometer and now has for sale maps of magnetic fields of large areas, as illustrated in the Index Map of Aeromagnetic Survey Areas, Section II.

The Division of Geological Survey hopes to continue increasing the geological knowledge of Alaska, further contributing to the development of the State's mineral industry.

Respectfully submitted,

William C. Fackler
Assistant Commissioner for Minerals

WILLIAM A. EGAN

GOVERNOR
State of Alaska

CHARLES F. HERBERT

COMMISSIONER
Dept. of Natural Resources

WILLIAM C. FACKLER

ASS'T. COMMISSIONER
for Minerals

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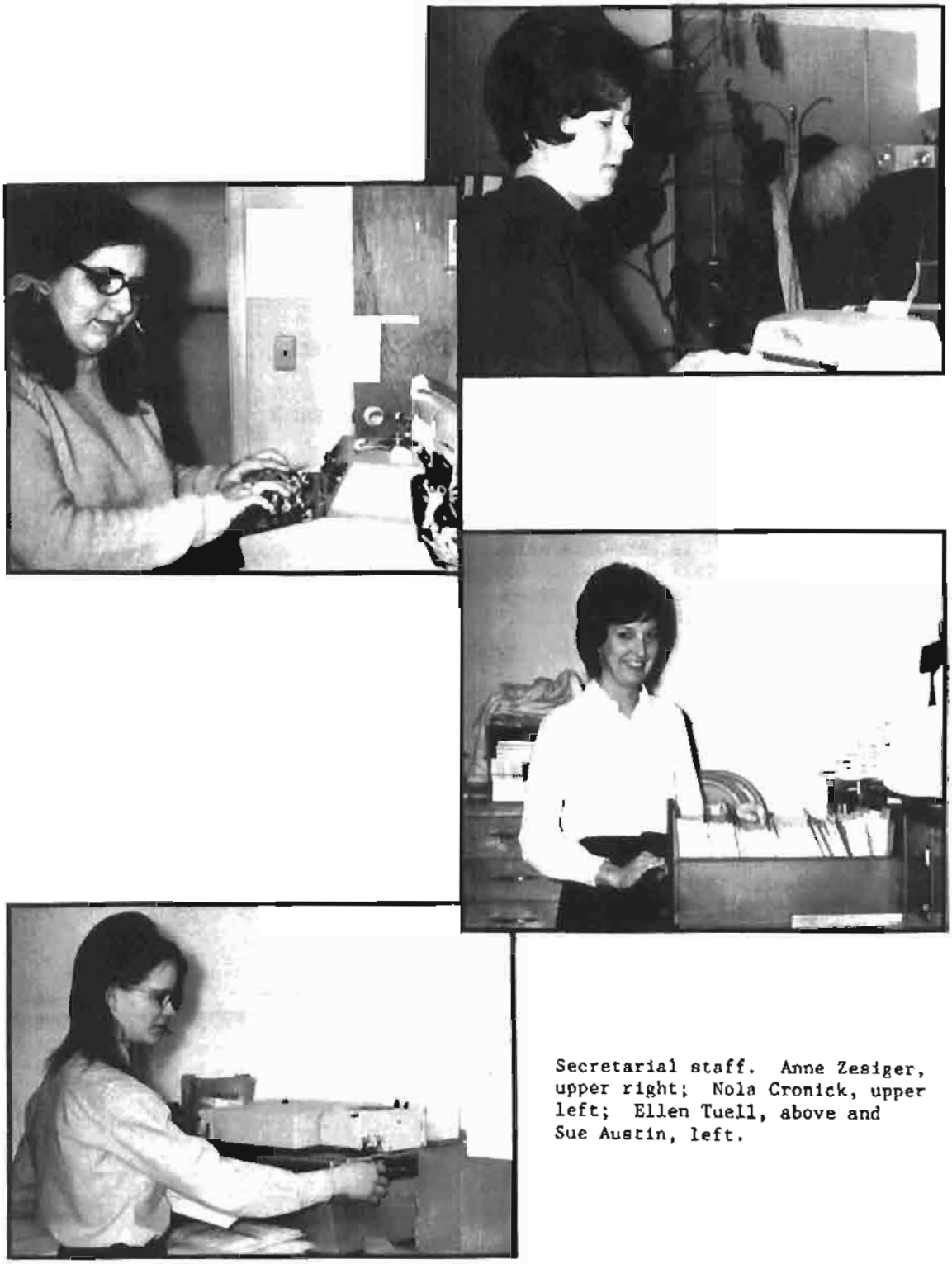

Secretarial staff. Anne Zesiger, upper right; Nola Cronick, upper left; Ellen Tuell, above and Sue Austin, left.

Figure 1

PERSONNEL

ALASKA DIVISION OF GEOLOGICAL SURVEY

WILLIAM C. FACKLER, Assistant Commissioner for Minerals
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DONALD L. MCGEE, Petroleum Geologist
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*Temporarily assigned to Northern Alaska Planning Team.

NOTE: Summer assistants were:
JAMES C. PRAY, THOMAS K. BUNDTZEN, GARY L. KLINE, JOHN T. LARSON, JOHN M. ZDEPSKI, AND WILLIAM S. ROBERTS, Assistant Geologists; and MARGARET L. BIXBY, Cook

TABLE 1. DIVISION OF GEOLOGICAL SURVEY ORGANIZATION AND FUNCTIONS

STATE GEOLOGIST

	OFFICE OF DIRECTOR	GEOLOGY SERVICES SECTION	MINING GEOLOGY SECTION	MINERAL ANALYSIS AND RESEARCH SECTION	RESOURCES INVESTIGATION SECTION
Personnel	Publication Specialist Four Mining Information Specialists Secretary Clerk Two Clerk–Typists	Mining Specialist Mining Engineer Exploration Geophysicist Stratigrapher Cartographer	Five Mining Geologists Seven Summer Assistants	Laboratory Supervisor Geochemical Analyst Assayer Chemist Assayer Technician	Two Petroleum Geologists
Functions	Publishing and distribution of information circulars, special reports, lab reports, field reports, monthly bulletin, and annual report Budget, finance, and all Division records Kardex file of claim locations and annual labor	Administration of regulatory inspections, commodity studies and prospect examinations Air borne magnetometer surveys and other geophysical programs Stratigraphic evaluation Cartographic and illustrative work	Ore deposit investigations Ore province evaluation Regional and detailed geologic mapping and geochemical sampling with written reports Technical assistance and advice to public and Division personnel	Chemical, mineralogical, petrological analyses of public and Division samples Technical advice and assistance to prospectors, miners, and companies Investigations in mineralogy, geochemistry, petrology, and analytical methods appropriate to Division programs and objectives	Investigation of nonmetallic mineral and energy resources, resource inventory and commodity studies Regional and detailed geologic mapping, stratigraphic studies with written reports Technical advice to government agencies, public and industry

TABLE 2. SUMMARY OF WORK ACCOMPLISHED IN THE DIVISION DURING 1971

OFFICE OF DIRECTOR	GEOLOGY SERVICES SECTION	MINING GEOLOGY SECTION	MINERAL ANALYSIS AND RESEARCH SECTION	RESOURCES INVESTIGATION SECTION
Processed 6686 claim location notices; 1519 affidavits and mining documents. Updated 18,392 active claim records in Kardex file.	Completed one geological report of an exploration site where both drilling and drifting were in progress	Conducted field research projects in the Brooks, Alaska, and Coast Ranges of Arctic, South-central, and Southeastern Alaska, respectively. All are continuing projects to which more than one field season is being devoted. Five geologists and 6 assistants mapped more than 2000 square miles and collected more than 1500 geochemical stream-sediment samples	Various analyses of public and Division samples, ranging from visual identification to detailed quantitative work	Section organized only in latter part of 1971
Published 1 professional report, 3 bibliographies, an annual report, and twelve monthly bulletins (circulation 2600)	Carried out 25 coal mine inspections and 12 metal mine inspections	Prepared reports and maps related to field projects	Received and processed 832 samples from the public, plus 3863 Division samples during the calendar year	Compiled report and map on geology and mineral resources potential of Arctic National Wildlife Refuge in cooperation with Bureau of Sport Fisheries and Wildlife
Distributed 3794 professional reports and 5959 information circulars	Administered 3 road assistance programs	Compiled Bibliography of Alaskan Geology in 5 volumes covering 1831-1968	Research in geochemical exploration procedures and techniques, with emphasis on problems relative to Division programs. This is an area of continuing effort, in terms of sampling, analysis, data processing, and data evaluation interpretation	
Assisted 1637 visitors and answered 2586 information requests	Assisted the Division of Lands in evaluating coal lease applications and conversion of coal prospecting permits to coal leases		Method development in X-ray diffraction and emission, optical emission, atomic absorption, and colorimetric analytical procedures	
Accounting, budgeting, and maintenance of all Division records	Investigated 1 tunnel accident on a hydroelectric project			
	Geophysical surveying of 42,000 square miles and printing of 202 different contour maps for sale to the public			

Section I

INTRODUCTION

The Division of Geological Survey, Department of Natural Resources, State of Alaska, maintains offices with scientific and technical personnel in Anchorage and Fairbanks. The Division replaced the State Division of Mines and Geology in 1970. Offices of Mining Information Specialists are located in Juneau, Ketchikan, Anchorage and Fairbanks.

RESPONSIBILITIES OF THE DIVISION

The Alaska Geological Survey is responsible for the development of the mineral resource industry in Alaska. The Division's goal is to increase the State's economic prosperity while practicing the best resource management.

Duties of Division personnel include studies of potential geologic hazards and studies of water and energy resources, including geothermal energy. A mineral resources inventory is underway, as are geologic investigations for classification, selection and use of public lands. The Division performs routine mine inspections to enforce its mine safety regulations, and administers other state laws and programs relating to mining, exploration and conservation. Geologic and geophysical mapping, economic geology studies and geochemical sampling are carried out during the field season. The resulting maps and reports are the principal product of the division.

Property examinations and technical assistance are provided to miners and prospectors if the claim holder cannot afford a consultant and when there is sufficient evidence of potential production. The Division laboratory at College, near Fairbanks, provides free assays and mineral identification, and conducts studies of rocks and minerals. Files of all known Alaska mineral deposits, mining claims and claim holders are maintained at the office in College as a service to the mineral industry. Copies of the files are also available at Division offices in Anchorage, Juneau and Ketchikan.

ORGANIZATION

The great area of Alaska plus the difficult logistical problems in large portions of the State requires that the Division personnel be very flexible in their assignments and able to perform in several categories if the need arises.

The Division of Geological Survey is organized in five sections: (1) Office of the Director, (2) Geology Services, (3) Mining Geology, (4) Minerals Analysis and Research, and (5) Resources Investigation. Personnel and functions of each section are outlined in Table 1 and a summary of work accomplished during 1971 is outlined in Table 2.

PERSONNEL CHANGES

The increasing scope of the activities and responsibilities of the Division of Geological Survey has been reflected by further changes in organization and personnel during 1971. William C. Fackler, Assistant Commissioner for Minerals, became the Director of the Division, and his headquarters are in Anchorage. James A. Williams is on temporary assignment as Mining Specialist to the Joint Federal-State Land Use Planning Group. Crawford E. Fritts, Acting Chief, Geology Section, is in charge of the College office of the Division.

New personnel since 1970 include Thomas E. Smith, geologist; Robert Garland, geologist; Edward Holmes, publication specialist; and Ellen J. Tuell, clerk typist, in the College office; Donald C. Hartman, geologist and Donald L. McGee, geologist in the Anchorage office; and Geraldine Zartman, mining information specialist, in the Ketchikan office.

The services offered by the Ketchikan Mining Information Office have been increased to provide Division of Land general information (but not land status) to the people of that area.

GEOGRAPHIC DIVISIONS OF ALASKA

For ease of reference the State has been divided into six arbitrary units as illustrated in figure 2. The boundaries of these units are based on bedrock geology, topography, parallels of latitude, and meridians of longitude.

1. Arctic Alaska, including the Brooks Range and other parts of the State north of the Arctic Circle, which is near latitude 66° 32' 25" N.

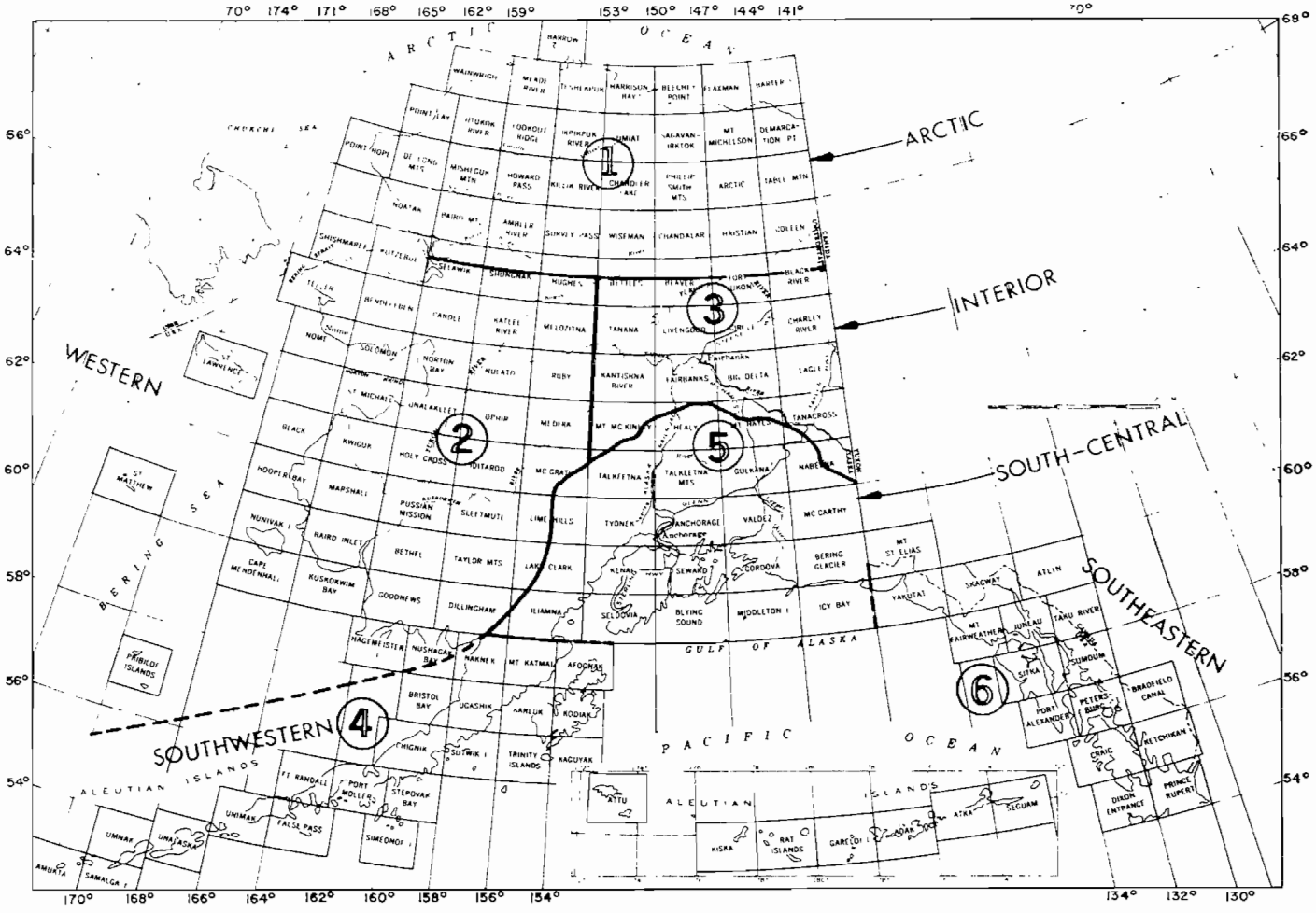
2. Western Alaska, including the Seward Peninsula, Pribilof Islands, and other parts of the State south of the Arctic Circle, northwest of the Alaska Range, and west of meridian 153° W.

3. Interior Alaska, including that part of the State south of the Arctic Circle, north of the Alaska Range, and east of meridian 153° W.

4. Southwestern Alaska, including the Aleutian Islands, Kodiak Island, and the Alaska Peninsula south of parallel 59° N.

5. South-Central Alaska, including the Alaska Range, adjacent mountainous terrain, and intermediate lowlands north of parallel 59° N. and west of meridian 141° W.

6. Southeastern Alaska, including all of the State east of meridian 141° W.



QUADRANGLES AND MAJOR GEOGRAPHIC DIVISIONS OF ALASKA REFERRED TO IN THIS REPORT

Figure 2

Section II

1971 PROGRAMS

COOPERATIVE PROGRAMS

Several joint Alaska Division of Geological Survey-United States Geological Survey projects are now in progress. These cooperative Projects are financed by state-federal funds on a matching basis.

COOK INLET STRATIGRAPHIC STUDY

The project is a detailed study of the stratigraphy and petroleum potential of the Cook Inlet basin. The objective is the dissemination of increased knowledge of the subsurface geology of the Cook Inlet basin to stimulate increased exploration and to aid in the evaluation of unexplored lands. It is estimated that the study will require five years to complete. Interim reports will be made at several stages during the project, and a final report will cover the entire study.

GRAVITY MAP OF ALASKA

During past years the U. S. Geological Survey has made approximately 19,000 gravity observations throughout Alaska. Several large areas remain unworked, and it is estimated that about 7,000 more stations would provide sufficient data for a gravity map of the entire State. The maps will be published on scales of 1:2,500,000 and 1:1,000,000 which are compatible with map scales now in use. The gravity maps will contribute valuable regional information on shape and size of basins, structural elements, major fault systems and so forth. It is estimated that completion of this project will require two field seasons of data acquisition plus one year for preparation of the report.

AEROMAGNETIC MAPS

The 1971 aeromagnetic surveys were entirely state funded, with the U. S. Geological Survey contributing valuable technical assistance.

Three areas were surveyed, the East Alaska Range, the Seward Peninsula, and the Goodnews-Platinum area (fig. 3). Contractor for the work was Lockwood, Kessler and Bartlett. The area covered was about 42,000 square miles at a contract cost of approximately $420,000 or about $10 per square mile. The contract work has been completed, the maps have been printed, and the maps are for sale by the Division of Geological Survey.

The survey flight lines were spaced 3/4 mile apart and 1000 feet above ground level where possible. The fluxgate magnetometer signal was recorded in flight on a paper strip chart recorder. The diurnal variation was recorded by a fluxgate magnetometer ground station. Aircraft altitude was determined by radio altimeter and recorded in flight on a paper strip chart recorder. Aerial photography on 35 mm black and white film at 3-second intervals was used to plot the aircraft flight path. The regional field was removed from the magnetic data and corrections were made for

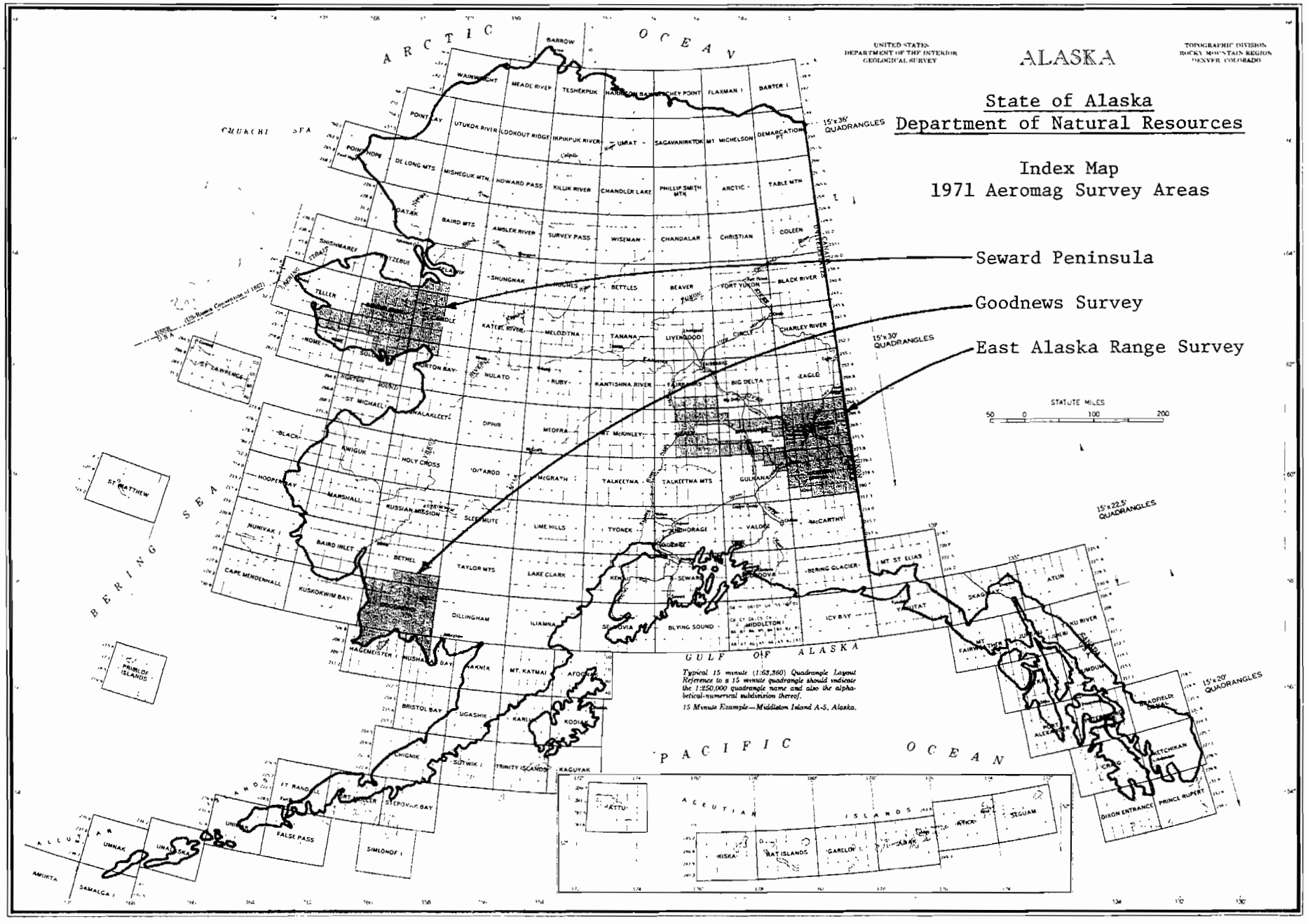

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ALASKA
TOPOGRAPHIC DIVISION
ROCKY MOUNTAIN REGION
DENVER, COLORADO
State of Alaska
Department of Natural Resources
Index Map
1971 Aeromag Survey Areas
Seward Peninsula
Goodnews Survey
East Alaska Range Survey
15'x36' QUADRANGLES
15'x30' QUADRANGLES
15'x22.5' QUADRANGLES
15'x20' QUADRANGLES
STATUTE MILES
50 0 100 200
ARCTIC OCEAN
CHUKCHI SEA
BERING SEA
GULF OF ALASKA
PACIFIC OCEAN
ALEUTIAN ISLANDS
Typical 15 minute (1:63,360) Quadrangle Layout
Reference to a 15 minute quadrangle should indicate the 1:250,000 quadrangle name and also the alphabetical-numerical subdivision thereof.
15 Minute Example—Middleton Island A-5, Alaska.

Figure 3

diurnal variation. The corrected information was transferred to the maps and contours were drawn manually on 10-gamma contour intervals. The maps generally show the concentration of magnetite iron in the rocks and are useful indicators of the boundaries of different rock types. The set of maps consists of 202 sheets 18 x 21 inches. USGS quadrangle maps (1 inch = 1 mile) were used as the base maps and the aeromagnetic survey information overprinted in red as contour lines of magnetic field intensity. The maps are priced at $1.05 each postpaid.

PROSPECTOR ASSISTANCE PROGRAM

The Alaska Legislature did not appropriate funds for the Prospector Assistance Program in 1971. Regulations covering the Prospector Assistance Program provide that submitted programs will be held confidential for a period of two years. Programs that have been submitted through 1968 have been summarized and are available to the public at our Fairbanks, Anchorage, and Juneau offices. If the summary of a particular program is of sufficient interest to an individual the entire program can be made available to him.

Gordon Herreid, above, studies rock sample from Prince of Wales Island. Norman Veach, right, checks a location on aeromagnetic survey map.

Figure 4

ABSTRACTS

(The following summaries are taken from reports planned for publication in 1972.)

URANIUM INVESTIGATIONS IN SOUTHEASTERN ALASKA

by Gilbert R. Eakins

This project is a continuation of our uranium program that consisted of examinations of fourteen localities in Southeastern Alaska. The purpose was to determine if geologic settings, such as structural trends, rock alteration, or mineral zoning, could be used to aid in the search for radioactive materials in the region.

Most of the localities visited were previously known to have radioactive showings, but others were selected on the basis of geology alone or had been reported to have showings by prospectors. Both Tertiary nonmarine sediments and vein-type deposits were examined. Radiometric surveys with a scintillometer were made on foot, and the geology of some local areas was mapped. Rock samples and stream-sediment samples were collected.

After studying the sample analyses and thin sections, the author will try to relate the known radioactivity in Southeastern Alaska to regional geology. It appears that a relationship to copper occurrences may exist.

WALES PROJECT, PRINCE OF WALES ISLAND, SOUTHEASTERN ALASKA

by Gordon Herreid

During the 1970 and 1971 field seasons, all of the coastline and much of the high country in the Craig A-2 quadrangle were mapped at 1:40,000 field scale. Areas adjacent to the quadrangle also were mapped where necessary for an understanding of the geology. A total of about 1100 geochemical stream-sediment and rock-chip samples were taken.

In the 290 square miles underlain by Wales group rocks and associated granitoid intrusives, at least 70 mineral deposits are known from early day prospecting. The richest of the known deposits are small contact metamorphic copper deposits near gabbro to syenite intrusives in the Copper Mountain district. However, most of the known mineral deposits in the region are small vein deposits, distant from these large granitoid intrusives. These deposits carry gold, copper, lead and zinc. Some have been mined for gold and copper. It is reasonable to consider the entire area favorable for the discovery of new deposits. Modern-day geochemical prospectors have recently been active in the area.

Schist and interlayered marble on southern Prince of Wales Island have long been considered to be the oldest rocks in the area and have been given the name Wales group. These schistose rocks have undergone greenschist facies regional metamorphism and two periods of folding. The surrounding (overlying) rocks are much less deformed and are in thrust contact with the Wales group. At Klakas Inlet the Wales rocks were either metamorphosed previous to deposition of the overthrust sheet, or thrusting has brought unmetamorphosed rocks in from elsewhere.

On Klakas Inlet the overthrust sheet consists of conglomeratic graywacke and argillite, overlain by thinly laminated mudstone and siltstone, overlain by metabasalt. The whole section is several thousand feet thick, right side up, and dips moderately southwest. The section is unconformably overlain by siltstone dated by Churkin and others (1970) as Lower Devonian. Granitoid rocks, intrusive into the metabasalt at Max Cove, have shed large boulders into the conglomerate at the base of this siltstone. Similar granitoids have been dated as latest Ordovician (about 440 m.y.) by the K-A method at Kendrick Bay, 12 miles to the east. It seems most likely that the intrusive rocks at Max Cove are Late Ordovician and the metabasalt is pre-Late Ordovician.

The intrusives around Max Cove range from albite granite to albite-hornblende diorite, typically with altered plagioclase. A mile west of Max Cove the Lower Devonian siltstone is cut by Mesozoic(?) diorite plutons. A scattering of Mesozoic(?) diorite plutons extends northwest toward Copper Mountain. These intrude both Devonian and older rocks.

The Copper Mountain intrusives range from gabbro to granodiorite to syenite and are unaltered. They have been considered by previous writers to be Mesozoic in age.

The contact between the Wales group and the overlying thrust sheet has been offset left laterally about 1.6 miles by the nearly vertical north-trending Klakas fault (new name), which extends up Klakas Inlet and the South Arm of Cholmondeley Sound. In the northern part of the South Arm of Cholmondeley Sound, the Klakas fault cuts a series of northwest-trending faults. Farther north, the West Arm of Cholmondeley Sound is controlled by a west-trending fault that cuts off the Klakas fault. The here called West Arm fault possibly extends, across a yet-to-be-mapped offset, to the north end of Hetta Inlet. There it offsets the Mesozoic(?) intrusives right laterally.

Both on a large scale and on smaller scales the style of faulting is a complex shuffle of fault blocks moved about by faults of widely differing orientations.

Along Hetta Inlet, the Corbin and Copper City copper mines are on north-trending faults. Along the South Arm of Cholmondeley Sound, there are old prospects in a wide zone of silicification and pyritization associated with the northwest-trending faults mentioned above.

Stream-sediment sampling has been done in the mapped area in order to evaluate the ore potential of the various geological features. The Copper Mountain plutons are marked by strong copper anomalies, but only a few scattered anomalies were found farther south along the east side of Hetta Inlet (Herreid, 1971). Scattered moderate zinc anomalies and old prospects are present within about two miles of Sultzer. The mineralized zone along faults in the northern part of the South Arm of Cholmondeley Sound is marked by zinc and lead rock-chip and stream-sediment anomalies. The intrusives east and west of Klakas Inlet in the vicinity of Max Cove are marked by scattered zinc anomalies in the stream sediments.

REFERENCES

Churkin, Michael, Jr.; Jaeger, Herman; Eberlein, G. D., 1970, Lower Devonian graptolites from southeastern Alaska: Lethaia, v. 3, no. 2, p. 183-202.

Herreid, Gordon, 1971, Analyses of rock and stream-sediment samples, Hetta Inlet area, Prince of Wales Island, Craig quadrangle, Alaska: Alaska Division of Geological Survey, Geochemical Report 24.

GEOLOGY OF THE WESTERN CLEARWATER MOUNTAINS, SOUTH-CENTRAL ALASKA

by Thomas E. Smith

This report, concluding 2 years of geologic investigations will describe part of a newly discovered metamorphic belt in the Healy A-1 and B-1 quadrangles. The study was initiated by the U. S. Geological Survey as part of the Heavy Metals Program during 1968 and 1969. Economic aspects of the investigation are available as separate reports of the U. S. Geological Survey (Smith, 1970a, b).

Metamorphosed bedrock forming the western Clearwater Mountains comprises two main rock sequences, (1) a thick section of low grade volcanic rocks of Triassic age, and (2) an overlying pelitic succession of latest Triassic and Jurassic age which varies in metamorphic grade from argillite to layered gneiss. Combined, the sequences have an aggregate thickness of at least 30,000 feet, and are exposed in a broad northeasterly-trending belt extending approximately 70 miles along the south flank of the Alaska Range. The pelitic sediments have been intruded by alkali gabbro in Late Jurassic time and by a magma series of intermediate composition during Cretaceous and early Tertiary time.

The north-dipping metavolcanic sequence consists mainly of thickly bedded tholeiitic basalts and basaltic andesites. Subordinate volcaniclastic, pelitic, and calcareous sediments are interstratified throughout the flow sequence, but are most abundant near the upper contact. Thin hematitic flows are also common in the upper part of the section.

Folded pelitic strata north of the volcanic belt consist primarily of dark carbonaceous argillite, siltstone, and lighter graywacke, with minor layers of tuff and intraformational conglomerate. The pelitic rocks form a zonational metamorphic belt, of the Barrovian facies series, that grades northwestward from prehnite- or pumpellyite-bearing sediments near Windy Creek to sillimanite-bearing gneisses and schists north of Valdez Creek. A steep thermal and dynamic gradient during metamorphism, now recorded by index mineral assemblages, rotational microtextures, and intrafolial folds is attributed to a penetrative overthrusting, bringing highest P-T assemblages on the north into the same tectonic level as lower grade rocks to the south.

Numerous plutonic and hypabyssal bodies of intermediate composition were emplaced during the regional metamorphic event. Most intrusives show secondary minerals and textures characteristic of the metamorphic zone in which they occur, and several have acted as hosts for gold-quartz-carbonate vein deposits.

Deformation of the region has progressed from (1) downwarp with coeval sedimentation (Triassic-Jurassic) through (2) deep-seated overthrusting and strike-slip dislocation accompanied by recrystallization (Cretaceous) to (3) high-angle, brittle-fracture style of faulting characteristic of shallow environments (Tertiary). The high-angle faults of greatest continuity trend generally E-W or ENE, subparallel to major rock units.

REFERENCES

Smith, T. E., 1970a, Gold resource potential of the Denali bench gravels, Valdez Creek mining district, Alaska in Geological Survey Research 1970: U. S. Geol. Survey Prof. Paper 700-D, p. D-146-D152.

Smith, T. E., 1970b, Results of geochemical sampling in the western Clearwater Mountains, Alaska: U. S. Geol. Survey open-file report 441, 249 p.

GEOLOGY AND GEOCHEMISTRY NEAR WALKER LAKE, SOUTHERN SURVEY PASS QUADRANGLE, ARCTIC ALASKA

by Crawford E. Fritts, Gilbert R. Eakins and Robert E. Garland

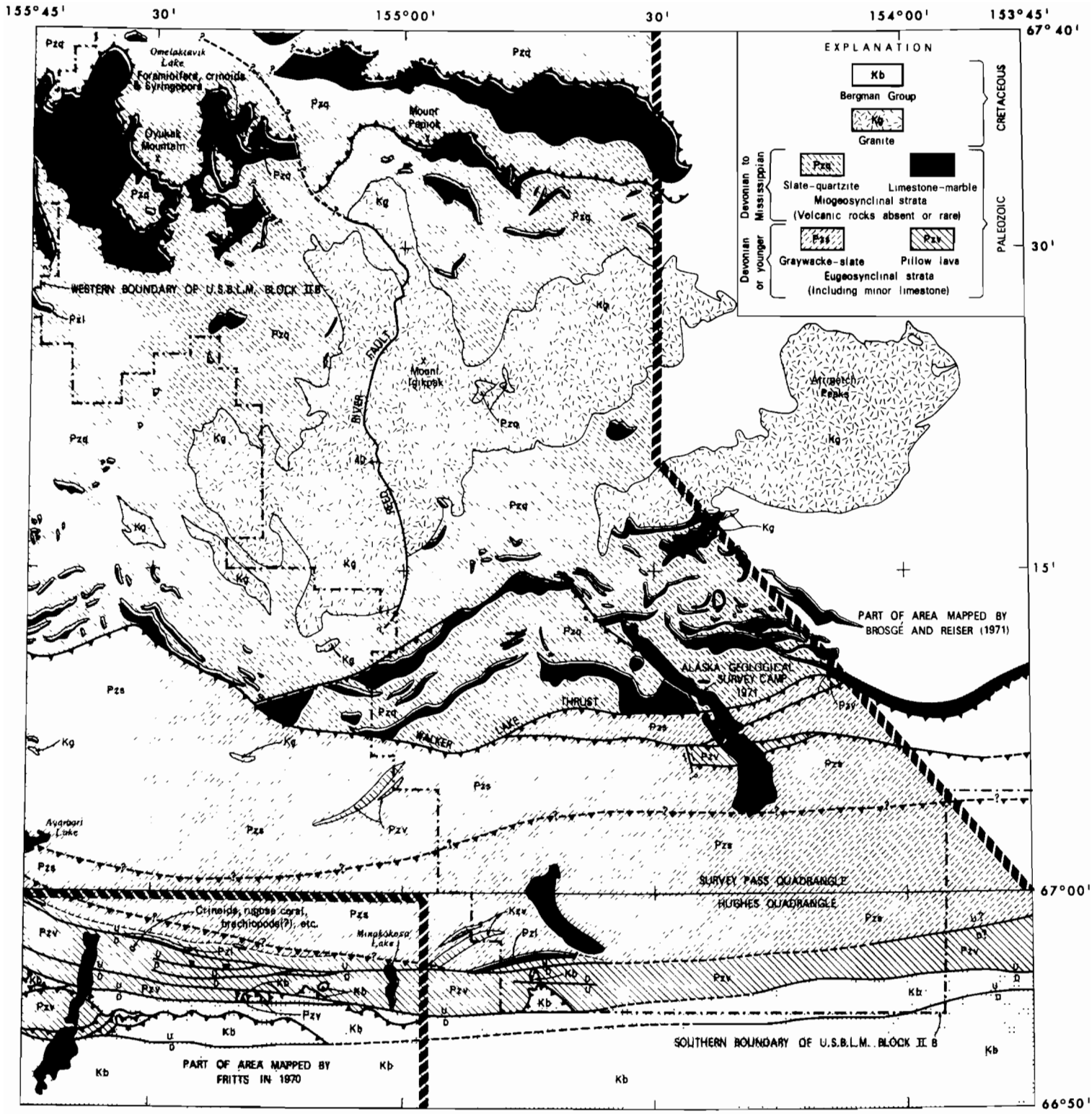
Geological mapping and geochemical stream-sediment sampling were undertaken in the summer of 1971 in the southern part of the Survey Pass quadrangle near Walker Lake (fig. 5) for two main reasons. (1) In 1968, the senior author had begun a long-term study of a broad, complexly deformed belt of copper-bearing metasedimentary and metavolcanic rocks along the southern flank of the Brooks Range, extending eastward from the Cosmos Hills through the Angayucham Mountains toward Walker Lake. Field work near Walker Lake in 1971 was a logical continuation of that project. (2) In late 1970, the U. S. Bureau of Land Management proposed a new classification of land in the central Brooks Range, which included some 2,600,000 acres in Block IIB, covering much of the Survey Pass quadrangle. That classification would have rendered Block IIB "...closed to mining and land actions that result in title transfer... [and] ...closed to selection by the State of Alaska." In view of the Division's long-term regional mapping program and a general lack of geological data concerning Block IIB, the State, via Senate Joint Resolution No. 19, dated February 2, 1971, requested that the land classification be postponed until the area was mapped in sufficient detail to permit a reasonable appraisal of its geology and economic potential. Subsequently the classification was postponed, and mapping commenced with full helicopter support.

The main base of operation in 1971 was a multi-tent camp established in late May on the east shore of Walker Lake near its narrowest point. Field work was accomplished from there with the aid of a Hiller 12E-4 helicopter under a contract won by Merric, Incorporated, of Fairbanks. Deep snow during the previous winter prevented the landing of large aircraft on lake ice before spring breakup, so helicopter fuel was shuttled to the camp via float plane from Bettles throughout the summer. Fuel also was cached on Omelaktavik and Avaraart Lakes in the northwestern and southwestern parts of the mapped area, respectively, to facilitate mapping there.

The field party consisted of three geologists, three (briefly four) assistants, a cook, and helicopter personnel. All of the geological personnel cooperated as much as possible in the accumulation of basic data, but responsibility for certain phases of the work was divided according to individual interests, training, and (or) experience. In this report, Fritts will concentrate on regional bedrock geology, including stratigraphy and structure, Eakins on geochemistry and economic geology, and Garland on surficial geology and archeology.

Mapping at scale 1:63,360 (1 mile = 1 inch) and stream-sediment sampling at practical intervals such as 1/2 to 1 mile were confined to the central and southwestern parts of the Survey Pass quadrangle, or more specifically to the southwestern third of Block IIB, which had not been studied previously. The field party attempted to tie into a recent geologic map of the Wiseman and eastern Survey Pass quadrangles compiled by W. P. Brosgé and H. N. Reiser (U. S. Geol. Survey open-file rept. 479). A total of approximately 1700 square miles were mapped, and 764 stream-sediment samples were collected during June, July and August.

The most significant geological discovery during the summer was the recognition of a major west-trending, high-angle, thrust fault, which passes beneath Walker Lake near its narrowest point. This fault, here called the Walker Lake thrust, was mapped for at least 65 miles along strike, and is believed to continue eastward at least another 15 miles. The fault was traced westward from Walker Lake more than



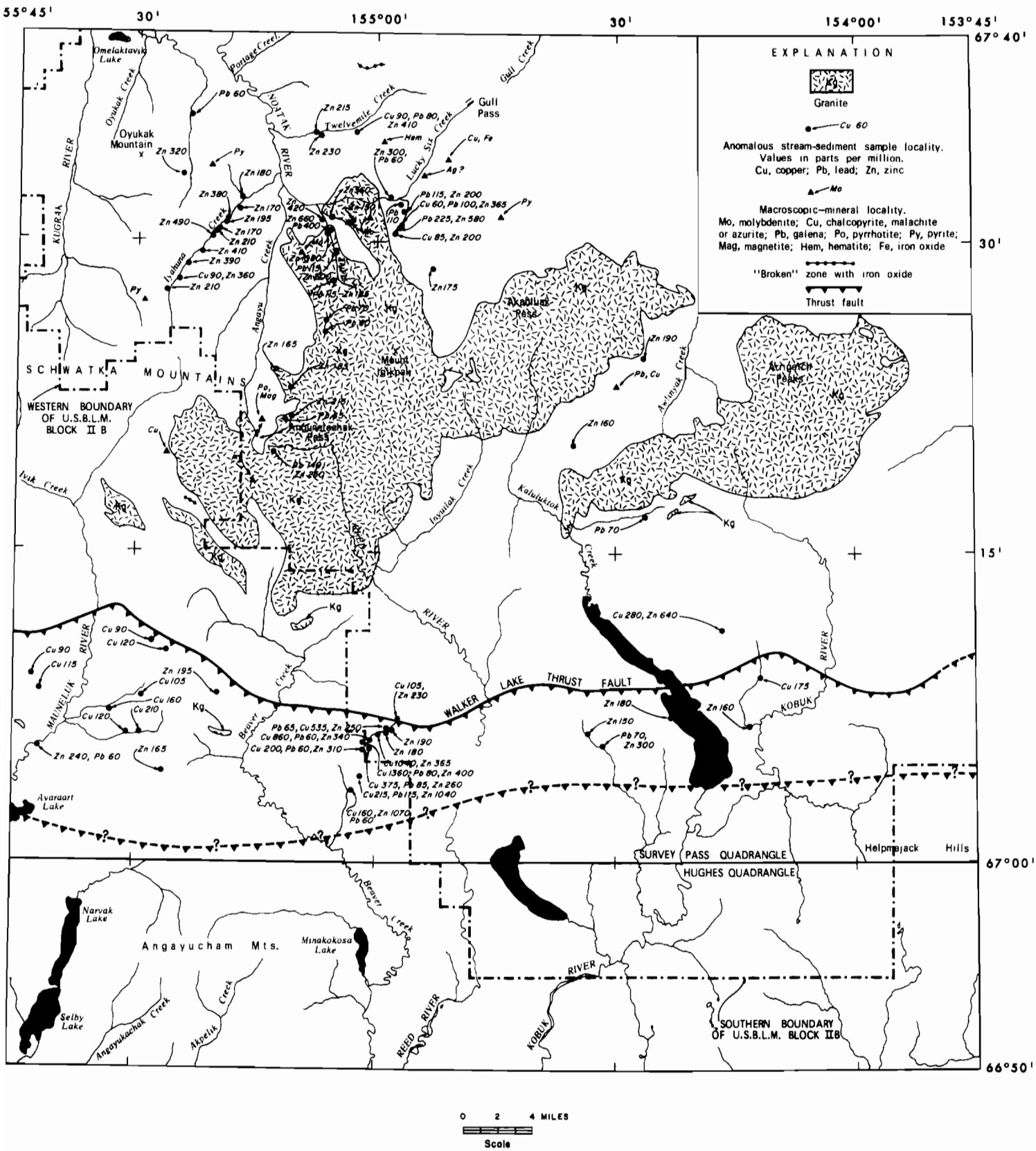
STRUCTURAL SYMBOLS FOLLOW CONVENTIONAL STANDARDS.

GEOLOGY MAPPED BY C. E FRITTS, G. R. EAKINS AND R. E GARLAND, ASSISTED BY J.T. LARSON, W. S. ROBERTS, J.M ZDEPSKI AND G. L KLINE

0 2 4 MILES
Scale

SIMPLIFIED BEDROCK GEOLOGIC MAP OF THE WALKER LAKE AREA, SURVEY PASS AND HUGHES QUADRANGLES, ARCTIC ALASKA, 1971

Figure 5



GEOCHEMICAL SAMPLING IN THE WALKER LAKE AREA, SURVEY PASS AND HUGHES QUADRANGLES, ARCTIC ALASKA, 1971

Figure 6

50 miles to the Kogoluktuk River in the eastern Ambler River quadrangle. It is believed to cross the river at a point approximately 6 miles north of Bear Creek Mining Company's Arctic Camp prospect, which is 16 miles northeast of Bornite. The fault also was mapped at least 15 miles eastward from Walker Lake, and is believed to extend at least another 15 miles to the north end of Iniakuk Lake in the eastern Survey Pass quadrangle. It probably forms the southern boundary of the Skajit Limestone in the part of the Survey Pass quadrangle recently mapped by Brosgé and Reiser (idem.), although it is not shown by a fault symbol on that map. Displacement on this fault undoubtedly is many miles, as it completely cuts off a triangular fault block containing at least 5 to 6 miles of carbonate-rich strata of the Skajit type west of Walker Lake.

Throughout the 80-mile distance from the Kogoluktuk River to Iniakuk Lake, the Walker Lake thrust separates distinctly different geological terrains, and it appears to be the most important structural break in this part of the Brooks Range. The fault apparently constitutes a boundary along which two great plates containing rocks as old as Devonian collided in late Mesozoic to early Tertiary time. This caused (1) extreme tilting of the colliding strata in opposite directions, making northern strata dip north and southern strata dip south, (2) upward thrusting of the southern plate relative to the northern one, (3) local overturning of rocks in the northern plate as a result of upward and northward drag, (4) related high- and low-angle thrust faulting of strata within the northern plate, including the possibility of northward gravity sliding away from the Walker Lake thrust, and (5) extensive, imbricate, high-angle, thrust faulting of strata in the southern plate due to continued pressure from the south. Prominent high-angle normal faults, which cut thrust faults involving strata of Cretaceous age in the southern part of the area, are attributed to a post-thrust episode of relaxation in Tertiary time. The normal faults are characterized by minimum displacements of as much as 3,000 feet.

In this area, the southern plate consists mainly of thousands of feet of steeply inclined eugeosynclinal strata of possible Devonian age, including predominant graywacke-slate (and graywacke-schist), associated weakly metamorphosed pillow lava, and a little radiolarian(?) chert. Near the Walker Lake thrust, some of them contain glaucophane. Farther south, these rocks are overlain by conglomeratic continental strata of the Bergman Group of Cretaceous age, which presumably were derived from the ancestral Brooks Range as the older rocks in it were being deformed. Pillow lavas and chert are most abundant in the Angayucham Mountains, but also crop out near the southern end of Walker Lake and at other localities. Dips of 50° to 70°S are common, but some strata are nearly vertical or locally overturned. Tops of pillows and graded beds consistently face south. Scattered, discontinuous beds and lenses of crystalline limestone a few tens to a few hundreds of feet thick within these pelitic and volcanic strata contain rugose corals, especially in and near the Angayucham Mountains, indicating a probable Paleozoic age for the sequence. Known and inferred imbricate high-angle thrust faulting within the southern plate probably accounts, in part, for an enormous apparent thickness of the Paleozoic stratigraphic section there, which is 14 to 22 miles wide across strike. Structure is complicated further by the late large-scale normal faults shown near the southern edge of the map. Strata in this plate are intruded by at least two small plutons of well foliated and lineated syntectonic granite of Cretaceous age less than 2 miles in diameter, which are shown on the map north and northeast of Avaraart Lake.

In contrast, the northern plate contains thousands of feet of north-dipping, carbonate-rich and quartz-rich strata of the miogeosynclinal or stable-shelf type, including the Skajit and Lisburne Limestones and associated pelitic and quartzitic rocks. These strata are exposed in a belt at least 35 miles wide across strike, in

which dips generally flatten northward. Volcanic rocks are absent or rare. Tops in the northern strata commonly face north, although beds locally are overturned in Skajit-type limestone exposed near the Walker Lake thrust in the western part of the mapped area. Some of the youngest of the northern strata mapped in 1971 contain foraminifera of probable Mississippian age, which were identified by A. K. Armstrong, U. S. Geological Survey. These fossils were found about 5 miles east-northeast of Oyukak Mountain in a part of the area characterized by imbricate low-angle overthrust faults. The foraminifera (and associated crinoids and Syringopora) were in or near thin limestone beds within largely pelitic strata above (and surrounding) broad window-like areas of marble believed to represent parts of the Skajit Limestone. Similar marble also crops out in a thrust-bound lens near Mount Papiok. Lisburne(?) Limestone crops out near Gull Pass. The northern strata have been intruded by several large concordant to discordant plutons of well foliated and lineated syntectonic granite of Cretaceous age. The largest pluton is 20 to 30 miles in diameter and is well exposed in some of the highest peaks of the central Brooks Range, including 8510-foot Mount Igikpak. This pluton is cut by a large-scale, north-trending, west-dipping fault, here called the Reed River fault, which is shown on the map.

Geochemical stream-sediment samples collected during the summer were analyzed for trace amounts of copper, lead, and zinc by the atomic absorption method at the Division laboratory in College. Anomalous values for these metals were determined by inspection of frequency distribution histograms. Minimum anomalous values are as follows: 85 ppm copper, 60 ppm lead, and 160 ppm zinc.

Anomalies (fig. 6) are concentrated in four general areas, namely (1) a west-trending belt of graywacke-slate and related schist south of the Walker Lake thrust fault west of Walker Lake, (2) the northernmost margin of the major granite pluton in the area near the Reed River fault and the Noatak River, (3) Iyahuna Creek and Twelvemile Creek, tributaries of the Noatak west and north of the north end of the main pluton, and (4) the western margin of the main pluton near Angunelechak Pass. Only four isolated and scattered anomalies occur outside the above areas. One of these, located about 4 miles east of Walker Lake, is quite strong, showing 280 ppm copper and 640 ppm zinc. The others are weak and probably not significant.

Several strong copper-lead-zinc anomalies in the southern belt, approximately 18 miles west of the southern end of Walker Lake, were obtained from an area near Bear Creek Mining Company's Picnic Creek prospect. Stream sediments there yielded maximum values of 1360 ppm copper, 1070 ppm zinc, and 115 ppm lead. These copper and zinc values are the highest found and are in the same structural belt as Bear Creek's Arctic Camp prospect near Bornite.

Other copper-zinc anomalies in the southern belt of graywacke-slate and related schist are from scattered localities between Beaver Creek and the west side of Mauneluk River. These anomalies are weak to moderately high, showing as much as 210 ppm copper and 240 ppm zinc. Only one lead anomaly was found, showing a weak 60 ppm. While the copper and zinc values in this area offer some encouragement for prospecting, the distribution does not pinpoint any local concentrations, and no mineralization was observed in outcrop. The same comment can be made for anomalies from five other locations near the south end of Walker Lake.

Four localities along the western edge of the main pluton near Angunelechak Pass produced two anomalies for lead (65 and 140 ppm), and four for zinc (165 to 215 ppm). A north-trending "broken" zone, containing iron oxide staining and a few small pods of pyrrhotite less than one inch wide, extends for several hundred feet at Angunelechak Pass.

Summer field party working in the Walker Lake area of Survey Pass Quadrangle, Arctic Alaska.
Above, Jim Fritts and Bob Garland mapping near the Kugrak River.
Left, Al Kendall, helicopter pilot, and a 425-pound quartz crystal found 20 miles west of Walker Lake.
Bottom, Gil Eakins using field radio west of Gull Pass.

Figure 7

Lead and zinc anomalies were detected along two small streams which drain into the Noatak River near the northernmost part of the main pluton. One stream is Tupik Creek. The other is unnamed but is almost opposite the mouth of Lucky Six Creek. At Tupik Creek, zinc values ranged from 600 to 1080 ppm and lead from 115 to 400 ppm. At the unnamed creek, copper was 60 to 85 ppm, lead 100 to 225 ppm, and zinc 300 to 580 ppm.

Iron staining is visible in granite in bluffs on the north side of the Noatak River, and pyrite was found in the unnamed creek opposite Lucky Six Creek. Several patches of bright yellow iron staining as much as a few hundred feet wide are present in the region between Angayu Creek and Kugrak River to the west. Considerable pyrite also was found in a white quartzite in a tributary on the east side of the Kugrak River near its head.

Moderately high zinc anomalies were detected in sediment from Iyahuna Creek, which flows into the Noatak from the south about four miles west of the northernmost granite. Anomalous values were obtained along this stream for a distance of seven miles. Zinc values ranged from 170 to 490 ppm. A single copper anomaly there shows a low 90 ppm. No lead anomalies were found there. The copper and zinc anomalies, along with gossans, make the drainage of Iyahuna Creek an interesting area for prospecting.

Across the Noatak River from Iyahuna Creek, three anomalous samples were collected from Twelvemile Creek. These showed zinc values of 215, 230, and 410 ppm, respectively. One showed 90 ppm copper, and another 80 ppm lead. About two miles north of Twelvemile Creek, near its head, a west-trending, iron-stained "broken" zone in dolomite can be traced for almost two miles.

Sulfide minerals other than pyrite were observed at five localities. Molybdenite was found disseminated in patches a few inches across in granite, and as flakes in quartz veins cutting granite, south of the Noatak River. Molybdenite also was found disseminated in garnet-epidote rock of contact metamorphic origin associated with granite exposed between Tupik and Angayu Creeks. Several masses of galena as much as an inch wide were found in quartz pods cutting metasedimentary rocks exposed between the two largest granite plutons in the area about 4 miles west of Awlinyak Creek. A little chalcopyrite was found on the east side of Lucky Six Creek north of the Noatak River. Thin coatings of malachite (and rarely azurite) were seen on several outcrops peripheral to the main granite pluton.

Unusually large pieces of crystalline hematite were found in rubble derived from hematite-quartz veins cutting marble on the north side of the Noatak River near Mount Papiok. The largest piece collected is about 4x5x8 inches, weighs about 30 pounds, and consists of a single "book" of tabular hematite crystals.

Surficial deposits cover an estimated 70% of the mapped area. These deposits include alluvium, colluvium, soils, and glacial drift. Generally the surficial cover is more extensive in the southern part of the area where relief is lower than in the central and northern parts. A wide array of features reflecting both a periglacial origin and a glacial origin were observed. These are erosional as well as depositional, and include talus, felsenmeer (block fields), protalus ramparts, rock glaciers, solifluction lobes, U-shaped valleys, faceted spurs, hanging tributaries, kames, kame terraces, moraines, and outwash plains. Although the determination of the glacial history of the area was not the primary objective of the field project, the data collected in aerial reconnaissance and ridge-top traverses, and from air photos, permit some tentative interpretations and correlations.

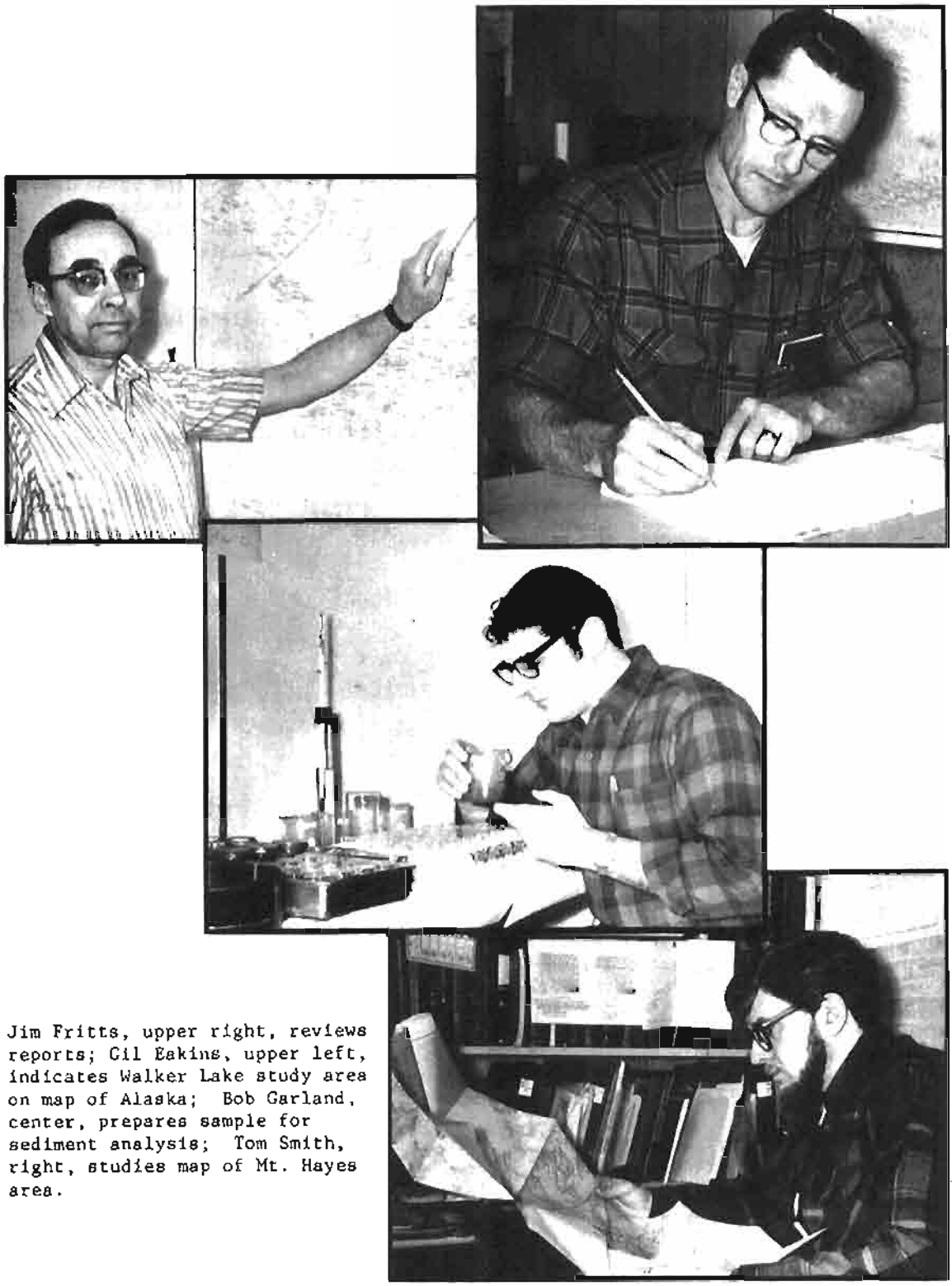
Pre-late Wisconsin glacial events in the report area are represented by ice-scoured uplands, erratic boulders as much as 2000 feet above present valley bottoms, and drift lacking good morainal form in the lowlands which border the south flank of the Brooks Range. Though undifferentiated here, these features may have originated during two separate ice advances. The earlier and more extensive of these advances may be of Illinoian age, and the later one of late Illinoian or early Wisconsin age.

Late Wisconsin events are represented by better preserved moraines and glacially striated outcrops in the major valleys of the region. One of the most conspicuous terminal or recessional moraines can be seen near the southern end of Walker Lake, and several outcrops along the lake shore show very well preserved striations trending southeast parallel to the direction of latest glaciation. Similar distinctly arcuate terminal or recessional moraines of probable late Wisconsin age also are found in the valleys of the Reed and Mauneluk Rivers and Beaver Creek near where these streams leave the south flank of the Brooks Range.

The most recent glaciation in the area is represented by 29 small remnant glaciers at relatively high altitude. Most are valley glaciers, but one caps the northern part of Oyukak Mountain. Short, very well preserved and very young valley moraines also occupy many of the highest valleys of the area no longer occupied by glaciers.

In late August, shortly before the field party returned to Fairbanks, an interesting archeological discovery was made. The Walker Lake campsite apparently had been occupied by Eskimo or Indian hunters hundreds or perhaps thousands of years ago. Flakes of chert were found on a main path within the site, and further search revealed an assortment of stone tools, including hand-axes, scrapers, knives and broken points. All of these artifacts were found beneath 6 to 8 inches of caribou moss and peat, and beneath the root systems of spruce trees as much as 200 years old. Mindful of the provisions of the recently enacted Alaska Antiquities Act, the search for artifacts was conducted as carefully as possible, and the site was mapped in detail. All of the artifacts found, plus photographs, charcoal for possible C^{14} dating, a spruce section for tree-ring study, and a map of the site were turned over to the Department of Anthropology, University of Alaska.

The same features that attracted Alaska Geological Survey personnel to this site undoubtedly attracted the earlier occupants as well. The site included a stream-cut bench or terrace several tens of feet above lake level, with a commanding view of the lake to the south. In prehistoric time, or in the absence of modern vegetation such as spruce and alder thickets, it also would have provided an excellent view to the west and north. Its attractiveness was enhanced further by a spring issuing from a hole approximately 4 feet in diameter and more than 45 feet deep in a limestone outcrop less than 100 yards from the center of the campsite. This spring was flowing well in May before the spring breakup, and it apparently does not stop or freeze over during the winter. Its rate of flow in August 1971 was estimated to be approximately 2000 gallons per minute.



Jim Fritts, upper right, reviews reports; Gil Eakins, upper left, indicates Walker Lake study area on map of Alaska; Bob Garland, center, prepares sample for sediment analysis; Tom Smith, right, studies map of Mt. Hayes area.

Figure 8

BEDROCK GEOLOGY OF THE MT. HAYES A-6 QUADRANGLE

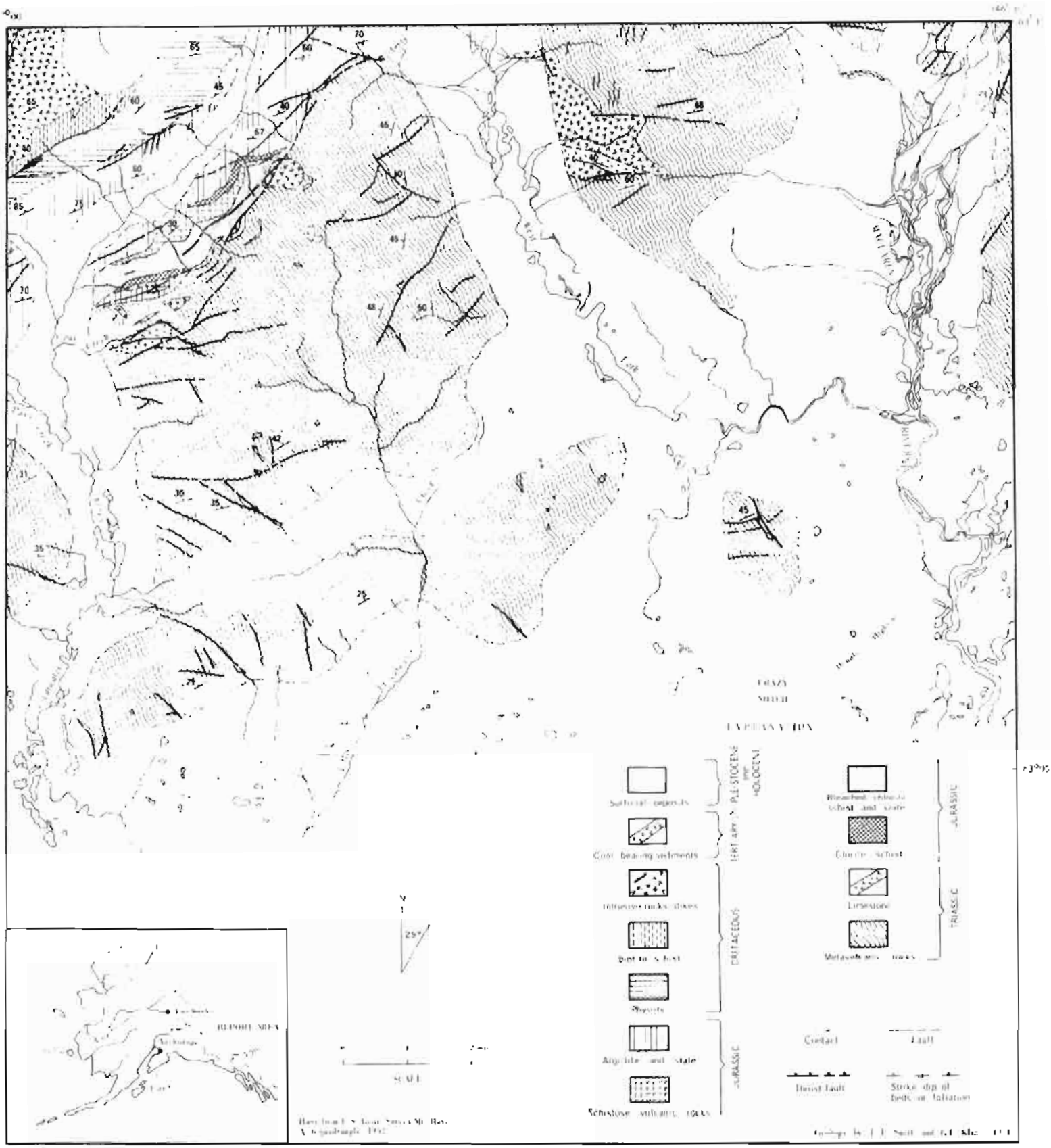
by Thomas E. Smith

The 1971 field season was spent primarily in reconnaissance geologic mapping and geochemical sampling of the Mt. Hayes A-6 quadrangle, as part of a continued effort by the author to define metamorphic zonation in major bedrock units and to evaluate mineral resource potential of the Clearwater Mountains. The preliminary discussion and map included here are based on field mapping and hand specimen criteria. This brief account will be superseded by a final quadrangle map when laboratory data and other preparations become available. Results of the geochemical sampling program will be released separately.

Bedrock exposures are confined mainly to the northern half of the quadrangle, where the landscape consists of sharp narrow ridges separated by deep glacial valleys (fig. 9). River valleys, lowlands, and upland areas to an elevation of about 4000 feet above sea level are mantled by a diverse variety of glacial, alluvial, and other surficial deposits of Pleistocene and Holocene ages. Isolated erratic boulders and cobbles are present on some hills as high as 5000 feet.

Figure 9. Glaciated terrain along upper Clearwater Creek. View downstream and southwest along strike of major units. Ridge in foreground underlain by metamorphosed volcaniclastic sediments (T) and limonitic argillite (A). Mountains on opposite side of Clearwater Creek are mainly slate and phyllite.

The northern part of the quadrangle is underlain largely by mildly metamorphosed lavas, which comprise a northwest-dipping, apparently tholeiitic volcanic series. Southerly exposures of this unit, near Crazy Notch (fig. 10), are dark, massive to sparsely amygdaloidal flows with minor laminated cherts and tuffs of pink, green, and gray color. In many exposures there and elsewhere, faulting has been localized by the sediment horizons, with the result that many of the more important faults parallel regional grain.



Generalized bedrock geologic map of the Mt. Hayes A-6 quadrangle, central Alaska

Figure 10

Individual flows of the volcanic succession become generally more heterogenous upsection (northwestward). Most of the flows cropping out between Clearwater Creek and West Fork are abundantly amygdaloidal or porphyroaphanitic basalts and andesites(?). Freshly broken surfaces vary from grayish olive through grayish brown to grayish red. Amygdule minerals are most commonly calcite, epidote, quartz, or chlorite with minor prehnite and zeolites(?). Locally both plagioclase phenocrysts and amygdules weather in strong relief, lending a pseudo-granitoidal appearance to some outcrops.

Coarse-grained rocks in the volcanic unit east of lower Clearwater Creek may represent intrusive sills, although their rhythmic occurrence with bedded flows and concordance for at least several hundred feet suggests they are thick, slowly-cooled flows. No cross cutting features or contrasting compositions were noted to support an intrusive origin for the coarse-grained rocks.

Many greenish and reddish flows, with glomeroporphyritic clots of plagioclase, occur on the mountain just south of Pass Creek (fig. 10). These rocks have an unusual "snow flake" appearance and may have value as decorative building stone.

The uppermost part of the volcanic sequence, and rocks immediately upsection, record a shift in depositional pattern from (1) subaerial volcanism to (2) shallow marine sedimentation with associated volcanism and finally to (3) shallow marine sedimentation. Lenticular gray limestone bodies, carbonaceous argillite, and tuffaceous strata are interbedded with the uppermost flows. Pillow basalts also occur locally along this zone. A fossil collection from the limestone body in Coal Creek includes the pelecypod *Monotis*, either *M. subcircularis* or *M. salinaria*, which is late Upper Triassic in age (Moffit, 1912, p. 33; N. J. Silberling, written commun., 1969).

Bedrock exposures immediately northwest of the volcanic unit define a transitional belt of dissimilar but related rock types that grade into pelitic sediments above. Volcaniclastic sediment, argillite, limestone, and intermixed flows and sediment occur along this narrow zone, separating the volcanic sequence from pelitic rocks which underlie most of the upper Clearwater Creek drainage. Mappable lithologic units in this zone are large lenticular bodies which show various degrees of internal deformation and recrystallization. Some are markedly schistose, whereas others retain a sedimentary character with well preserved primary textures. Numerous bedding-plane faults traverse this area; a few of the smaller lensoidal bodies may represent fault slivers. Several intrusive bodies of intermediate composition were emplaced along this zone and were subsequently sheared and altered. Widespread pyritization, apparently introduced along myriad fractures, has affected both country rock and intrusives. Weathering of these pyritic zones has produced extensive limonitic areas, now strikingly evident as orange and brown color anomalies. The structural and stratigraphic setting of altered rocks along the transitional belt is very similar to that of the Denali Copper Prospect, 10 miles to the southwest.

A zonal belt of complexly folded pelitic metasediments underlies the upper Clearwater Creek drainage. These rocks, which grade from argillite through phyllite to biotite schist (fig. 10), form an eastward extension of an equivalent belt mapped by the author in the Healy A-1 quadrangle to the west, now referred to as the Maclaren metamorphic belt. Lower grade rocks are mostly dark, banded argillite or slate with subordinate intraformational conglomerate. Where primary depositional features such as graded laminae or load casts are preserved, the section is complexly and isoclinally folded. As the argillites grade northwestward into phyllite and biotite schist, sedimentary features are less distinct. In the highest grade pelites, only thin

compositional laminations remain as relict bedding; some former volcaniclastic laminae now contain unoriented amphibole needles, especially evident on foliation surfaces. The phyllitic rocks are often wrinkled or kink-banded on a small scale. Axial planes of small isoclinal folds in the phyllites trend about N60°W and dip 60°N. In many such exposures, minor fold axes are accentuated by closely spaced cleavage.

Poorly consolidated coal-bearing sediments of Tertiary(?) age occur in the Coal Creek valley and in the headwaters of Little Clearwater Creek. Where best exposed, coal seams as much as 3 feet thick are interbedded with gray and tan shale, pebble conglomerate, and moderately sorted sandstone. Elsewhere, sloughed, clayey slopes stained by black coal "bloom" typify exposures of the unit. Most outcrops are highly deformed and faulted.

Plutonic rocks are exposed in the northwestern corner of the quadrangle, along the upper part of the volcanic sequence, and near the West Fork of the Maclaren River. The largest pluton, apparently a biotite quartz diorite or granodiorite, is strongly foliated parallel to adjoining schists. Margins of the same pluton in the Healy A-1 quadrangle, west of the present map area, show marked discordance with surrounding host rocks, and the foliation there is interpreted to be the result of extreme protoclasis. K-Ar ages of coexisting hornblende and biotite at that locality are 66 and 61 m.y., respectively (Smith and Lanphere, 1971, p. 17). Border phases of this pluton, in both quadrangles, display a tectonite fabric and include numerous dark schlieren.

A large non-foliated stock of hornblende quartz diorite is exposed near the West Fork of the Maclaren River. Most outcrops of this body are relatively homogeneous and unaltered, except for local dikelets of aplite, or along shear zones. Metavolcanic country rock north of the body was intruded by an associated north-trending dike swarm. Component dikes of the swarm are mainly quartz diorite porphyry with large phenocrysts of plagioclase and quartz.

Intrusive rocks along the transitional belt appear generally more felsic and more highly altered than other plutons in the map area. The equidimensional stock southeast of upper Clearwater Creek is principally of granitic composition. Westerly outcrops of the stock are fine-grained and equigranular, whereas the eastern part is porphyritic with pinkish alkali feldspar phenocrysts. Numerous small roof pendants of greenish metasediment and hornfelsed volcanic rock are found within the pluton. Propylitic alteration, pyritization, and subsequent weathering have resulted in the strongly bleached and limonitic outcrops now evident.

REFERENCES

Moffit, F. H., 1912, Headwater regions of Gulkana and Susitna Rivers, Alaska: U. S. Geol. Survey Bull. 498, 82 p.

Smith, T. E.; Lanphere, M. A., 1971, Age of the sedimentation, plutonism, and regional metamorphism in the Clearwater Mountains region, central Alaska: Isochron/West, no. 2, August, p. 17-20.

Section III

FUTURE PROGRAMS

DIVISION OF GEOLOGICAL SURVEY PROGRAMS FOR 1972

Programs planned by the Alaska Geological Survey in 1972 include work to be done by the Mining Geology, Geological Services, and Laboratory Sections.

MINING GEOLOGY SECTION

Programs planned by this section include work in Arctic, Southeastern, and

ARCTIC ALASKA. Geologic mapping and stream-sediment sampling will continue in the west-central Brooks Range in 1972 as part of a long-term study of the regional setting of the well known copper prospect at Bornite and others in that vicinity. Mapping so far has shown that the most significant copper deposits in the region are in a broad belt of complexly deformed metasedimentary and metavolcanic strata of probable to known Paleozoic age along the southern flank of the Brooks Range. These deposits all appear to be structurally as well as stratigraphically controlled. The belt of noteworthy copper mineralization now is known to be south of a major west-trending, high-angle thrust fault recognized in the course of recent mapping near Walker Lake in the Survey Pass quadrangle. In 1971, this fault appeared to extend westward at least 60 miles to a point in the Ambler River quadrangle about 6 miles north of Bear Creek Mining Company's Arctic Camp prospect, which is 16 miles northeast of Bornite. In 1972, mapping will be done mainly in the southern and eastern parts of the Ambler River quadrangle and in the westernmost part of the Survey Pass quadrangle. The field party plans to tie in with previous mapping done by C. E. Fritts in the Cosmos Hills and Angayucham Mountains in 1968-1970 and by C. E. Fritts, G. R. Eakins and R. E. Garland near Walker Lake in 1971, assuming that full helicopter support will be forthcoming.

SOUTHEASTERN ALASKA. Detailed mapping of the geology and geochemistry of the Craig A-2 quadrangle and some adjoining areas on Prince of Wales Island will be continued. The aim of the geologic work is to describe and map the rocks and structures of the Wales group and to determine the structural relationships of the

Wales rocks with the surrounding rocks. Work at high elevations will be facilitated by a limited amount of helicopter support.

Geochemical bedrock and stream-sediment samples will be taken throughout the area. Results will show the ore potential of the various geological features that are mapped. Results in background areas will show the normal relationships of bedrock vs. stream-sediment metal contents. Such information will be useful in designing prospecting programs in the region.

SOUTH-CENTRAL ALASKA. Since 1968, geological investigations by Thomas E. Smith in the Clearwater Mountains have resulted in geologic maps of nearly 500 square miles, including detailed studies of lode and placer gold occurrences in the Valdez Creek mining district, as well as a comprehensive geochemical survey of the entire

area. Correlation of the new bedrock mapping with that of others has established that a zonal metamorphic belt, heretofore unrecognized, extends southwestward from the Richardson Highway north of Paxson through the Clearwater Mountains and into the northern Talkeetna Mountains. Lode gold and copper occurrences in the Clearwater Mountains appear to coincide with structural intersections along major E-W trending faults of Tertiary(?) age.

In 1972, the Division will continue geologic investigations in the Healy A-2 and Mt. Hayes A-6 quadrangles, in order to further delineate bedrock units and to establish character, extent, and age of metamorphism, plutonism, and mineralization in the region. Mapping of remote parts of the quadrangles and reconnaissance examination of contiguous areas will be carried out under helicopter support.

GEOLOGICAL SERVICES SECTION

COMMODITY STUDIES. Two commodity studies by the Division's mining engineer are planned for 1972. The first is a continuation of a long-range study of mercury in Alaska. A project began in 1971 in the lower Kuskokwim region of Western Alaska. This region contains numerous mercury deposits, and has been productive for several years. The region should continue to produce mercury and add to the Alaskan economy.

The second study will involve the possibility of mining coal for export. Coal has been mined in Alaska for more than a century and has added to the economy of the State continuously since 1915. Two areas of particular interest in Alaska today are the Beluga area of the Susitna field in South-central Alaska and the Kukpowruk River area of the Northern coal field in Arctic Alaska. The coals in the Beluga area are close to tidewater, low in sulphur, and potentially an excellent source of steaming coal. The Kukpowruk River area in the Northern coal field contains a 20-foot bed of coking coal. Coking coals are in short supply today in the world market. Private companies have been actively exploring the Beluga coals, and the U. S. Bureau of Mines is planning a new exploration program for the Northern coal field starting in the summer of 1972.

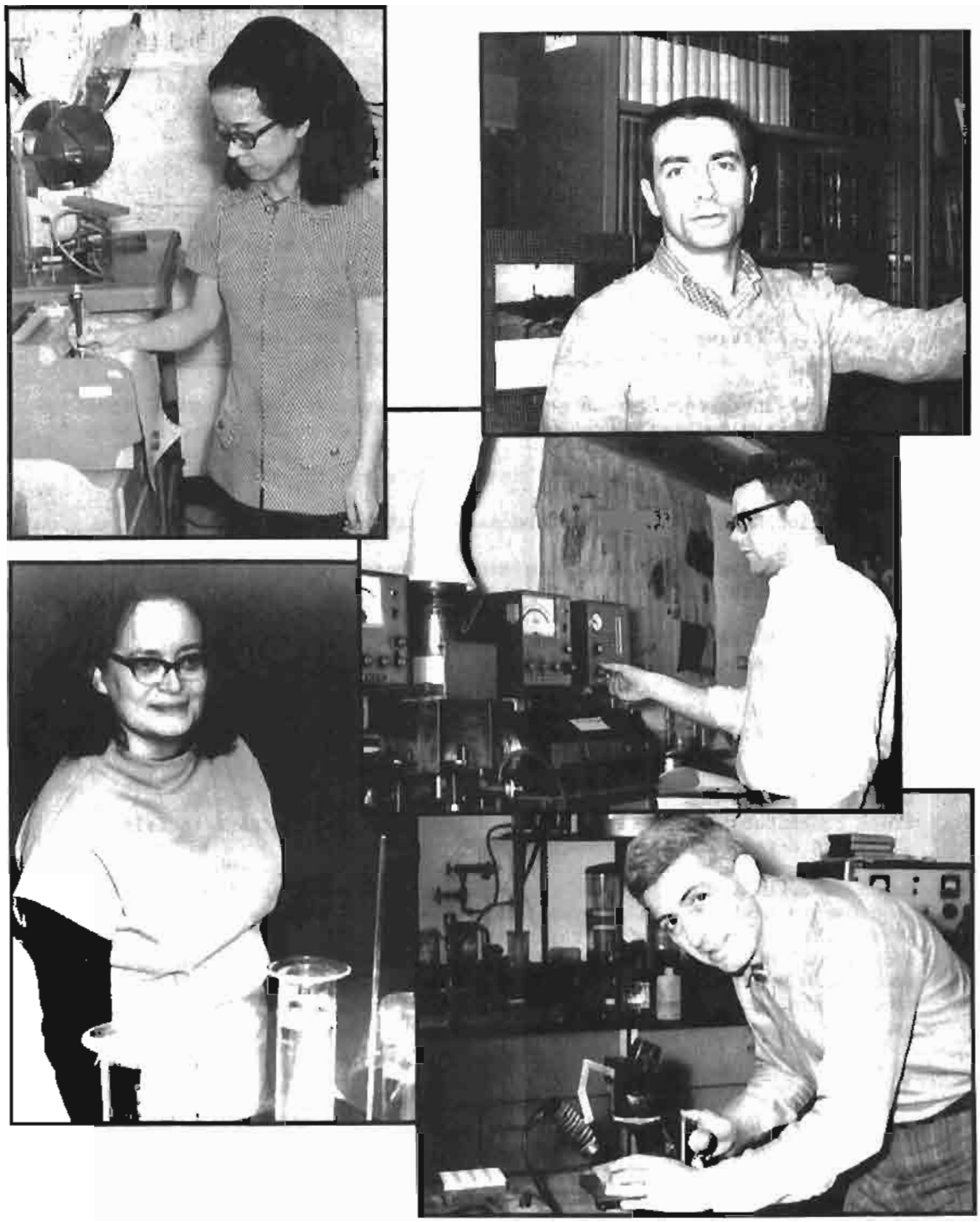
GEOPHYSICS. Geophysical work in 1971 concentrated on aeromagnetic survey mapping. Continuation of the aeromagnetic survey work is planned for 1972, and it is anticipated that approximately 12,000 square miles will be mapped.

CARTOGRAPHY AND GRAPHICS. The continued production of maps for geological and geochemical reports is planned for 1972, as well as the providing of art work for various other Division publications.

MINERAL ANALYSIS AND RESEARCH LABORATORY

Programs and objectives are summarized as follows:

1. Continuing review and evaluation of analytical methods, sample handling, data processing, and monitoring of current procedures. Methods employed include X-ray diffraction and emission spectrometry, atomic absorption spectrophotometry, optical emission spectroscopy and spectrography, fire assay, polarizing microscopy, colorimetry, and other techniques.



Laboratory Staff. Namok Veach, upper left, works with X-Ray diffractometer; Tom Mowatt, upper right, is Laboratory Supervisor; Pat Garland, center left, checks sediment particles; Tom Trible, center right, takes sample reading on atomic absorption spectrophotometer; Don Stein, right, examines rock sample.

Figure

2. Evaluation and reassessment of the Division program in geochemical reconnaissance, with the object of attempting to optimize the efficiency and reliability of work in this area. This involves three major concerns:

   a. analytical procedures (field and laboratory)

   b. theoretical geochemical considerations, including sampling, element distributions and behavior, geologic/geochemical associations

   c. data processing (computer interfacing, input, data manipulation, and output) and data evaluation/interpretation.

3. Fundamental investigations in geochemistry-mineralogy-petrology relative to minerals exploration and resource appraisal. Of primary concern here is the manner in which elements of interest are associated in various geologic environments. Topics of current interest include:

   a. relationships between soils and parent materials

   b. relationships among coexisting mineral phases in rocks of granite aspect, with regard to potential mineralization

   c. relationships in carbonate rocks, areally and stratigraphically, with respect to copper, lead and zinc mineralization

   d. relationships in rocks of varying metamorphic grades, with respect to element distribution/redistribution and potential strata-bound (or other) mineralization.

4. Development of a computerized scheme to facilitate major, minor, and trace constituent chemical elemental analysis of geological materials, utilizing X-ray emission spectrometry.

5. Maintenance of a high level of competence in X-ray diffraction analysis, in order to maximize the information obtainable by this technique. Crystallographic information regarding atomic substitution, order-disorder and polymorphism, for example, is of interest in investigating various geologic/mineralogic relationships such as mineral composition, rock composition, alteration effects, geothermometry, petrogenesis, and ore genesis.

Section IV

OTHER AGENCIES

U. S. GEOLOGICAL SURVEY

OFFICE OF THE DIRECTOR Office of Public Inquiries.	508 Second Avenue Anchorage, Alaska 99501
ADMINISTRATIVE DIVISION CONSERVATION DIVISION Branch of Mining Operations. Branch of Oil and Gas Operations. Branch of Mineral Classification.	218 E Street Anchorage, Alaska 99501
GEOLOGIC DIVISION Branch of Alaskan Mineral Resources Main Office - Menlo Park	345 Middlefield Road Menlo Park, California 94025
Field Office - Anchorage	218 E Street Anchorage, Alaska 99501
Field Office - near Fairbanks	(Room 402 Brooks Building University of Alaska) Box 80586, College, Alaska 99701
Branch of Engineering Geology. Office of Earthquake Research and Crustal Studies. Office of Marine Geology.	345 Middlefield Road Menlo Park, California 94025
Branch of Paleontology and Stratigraphy	U. S. Geological Survey Washington, D. C. 20242
PUBLICATIONS DIVISION Alaska Map Distribution Section.	310 First Avenue Fairbanks, Alaska 99701
TOPOGRAPHIC DIVISION Resident Engineer	218 E Street Anchorage, Alaska 99501
WATER RESOURCES DIVISION Anchorage Office	218 E Street Anchorage, Alaska 99501
Fairbanks Office	310 First Avenue Fairbanks, Alaska 99701
Juneau Office	441 Federal Building Juneau, Alaska 99801

CURRENT STUDIES CONDUCTED BY U. S. GEOLOGICAL SURVEY

1. Geologic mapping and mineral resource evaluation, principally at scales of 1:250,000 and 1:63,360.
2. Mineral district mapping and evaluation.
3. Mineral reconnaissance.
4. Geochemical studies and sampling related to mineral studies.
5. Aeromagnetic and gravity surveys and interpretation.
6. Engineering geology studies in urban areas.
7. Isotope age determinations and interpretation.
8. Heat flow.
9. Oil shale studies.
10. Subbottom profiling, sampling, and geophysical studies of the ocean floor.
11. Seismic studies.

A complete coverage of the location and types of studies performed is presented in Table 3.

OTHER RESEARCH AND ACTIVITIES OF THE U. S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION. Activities include the collection, analysis and interpretation of data on the availability and quality of surface and ground water throughout the state.

CONSERVATION DIVISION.

Branch of Mining Operation. This office supervises mining and prospecting operations on Federal lands and offshore areas. Coal production and value is studied.

Branch of Oil and Gas Operation. This office is responsible for the supervision of oil and gas exploration and development and royalty accounting on all Federal and Indian lands in Alaska (except Naval Petroleum Reserve No. 4), as well as the Outer Continental Shelf Lands.

Branch of Mineral Classification. This office investigates the value of petroleum and minerals on public domain lands and the outer continental shalf, and classifies the land for leasing of mineral rights.

GEOLOGIC DIVISION.

Branch of Alaska Mineral Resources. The office at Anchorage has three resident geologists and the office at College, near Fairbanks, has one. Both offices contain maps and reference material for use by interested parties, and the geologists are available for consultation.

USGS PUBLICATIONS AND MAPS

Tables 4-9 list U. S. Geological Survey 1971 publications. These and other USGS reports and maps are available for study at USGS offices, and also at offices of the State of Alaska Division of Geological Survey.

Open-File Reports can be purchased only at the

Branch of Alaskan Mineral Resources Office
345 Middlefield Road
Menlo Park, California 94025

Other publications and maps may be purchased in Anchorage at the

Office of Public Inquiries
508 Second Avenue
Anchorage, Alaska 99501

Topographic and geologic maps are also available from various dealers throughout the state whose addresses are available from the USGS; or at the

Alaska Map Distribution Section Office
310 First Avenue
Fairbanks, Alaska 99701

Circulars are free, and may be obtained at most USGS offices.

TABLE 3. U.S.G.S. CURRENT STUDIES IN ALASKA

Location		Activity
Arctic Alaska	Northeastern Brooks Range	Reconnaissance mapping
	Pipeline Route	Engineering-geologic study between Prudhoe Bay and Dietrich River
	Well Core Study	Intensive study of cores from wells drilled on the Arctic Coast
Interior Alaska	Wiseman to Big Delta	Engineering-geologic studies along the proposed pipeline route
	Tanana Quadrangle	Geologic mapping and special studies of structural, stratigraphic and economic geology
	Eagle Quadrangle	Continuance of geologic mapping and geochemistry
Western Alaska	Seward Peninsula	Reconnaissance mapping of Bendeleben quadrangle
	Eastern Seward Peninsula	Geologic mapping and mineral investigations
	St. Matthew Island	Gather basic geologic information of Islands and Bering Sea shelf
	St. Lawrence Island	Basic geologic and resource studies
South-western Alaska	Tikchik Lakes Area	Study and sampling of mercury deposits
	Goodnews Bay	Mapping and goechemical sampling near the Goodnews Bay platinum deposits
South-Central Alaska	Delta Junction to Valdez	Engineering-geologic study of pipeline route
	Mount McKinley	Study of the Denali Fault in Mount McKinley National Park
	Eastern Alaska Range	Geologic mapping and geochemistry
	Southern Wrangell Mountains	Geologic mapping and geochemistry
	Anchorage Area	Mapping for land use planning, and geologic mapping and geochemistry in the western Chugach Mountains

Table 3. U.S.G.S. Current Studies (continued)

Location		Activity
So.-Central Ak. (con't.)	Gulf Of Alaska	Geologic mapping and study of copper and gold mineralization
	Chickaloon	Stratigraphic studies on Boulder Creek
Southeastern Alaska	Craig Quadrangle	Stratigraphic and structural studies of Paleozoic rocks
	Juneau	Regional mapping on the Coast Range batholithic complex and study of surficial deposits in the Juneau area
	Sumner Strait	Determine if rocks are equivalents to those in the Ketchikan area
	Dall Island	Geologic mapping
	Annette-Gravina Project	Geologic mapping on Gravina and Annette Islands and other selected areas
	Haines-Porcupine	Check mapping and mining developments
Offshore Alaska	Gulf of Alaska Bering Sea St. Matthew Island Beaufort Sea	The office of Marine Geology will participate with other government agencies in drilling and sampling underwater sediments and study of geologic structures

U. S. BUREAU OF MINES

William E. Eckard heads the Interior Department's Bureau of Mines in Alaska. Eckard is also chief of the Bureau's Alaska office of Mineral Resources, with headquarters in Juneau.

The U. S. Bureau of Mines assists in maintaining the National mineral and energy supply while minimizing environmental damage and health hazards. The Bureau furnishes technical assistance and information on minerals and mineral fuels to State and Federal agencies and the mining industry. In addition, the following field projects were active in 1971 and most are continuing into 1972.

APPRAISAL OF COAL RESERVES. The Bureau of Mines in cooperation with the classification Branch of the U. S. Geological Survey has started a long-term program to evaluate Arctic Northwestern Alaska's coking coal potential. A coal sampling outfit including drilling equipment, low ground-pressure transport vehicles, and camp facilities was assembled and tested in Fairbanks during the summer and fall of 1971. The equipment will be moved to the Cape Beaufort area via C-130 Hercules aircraft early in 1972.

APPRAISAL OF PETROLEUM PRODUCTION. As a part of a nationwide study of alterations in historic supply patterns, an evaluation was made of production by primary and secondary methods as well as from offshore producing areas. Individual field oil and gas data, as well as production of natural gas liquids and condensate, were compiled for the various fields through 1985.

AVAILABILITY OF MINERALS. A study of the availability of mercury in Alaska, Nevada, and California should be completed in early 1972. The report will include reserve estimates and costs for various size mines using different mining and processing methods.

WILDERNESS INVESTIGATIONS. The Bureau of Mines investigation of areas proposed for inclusion in the wilderness system started in the Granite Fiords area of Southeast Alaska in 1971. A two-man field team gathered information on claims and mineral deposits in or near the area and examined deposits accessible by boat or plane. In 1972 two Bureau of Mines field parties will cooperate with U. S. Geological Survey field parties sharing a helicopter to examine the remaining known or reported mineral deposits in or near this area. Investigation of proposed wilderness areas in the vicinity of Tracy Arm and on the west side of Chichagof Island will follow.

COAL FIRES, NENANA. Bureau of Mines personnel started to extinguish a coal fire on Federal lands in the Nenana coalfield near Healy in early June and recessed in mid-September 1971. An attempt was made to completely remove the burning coal because air is thought to be feeding the fire through an underlying coarse-grained sandstone. When it became obvious that the burning materials could not be removed before winter, a cover of noncombustible materials was placed over the fire area. Control work on this fire will resume in the spring of 1972.

COAL FIRES, NINILCHIK. A coal fire at a beach recreation area near Ninilchik on the Kenai Peninsula, that had burned for several years, was extinguished. Work commenced under a negotiated contract with Cook Inlet Construction Co. of Soldotna September 7, and was completed September 21, 1971. Since the coal in the area is State property, Alaska's Department of Natural Resources participated in the financing.

TRANSPORTATION CORRIDOR. A listing and brief description of the known mineral deposits adjacent to the pipeline corridor from Prudhoe Bay to Fairbanks was started in July 1971 and should be completed early in 1972.

PETROLEUM SEEPS. Reports of petroleum seeps and leaks - both natural and man made - are being investigated to determine what action may be required to eliminate health hazards or to safeguard the environment. This is a continuing program that started in 1971.

PUBLICATIONS. U. S. Bureau of Mines recent publications are listed in tables 10 through 14. The Bureau also published a report in cooperation with the Mineral Industry Research Laboratory of the University of Alaska -- Report No. 27, which is listed in table 15.

MINERAL INDUSTRY RESEARCH LABORATORY

The Mineral Industry Research Laboratory is part of the University of Alaska's College of Earth Sciences and Mineral Industry at College, Alaska. Its purpose is to conduct basic and applied research to promote the mineral industries in the State.

COOPERATIVE POLICY

The equipment and technical expertise of MIRL is available to the Alaska Geological Survey, as a continuation of the policy of cooperation which has existed between the two organizations. During the past year, numerous occasions have arisen in which both of these groups has benefited by this mutual association, in terms of or loan of instrumentation, chemicals, literature, etc., as well as through continuing exchange of ideas on technical matters of common concern. Division personnel currently use the MIRL Optical Emission Spectrograph on a rental basis, in the course of analytical work.

PUBLICATIONS

A list of publications prepared by the Mineral Industry Research Laboratory follows. Numbered MIRL reports from 1964 to 1971 are contained in table 15.

Anyone interested in Alaska prospecting will find useful information in several books available for sale at the Mineral Industry Research Laboratory. A list can be obtained by writing to the laboratory at the University of Alaska, College, Alaska 99701.

TABLE 4. U.S.G.S. PROFESSIONAL PAPERS

Number	Title	Author
632	Mineral resources of Glacier Bay National Monument, Alaska	D. M. Mackevett, Jr. D. A. Brew C. C. Hawley L. C. Huff J. G. Smith
684-C	Preliminary geologic investigations of western St. Lawrence Island, Alaska	W. W. Patton, Jr. B. Csejtey, Jr.
703	Stratigraphy and paleontology of the revised type section for Tahkandit Limestone (Permian) in east-central Alaska	E. E. Brabb R. E. Grant
706	Pennsylvanian Fusulinids from southeastern Alaska	R. C. Douglass
711-A	New Late Mississippian ostracode genera and species from northern Alaska	I. G. Sohn
715-A	Combined ice and water balances of Gulkana and Wolverine Glaciers, Alaska, and South Cascade Glacier, Washington, 1965 and 1966 hydrologic years	M. F. Meier W. V. Tangborn L. R. Mayo A. Post

TABLE 5. U.S.G.S. BULLETINS

Number	Title	Author
1028-U	Geology of the Near Islands, Alaska	O. Gates H. A. Powers R. E. Wilcox
	with a section on surficial geology	J. P. Schafer
1211-E	Geologic reconnaissance of a proposed powersite at Lake Groco, Revillagigedo Island, Southeastern Alaska	A. A. Wanek J. E. Callahan
1312-K	Orientation geochemical soil survey at the Nixon Fork mines, Medfra quadrangle, Alaska	B. L. Reed R. L. Miller
1315	Geochemical and geological reconnaissance in the Seventymile River area, Alaska	S. H. B. Clark H. L. Foster
1323	Stratigraphy and general geology of the McCarthy C-5 quadrangle, Alaska	E. M. MacKevett, Jr.
1333	Geology of the McCarthy B-4 quadrangle, Alaska	E. M. MacKevett, Jr.
1343	Tertiary marine mollusks of Alaska: an annotated bibliography	W. O. Addicott

TABLE 6. U.S.G.S. SHORT PAPERS - PROFESSIONAL PAPER ANNUAL SERIES

Reference Professional Paper	Page Numbers	Article	Author
700-B	B21-B26	Mafic and ultramafic rocks from a layered pluton at Mount Fairweather, Alaska	G. Plafker E. M. MacKevett, Jr.
700-B	B33-B42	Blueschist and related greenschist facies rocks of the Seward Peninsula, Alaska	C. L. Sainsbury R. G. Coleman R. Kachadoorian
700-B	B224-B226	The relationship between surface water and ground water in Ship Creek near Anchorage, Alaska	J. B. Weeks
700-D	D125-D128	Induced polarization and resistivity surveys on Cleary Summit, Alaska	L. A. Anderson G. R. Johnson
700-D	D129-D133	Geologic interpretation of a residual aeromagnetic map of the Nixon Fork District, Alaska	L. A. Anderson B. L. Reed G. R. Johnson
700-D	D146-D152	Gold resource potential of the Denali bench gravels, Valdez Creek Mining District, Alaska	T. E. Smith
750-B	B23-B34	Lisburne group, Cape Lewis-Niak Creek, northwestern Alaska	A. K. Armstrong B. L. Mamet J. T. Dutro, Jr.
750-B	B48-B52	Paleocene mollusks from the Gulf of Alaska Tertiary province - a significant new occurrence on the North Pacific rim	W. O. Addicott G. Plafker
750-C	C18-C33	Clark's Tertiary molluscan types from the Yakataga district, Gulf of Alaska	W. O. Addicott S. Kanno K. Sakamoto D. J. Miller
750-C	C39-C43	Goniatites Americanus N. Sp., a late Meramec (Mississippian) index fossil	M. Gordon, Jr.
750-C	C52-C57	The Ordovician-Silurian boundary in the York Mountains, western Seward Peninsula, Alaska	C. L. Sainsbury J. T. Dutro, Jr. M. Churkin, Jr.

Table 6. U.S.G.S. Short Papers (continued)

Reference Professional Paper	Page Numbers	Article	Author
750-D	D1-D8	Geology and geochemistry of the Sinuk River barite deposit Seward Peninsula, Alaska	D. A. Brobst D. M. Pinckney C. L. Sainsbury
750-D	D68-D76	Cretaceous plutonic rocks of St. Lawrence Island, Alaska - a preliminary report	B. Csejtey, Jr. W. W. Patton, Jr. T. P. Miller
750-D	D122-D126	Glaciation of the Ray Mountains, Central Alaska	W. Yeend
750-D	D198-D201	Reconnaissance of ground-water supplies from bedrock in the Metlakatla Peninsula, Annette Island, Alaska	M. V. Marcher
750-D	D202-D205	Raised beach deposits and their ground-water potential in the southern part of the Metlakatla Peninsula, Annette Island, Alaska	M. V. Marcher

TABLE 7. U.S.G.S. MAPS

Number	Title	Author
HA-364	Water-resources reconnaissance of a part of the Matanuska-Susitna Borough, Alaska	A. J. Feulner
I-610	Geologic map of the Yakataga District, Gulf of Alaska Tertiary province, Alaska	D. J. Miller
I-655	Reconnaissance geologic map and section of the Nabesna A-3 quadrangle, Alaska	D. H. Richter
I-656	Reconnaissance geologic map and section of the Nabesna B-4 quadrangle, Alaska	D. H. Richter
I-668	Geologic map of the Marshall quadrangle, Western Alaska	J. M. Hoare W. H. Condon
I-682	Geologic map of the St. Michael quadrangle, Alaska	J. M. Hoare W. H. Condon

TABLE 8. U.S.G.S. OPEN-FILE REPORTS

Title	Author
Translation of 1964 Russian Correlations between Wrangell Island and Northern Alaska	I. L. Tailleur
Petrology of the Plutonic rocks of west-central Alaska	T. P. Miller
Reconnaissance geology and geochemistry of Forester Island National Wildlife Refuge, Alaska	A. L. Clark H. C. Berg D. Grybeck A. T. Ovenshine
Geochemical reconnaissance of the McCarthy B-6 quadrangle, Alaska	G. R. Winkler E. M. MacKevett, Jr. J. G. Smith
Analyses of stream-sediment samples from the Taylor Mountains D-8 quadrangle, Alaska	A. L. Clark W. H. Condon J. M. Hoare D. H. Sorg
Metallic mineral resources map of the Mount McKinley quadrangle, Alaska	E. H. Cobb
Preliminary geologic investigations of eastern St. Lawrence Island, Alaska	W. W. Patton, Jr. B. Csejtey, Jr.
The Shublik Formation and adjacent strata in northeastern Alaska	H. A. Tourtelot I. L. Tailleur
Geology and geochemistry of the Sinuk River barite deposit, Seward Peninsula, Alaska	D. A. Brobst D. M. Pinckney C. L. Sainsbury
A heavy mineral study of Pleistocene and Holocene sediments near Nome, Alaska	M. Sheth
Heavy minerals on the continental shelf of the northern Bering Sea	K. Venkatarathnam
Magnetic susceptibilities of crystalline rock samples, Yukon River - Porcupine River area, east-central Alaska	W. P. Brosgé A. Conradi, Jr.
Preliminary Bouguer anomaly and specific gravity maps of Seward Peninsula and Yukon Flats, Alaska	D. F. Barnes

Table 8. U.S.G.S. Open-File Reports (continued)

Title	Author
Analyses of stream-sediment and rock samples from the eastern part of the Eagle quadrangle, east-central Alaska	H. L. Foster
Analyses of stream-sediment and rock samples from the northwestern part of the Eagle quadrangle, east-central Alaska	H. L. Foster
Maps showing distribution of anomalous amounts of selected elements in stream-sediment and rock samples from the Eagle quadrangle, east-central Alaska	H. L. Foster M. E. Yount
Geochemical data from the Nabesna A-1 quadrangle, Alaska	N. A. Matson, Jr. D. H. Richter
Geochemical data from the Nabesna C-4 quadrangle, Alaska	N. A. Matson, Jr. D. H. Richter
Geochemical data from the Nabesna C-5 quadrangle, Alaska	N. A. Matson, Jr. D. H. Richter
Geochemical data from the Nabesna D-5 quadrangle, Alaska	N. A. Matson, Jr. D. H. Richter
Reconnaissance geologic map and geochemical analyses of stream sediment and rock samples of the Anchorage B-6 quadrangle, Alaska	S. H. B. Clark S. R. Bartsch
Arctic Mesozoic correlation chart	R. L. Detterman
Cretaceous plutonic rocks of St. Lawrence Island, Alaska; a preliminary report	B. Csejtey, Jr. W. W. Patton, Jr. T. P. Miller
Results of geochemical sampling in the northern Darby Mountains, Seward Peninsula, Alaska	T. P. Miller R. L. Elliott D. Grybeck T. L. Hudson
Preliminary bedrock geologic map, Wiseman and eastern Survey Pass quadrangles, Alaska	W. P. Brosgé H. N. Reiser
Hydrologic data of the Kenai-Soldotna area, Alaska	G. Anderson S. H. Jones

Table 8. U.S.G.S. Open-File Reports (continued)

Title	Author
Water Resources of Alaska	A. J. Feulner J. M. Childers V. W. Norman
Pennsylvanian carbonates, paleoecology and stratigraphy, north flank, eastern Brooks Range, Arctic Alaska	A. K. Armstrong
Preliminary geologic map of the Livengood Quadrangle, Alaska	R. M. Chapman F. R. Weber B. Taber
Reconnaissance geologic map and geochemical analyses of stream sediment and rock samples of the Anchorage B-7 quadrangle, Alaska	S. H. B. Clark S. R. Bartsch
Investigation of gold mineralization along a part of the Elliott Highway, Fairbanks district, Alaska	D. B. Hawkins R. B. Forbes
Preliminary engineering geologic maps of the proposed trans-Alaskan pipeline route, Wiseman and Chandalar quadrangles	R. Kachadoorian
Preliminary engineering geologic maps of the proposed trans-Alaskan pipeline route, Bettles and Beaver quadrangles	R. Kachadoorian
Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route, Fairbanks and Big Delta quadrangles	F. R. Weber
Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route, Livengood and Tanana quadrangles	R. Kachadoorian
Preliminary geologic map, Mt. Michelson quadrangle, Alaska	H. N. Reiser W. P. Brosgé J. T. Dutro, Jr. R. L. Detterman
Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route, Beechey Point and Sagavanirktok quadrangles	O. J. Ferrians, Jr.
Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route, Philip Smith Mountains quadrangle	O. J. Ferrians, Jr.

Table 8. U.S.G.S. Open-File Reports (continued)

Title	Author
Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route, Mt. Hayes quadrangle	F. R. Weber
Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route, Gulkana quadrangle	O. J. Ferrians, Jr.
Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route, Valdez quadrangle	O. J. Ferrians, Jr.
Geology and coal resources of T. 6S, R 51 W., unsurveyed, Umiat Principal Meridian, in the Cape Beaufort coal field, northwestern Alaska	J. Callahan
Lake-level fluctuations in the Kenai-Soldotna area, Alaska 1967-71	G. S. Anderson S. H. Jones
Chukchi Sea seismic reflection profiles and magnetic data, 1970, between northern Alaska and Herald Island	A. Grantz W. F. Hanna S. L. Wallace
Early Paleozoic fossils in the Neruokpuk Formation, Northeast Alaska	J. T. Dutro, Jr. H. N. Reiser R. L. Detterman W. P. Brosgé
Analyses of samples and preliminary geologic summary of barite-silver-base metal deposits near Glacier Creek, Skagway B-4 quadrangle, southeastern Alaska	E. M. MacKevett, Jr.
Ground-water exploration, Beaver Creek Valley, near Kenai, Alaska	G. S. Anderson
Existing environment of natural corridors from Prudhoe Bay, Alaska to Edmonton, Canada	D. B. Krinsley W. E. Davies J. Rachlin E. G. Newton
Generalized geologic map of the Eagle River-Birchwood area, Greater Anchorage Area Borough, Alaska	H. R. Schmoll E. Dobrovolny C. Zenone
Generalized slope map of the Eagle River-Birchwood area, Greater Anchorage Area Borough, Alaska	H. R. Schmoll E. Dobrovolny

TABLE 9. U.S.G.S. WATER SUPPLY PAPERS

Number	Title	Author
1936	Surface water supply of the United States 1961-65, Part 15, Alaska	Water Resources Division Staff
1996	Quality of surface waters of the United States, 1966, parts 12-16, North Pacific slope basins, Alaska and Hawaii and other Pacific areas	Water Resources Division Staff

TABLE 10. U. S. BUREAU OF MINES MINERAL YEARBOOK

Title	Author	Date
Volume I-II, Mines, Minerals, and Fuels	--	1969
Volume III, Area Reports: Domestic, "The Mineral Industry of Alaska," pp. 69-88	K. Malone D. P. Blasko J. A. Williams	1969

TABLE 11. U. S. BUREAU OF MINES REPORT OF INVESTIGATIONS

RI Number	Title	Author	Date
7555	Sampling Gold-Lode Deposits; Bluff, Seward Peninsula, Alaska	J. J. Mulligan	1971
	(includes)		
	Section on Petrography	W. L. Gnagy	

TABLE 12. U.S. BUREAU OF MINES OPEN-FILE REPORTS

OFR Number	Title	Author	Date
6-71	Strippable Reserves of Bituminous Coal and Lignite in the U.S., Includes a chapter on Alaskan Coals p. 53-56	U.S. Bureau of Mines, Staff	1971
8-71	Investigations of Gossans of Hot Springs Dome, Near Manley Hot Springs, Alaska	R. P. Maloney	1971

TABLE 13. U.S. BUREAU OF MINES INFORMATION CIRCULARS

I.C. Number	Title	Author	Date
8462	Gold Placer Mining, Placer Evaluation and Dredge Selection	C. M. Romanowitz H. J. Bennett W. L. Dare	1970
8517	How to Mine and Prospect for Placer Gold	J. M. West	1971

TABLE 14. U.S. BUREAU OF MINES OUTSIDE PAPERS

OP Number	Title	Author	Date
159-71	The Environmental Challenges of Alaskan Mineral Development, UMR J No. 2,p. 27-29	E. T. Hayes	1971
182-71	Stability of an Underground Room in Frozen Gravel, Proc. 9th Ann. Symp. Eng. Geology and Soils Engineering, Boise, Idaho on 4-5-71	H. C. Pettibone G. G. Waddell	1971
185-71	BuMines Analysis Shows Characteristics of Prudhoe Bay Crude, Oil and Gas J., V. 69 No. 43,p. 112-120	C. J. Thompson H. J. Coleman J. E. Dooley D. E. Hirsch	1971
None Assigned	Effect of Petroleum and Natural Gas Industry Activities on public land use in Selected Areas of Alaska, Prepared for Environmental Quality Conference for the Extractive Industries of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) in Washington D.C. 6/7-9/71	D. P. Blasko	1971

TABLE 15. MIRL REPORTS 1964-1971

MIRL Number	Title	Date
*1	Annual Report of Research Progress	1964
*2	The market potential for Alaskan Clay Products; includes "Alaska Cement Markets and Opportunities for Regional Production," published by the Institute of Business, Economics and Government Research of the University of Alaska in cooperation with MIRL, as Research Monograph No. 4	1965
*3	Petrographic Evaluation of Coking Potential of Selected Alaskan Coals and Blends	1965
*4	Market for Insulation in Alaska and Feasibility of Regional Manufacture	1965
*5	Annual Report of Research Progress	1965
6	Investigations of Lightweight Aggregates in Alaska	1966
7	Annual Report of Research Progress	1966
*8	Natural Resource Base of the Fairbanks North Star Borough	1967
9	Fortran IV Trend - Surface Program for the IBM 360 Model 40 Computer	1970
10	Trace Element Copper Distribution and Areal Geology in a portion of the Clearwater Mountains, Alaska	1967
*11	Applications of Trend Surface Analysis and Geologic Model Building to Mineralized Districts in Alaska	1967
12	Geochemical-Geophysical Investigations Fairbanks District, Alaska	1967
13	Not used	
14	Annual Report of Research Progress	1967
*15	Distribution of Certain Minor Elements in Alaskan Coals	1968
16	Final Report - Mineral Resources of Northern Alaska	1968
17	Development of a Light-weight Low Cost Self Potential Unit	1968

Table 15. MIRL Reports (continued)

MIRL Number	Title	Date
17b	Model Three--Lightweight, Low Cost Self Potential Unit	1969
18	Known and Potential Ore Reserves, Seward Peninsula, Alaska Price $2.75	1968
19	Handbook of Geophysical Prospecting Methods for the Alaskan Prospector Price $2.00	1968
*20	Heavy Minerals in Alaskan Beach Sand Deposits	1969
21	Washability Characteristics of Low-Volatile Bituminous Coal from Bering River Field, Alaska	1969
*22	Annual Report of Research Progress	1969
23	Fortran IV Program for Processing Geochemical Sediment Data	1970
24	A Computer Processable Storage and Retrieval Program for Alaska Mineral Information	1971
25	Not used	
26	Annual Report of Research Progress	1970
27	Copper Mineral Occurrences in the Wrangell Mountain-Prince William Sound Area, Alaska (Produced in cooperation with U.S. Bureau of Mines)	1971
28	Mineral Resources of Southeastern Alaska	1971

NOTES: Unless otherwise marked, there is no charge for MIRL reports.

* = Out of print. (Can be Xeroxed at 4¢ per page.)

Section V

MINING PRODUCTION

The value of 1971 mineral production in Alaska is estimated at $356 million, compared with $338 million in 1970, according to production statistics compiled by the U. S. Bureau of Mines. Crude oil and natural gas from the Kenai Peninsula and offshore Cook Inlet fields once more were the leading mineral commodities, accounting for $287 million or 81 percent of total mineral production. Other mineral commodities, in order of value, included sand and gravel, stone, uranium, coal, barite, gold and silver, platinum group metals, mercury, antimony, gem stones, and tin.

Alaska's 1971 mineral production, excluding oil and gas, reached an all-time high of $69 million--a 38% increase over the 1970 figure of $43 million. Part of this increase was due to more accurate reporting of sand and gravel, but the mining of uranium at Kendrick Bay also added a significant amount to the total.

Annual Alaskan mineral production showing quantity and value in 1970 and 1971 are listed in Table 16. Production of major commodities since 1949 are listed in Table 17. Physical volume of Alaska mineral production is listed in Table 18.

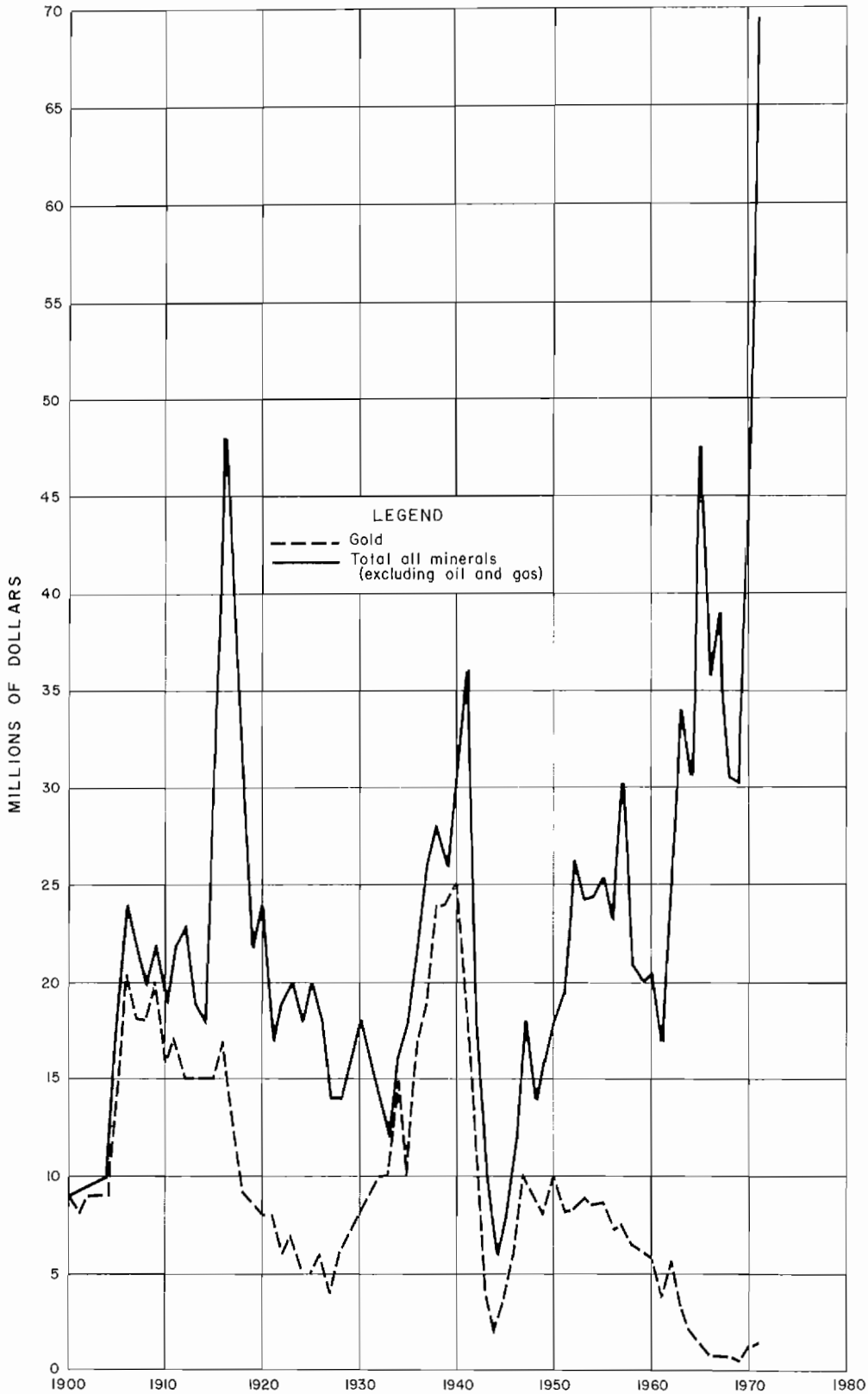
The statistics shown in Table 16 were prepared under a cooperative agreement between the U. S. Bureau of Mines and the Alaska Geological Survey for the collection of mineral data. The production figures for 1970 are revised on information collected by the U. S. Bureau of Mines, Division of Statistics. The production figures for 1971 are the best estimate of production for the year. The figures for coal and barite are presented by the Alaska Geological Survey.

Annual mineral production in Alaska, excluding oil and gas, from 1900 through 1971 is illustrated in figure 12. Figure 13 indicates the approximate locations of mineral deposits which were in production at least part of the year, or deposits where there was an active exploration program. The activity on these deposits was known to the Alaska Geological Survey. There undoubtedly were prospectors active in other areas, and the figure may not completely represent all areas of either production or exploration. Sand, gravel, and stone deposits were omitted.

PRECIOUS METALS

GOLD. This was number one in value of precious metals produced in Alaska. Gold production in 1971 is estimated to be at the same level as in 1970, with the possibility that a decrease in ounces produced was offset by a higher gold price. There was very little change in the number of gold placer operations. The United States Smelting Refining and Mining Company continued to operate its dredge on the Hogatza River. Small operators continued to produce from isolated areas near Marvel Creek, Flat, Livengood, Manley Hot Springs, the Seward Peninsula, Boundary, Fortymile, Wiseman, and Ruby. Chandalar Gold Mining Company continued its lode mining operation in the Brooks Range near Chandalar Lake.

PLATINUM. Goodnews Bay Mining Company continued to operate a floating dredge and a sluice box on the Salmon River near Goodnews Bay to recover platinum. The volume of material processed was about the same as 1970. The price of platinum and the platinum group metals was lower in 1971 than in 1970. The value of metal produced declined in 1971.



ANNUAL MINERAL PRODUCTION IN ALASKA
1900 - 1971

Figure 12

MINOR BASE METALS

MERCURY. Exploration and mining of mercury declined during 1971 because of a drop in the price of mercury. The Red Devil Mine shut down the first of June. T. A. Hubbard and Frances McClure operated the Cinnabar Creek Mine on a limited basis during the summer. Robert Lyman operated the White Mountain Mine at full capacity during the summer. The Haday Mining Company dismantled their retort in Anchorage in March 1971. At the present time there are no known mercury retorts operating in the state. The mercury ores are concentrated by hand sorting, gravity, and flotation. The concentrates are shipped to Japan, Oregon, and California for retorting.

ANTIMONY. Production of antimony declined during 1971 because of a sharp drop in price. Production was almost limited to the metal produced as a by-product of mercury mining.

BARITE

The Inlet Oil Company continued to operate an underwater open pit near Castle Island about 12 miles southwest of Petersburg, Alaska. Most of the barite was shipped to foreign areas for consumption. Some barite was ground at the Alaska Barite Company mill near Kenai, Alaska

COAL

Production and consumption of coal continued at about the same level as 1970. The production rate given in Table 16 for 1970 is believed to be low. It probably reflects a difference in the method of collection of data by the U. S. Bureau of Mines and the Alaska Geological Survey. The Nenana field accounted for about 90 percent of coal production in Alaska. The last mine to operate in the Matanuska Valley closed down following a flood in August 1971. A new mine was opened in the fall of 1971 in the eastern part of the Nenana field about 38 miles south of Delta Junction, Alaska. Exploration of coal beds to outline areas for strip mining continued in both the Nenana and Susitna fields. The major portion of the exploration dollars were expended in the Beluga section of the Susitna field.

URANIUM

The CM company under contract to Newmont Exploration Ltd., a wholly owned subsidiary of the Newmont Mining Company, extracted uranium ore from the Kendrick Bay Property on Bokan Mountain, Prince of Wales Island. The ore deposit reportedly contained 55,000 tons of 1.5% U_3O_8. Development work was started in December 1970 and completed in June 1971. Mining started in June and was completed in September 1971.

TABLE 16. MINERAL PRODUCTION IN ALASKA

NOTE: All values are in Thousands of Dollars

	1970		1971 (1)	
	Quantity	Value	Quantity	Value
Antimony--short ton antimony content	63	$ 109	34	$ 34
Barite--thousand short tons	134	835	160	2,400
Coal--thousand short tons	550	4,059	748	5,049
Gold--troy ounces	34,776	1,265	34,000	1,360(4)
Stone--thousand short tons	6,470	10,014	6,082	9,613
Natural Gas(2)--million cubic feet	111,576	27,448	124,700	30,676
Petroleum, Crude(2)--thousand barrels	83,616	251,684	79,350	256,301
Sand and Gravel--thousand short tons	25,825	41,092	26,391	41,989
Silver--thousand troy ounces	2	4	2	4
Undistributed(3)	xxx	1,761	xxx	8,927
TOTALS	xxx	$338,271	xxx	$356,353

NOTE: (1) Figures for 1971 are preliminary and subject to revision.

(2) Gas and petroleum figures will differ from those published by the Division of Oil and Gas because of different methods of compiling and reporting. For complete details on fields, wells, etc., see the Division of Oil and Gas Annual Report.

(3) Includes uranium, gem stones, mercury, platinum group metals, and tin. Figures on these minerals have been withheld to avoid disclosing confidential data from individual companies.

(4) Most of the gold produced in Alaska was from placer deposits and was sold to jewelers at a price above the metal market.

TABLE 17. PRODUCTION OF MAJOR COMMODITIES SINCE 1949

NOTE: All values are in thousands of dollars

Year	Gold	Mercury	Coal	Oil and Gas	Total All Production (millions)
1950	$ 10,125	$	$ 3,033	$	$ 17.9
1951	8,387		3,767		19.5
1952	8,420	6	5,779		26.3
1953	8,882	8	8,452		24.3
1954	8,699	277	6,442		24.4
1955	8,725	12	5,759		25.4
1956	7,325	853	6,374		23.4
1957	7,541	1,349	7,296		30.2
1958	6,525	774	6,931		20.9
1959	6,262	851	6,869	311	20.5
1960	5,887	940	6,318	1,496	21.9
1961	3,998	816	5,868	17,776	34.7
1962	5,784	711	6,409	31,657	54.2
1963	3,485	76	5,910	33,760	67.8
1964	2,045	95	5,008	35,490	66.1
1965	1,479	104	6,095	35,614	83.2
1966	956	101	6,953	50,418	86.3
1967	803	79	7,178	95,455	134.6
1968	835	78	5,034	191,083	221.7
1969	881	100	4,647	227,129	257.6
1970	835	1,260	4,059	279,132	338.2
1971 (1)	1,360	285	5,049	286,977	356.3
TOTALS	$109,239	$ 8,775	$129,230	$1,286,298	$ 1,955.4

NOTE: (1) 1971 figures are preliminary and subject to revision.

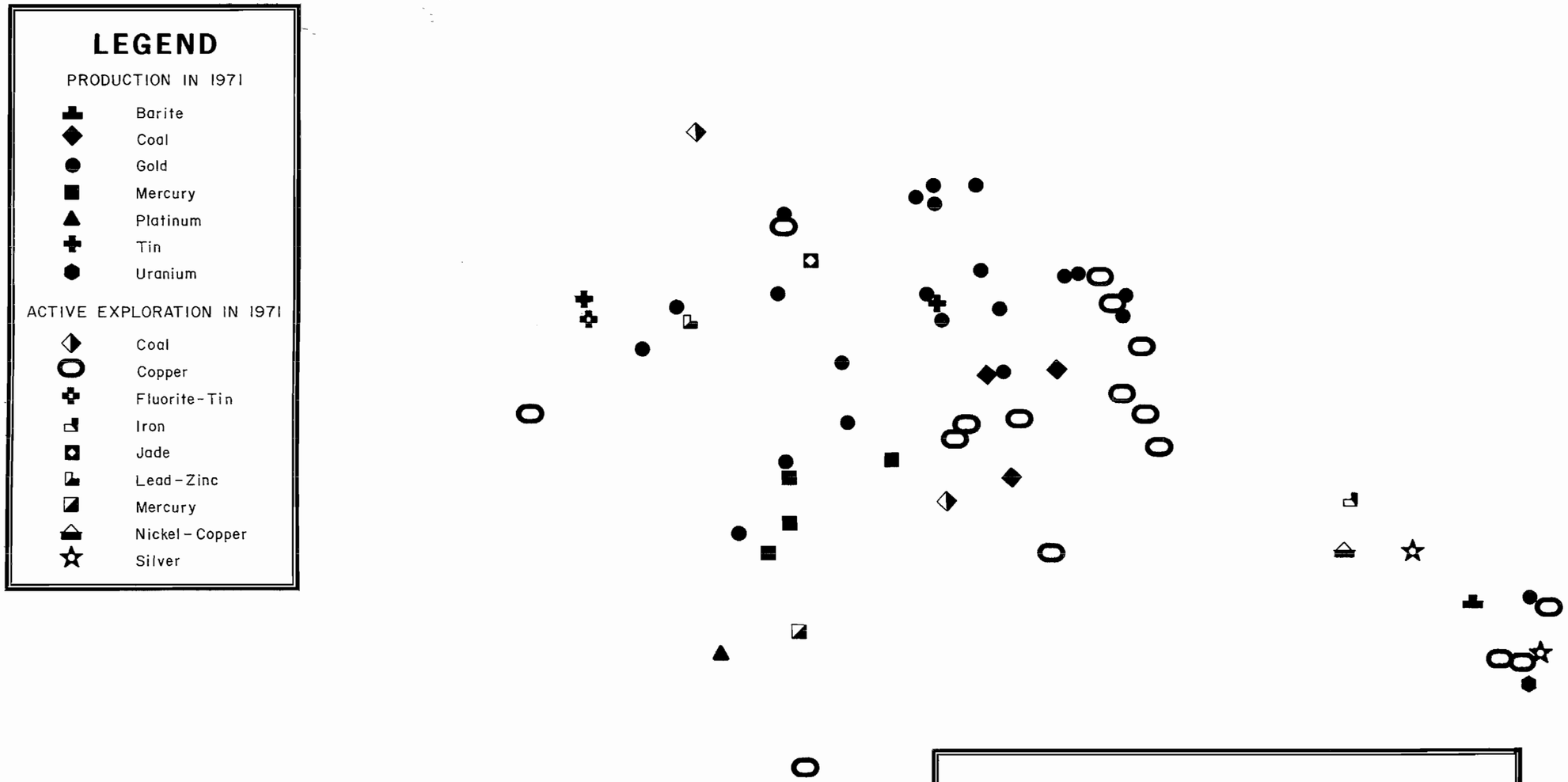
TABLE 18. PHYSICAL VOLUME OF ALASKA MINERAL PRODUCTION

Mineral	Weight	Quantity	Year	
			From	To
Antimony	(Approx. 53%Sb) short tons	4,180	1928	1971
Coal	Short tons	22,893,000	1951	1971
Copper	Short tons	690,011	1880	1967
Chromite	(Approx. 45% Cr_2O_3 long tons	29,000	1917	1957
Crude Petroleum	42 gallon barrels	320,844,671 (1)	1958	1971
Gold (Total)	Troy ounces	30,037,889	1880	1971
Lead	Short tons	25,016	1906	1969
Mercury	760 lb. flasks	39,049	1902	1971
Natural Gas	Million cubic feet	460,624	1948	1971
Sand and Gravel	Short tons	220,962,970	1958	1971
Silver (Total)	Troy ounces	19,082,012	1906	1971
Stone	Short tons	20,506,000 (2)	1921	1971
Tin	Short tons	2,405 (2)	1902	1971
Tungsten	Short ton Units WO_3	7,000	1916	1958

NOTE: Platinum, barite, and other commodity figures are confidential and are not included in 1970 production.

(1) The only other crude petroleum production recorded was from the Katalla area. From 1901 to 1932, about 154,000 barrels of oil were produced there.

(2) Production data, if any, withheld in 1967, 1968, 1969 and 1970.



MINERAL DEPOSITS

Alaska Division of Geological Survey

Figure 13

Section VI

EXPLORATION

Recent exploration ventures conducted by major companies in Alaska have been directed towards the search for large deposits suitable for open pit mining. Copper, nickel, coal and platinum deposits are of particular interest.

An increasing number of petroleum companies are showing an interest in Alaska's metallic mineral potential. The number of field parties remained about the same as 1970. The money expended on exploration increased because of drilling campaigns in the Southeastern region. Individual prospectors continue to be active throughout the state. Southeastern Alaska, Seward Peninsula, the Fortymile district, the Nabesna area, and the McCarthy district were the most popular prospecting regions during 1971.

A list of various prospectors, mines, and companies are listed in Table 19. A list of active coal mines is shown in Table 20. Active companies interested in Alaska mining possibilities are listed in Table 21 and consultants available for work in Alaska are listed in Table 22.

EXPLORATION EXPENDITURES

It is estimated that a total of about $9 million was spent on exploration in Alaska during the year. (See figure 14).

ARCTIC ALASKA. Approximately $850,000 was spent on minerals exploration in 1970 in Arctic Alaska. Bear Creek Mining Company is continuing its effort to increase its reserves around its copper properties at Bornite in the Kobuk area, and is doing reconnaissance work eastward along the south flanks of the Brooks Range. Other companies active in mineral exploration include Placid Oil Company, Cities Service, Shell, and Humble Oil.

WESTERN ALASKA. An estimate of the total amount spent for exploration in Western Alaska is $1,500,000. Of this amount, approximately $1,100,000 was spent by the Lost River Mining Corp. Ltd. diamond-drilling a fluorite-tin-beryllium-tungsten prospect at Lost River, 90 miles northwest of Nome. In addition to the diamond drill, expenditures included work on a 5000 foot air strip and rehabilitating the old mining camp.

Rhiny Berg continued his exploration at the old Independence property on the Kugruk River. Exploration consisted of diamond-drilling and driving a drift along the limestone schist contact. The objective is a complex lead-zinc-silver ore.

Getty Oil Company, a newcomer to Alaskan mineral exploration, conducted an extensive exploration program of a copper prospect including diamond-drilling on St. Lawrence Island.

The Inlet Oil Company continued to actively explore for platinum and other metal in the Goodnews Bay area both on and offshore. Other companies active in offshore exploration included Shell Oil Company, Amerada-Hess, American Smelting and Refining Co. and Rowan International.

INTERIOR ALASKA. Expenditures for exploration in Interior Alaska are estimated at $1,100,000. Activity was scattered throughout the area with reconnaissance exploration parties operating in the more remote areas, and drilling in the more accessible areas.

American Exploration Company (AMEX) continued a drilling program on a large copper deposit at Orange Hill. American Smelting and Refining Company (ASARCO) drilled on a property near Tok, Duval drilled on a property in the Nabesna area. Skyline Labs, Inc. of Wheat Ridge, Colorado had a geological party with helicopter support on the Seventymile River completing reconnaissance geology and geochemical sampling. Other companies that were active in the area included Inspiration Consolidated Copper Company, International Minerals, Cache Creek Exploration Company, Brown and Root, and Resource Associates.

SOUTH-CENTRAL ALASKA. Expenditures for exploration for the south-central area are estimated at $1,400,000.

Hanna Mining Company continued a detailed study and diamond-drilling of the old Kennecott Mother Lode property near McCarthy. Gordon Burdick continued development work at the Old Green Butte property. Other companies that were active in the McCarthy area included Inexco, International Nuclear, and SEREM. West of McCarthy Johnny Wilson with the Geneva-Pacific Corporation continued exploration near Peavine Bar and started building a road from Peavine Bar to Dan Creek.

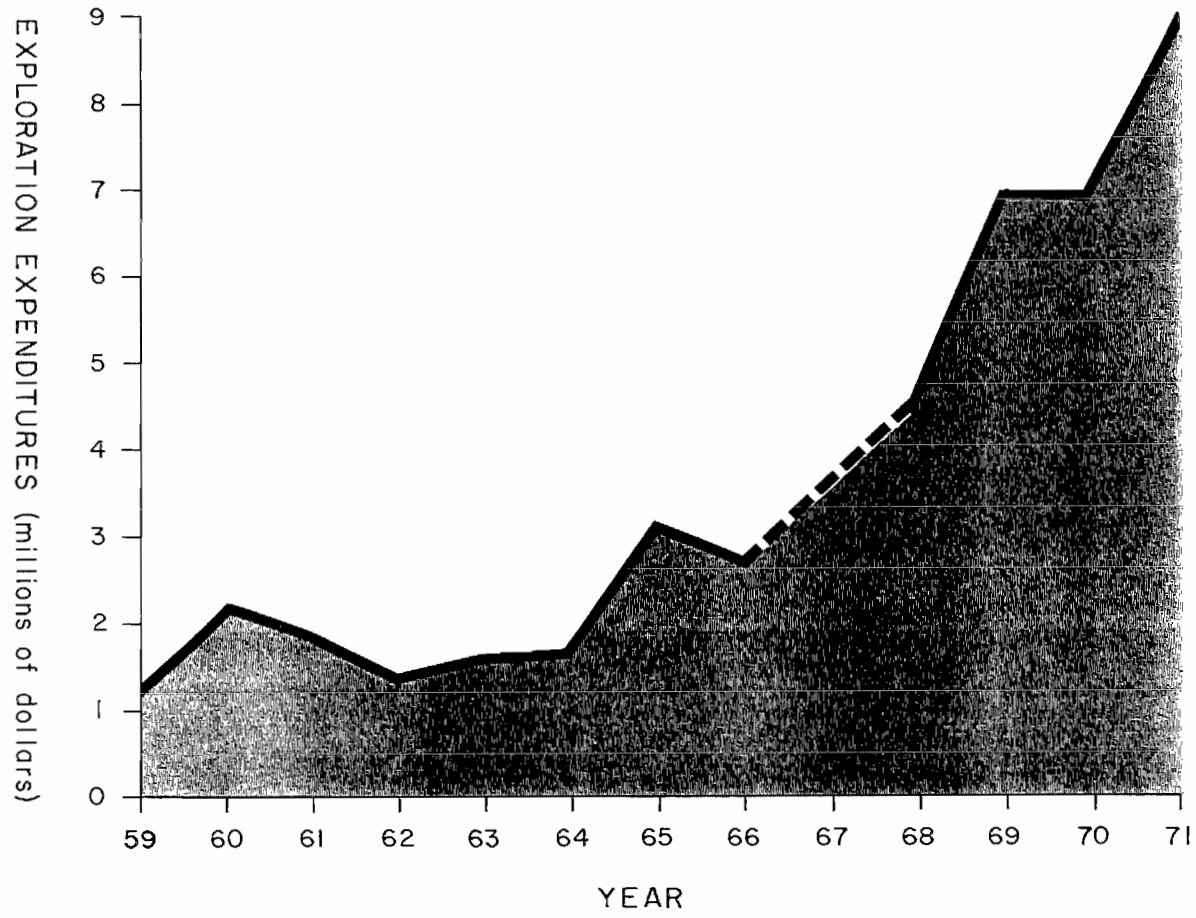
Inspiration Consolidated Copper Company had a crew at the Golden Zone near Cantwell opening old levels, mapping geology and taking metallurgical samples. Ptarmigan Company continued a program of exploration and drilling in the Slana district. Phelps Dodge drilled a copper prospect on Latouche Island. AJV (Louisiana Oil) was reported to have conducted geological exploration and diamond drilling on both Latouche and Knight Islands.

SOUTHWESTERN ALASKA. SEREM of Alaska, Inc., a French consortium, reportedly continued investigating a copper-molybdenum prospect near Chignik on the Alaska Peninsula. Exploration expenditures by this company and others in the region during 1971 are estimated at $150,000.

SOUTHEASTERN ALASKA. The largest dollar amount for exploration and most active search for Alaskan minerals continued to be in Southeastern Alaska centered around Ketchikan. The expenditure for 1971 is estimated to exceed $4,000,000.

The iron deposit at Klukwan continued to attract interest, and Kaiser was working on a project to beneficiate the iron rich alluvial sands. Newmont reportedly had a diamond drill crew working on the Brady Glacier nickel-copper deposits.

The company most active in Southeastern Alaska appeared to be the El Paso Natural Gas Company. El Paso maintained an office, geological staff, and geochemical laboratory in Ketchikan. This company reportedly conducted diamond-drilling exploration on 5 separate projects within a 100 mile radius of Ketchikan. Other companies that were reported to have diamond-drilling projects in the Ketchikan area (including Prince of Wales, Gravina, Revillagigedo islands and the mainland) were Clyde Wetherell, Kaiser, Banner, and Newmont. Alaskan Metals Ltd., continued drilling on 42 silver mining claims on Admiralty Island, a property of Red Rock Mining Company of Juneau.



Note: Information not available for 1967
Graph exclusive of oil and gas

ESTIMATED EXPLORATION EXPENDITURES IN ALASKA

1959 - 1971

Figure 14

Other companies that had exploration parties in the area included Inlet Oil Company, Cordilleran, Alaska Petroleum and Mining Company of Denver, Colorado, U. S. Borax, Humble Oil, American Oil Company, Bethlehem Steel, Border Mining Company, Texas Gulf Sulphur, Tipperary Resources Corporation, American Smelting and Refining Company, Alaska Mines and Minerals Research and Development Company, Societe Le Nickel, Alcan, American Exploration Company, Union Carbide, and Inspiration Consolidated Copper Company.

Bill Basey of Kina Enterprises constructed a 20 ton per day flotation mill near Ketchikan and concentrated a lead-zinc-silver ore obtained from exploration drifting and the start of a stope along a quartz vein. The areas of active exploration in 1971 are shown on figure 13.

Cleland Conwell, above, checks figures for exploration expenditures; Mildred Brown, left, works with Kardex file of mining claims; Charlotte Renaud, below, checks layout of Division report.

Figure 15

TABLE 19. ALASKAN PROSPECTORS, MINERS, AND COMPANIES

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Adams, Keldon Box 686 Ward Cove, Alaska	Ketchikan	1	Prospecting
Alakon Metals Limited 202 - 569 Howe Street Vancouver 1, B. C.	Admiralty Island Juneau	5	Drilling silver prospect
Alaska Barite Co. 345 Sixth Avenue Suite 202 Anchorage, Alaska	Castle Island Petersburg	12	Barite production
Alaska Drilling & Construction Company Dave McCrillis Box 2325 Ketchikan, Alaska	Southeast Alaska General	25	Contract drilling and geological work
Alaskamin Inc. 525 Failing Bldg. Portland, Oregon	Seward Peninsula Cape Nome	12	Drilling and exploration
Alaska Mines & Minerals, Inc. Ray Wolfe Box 422 Anchorage, Alaska	Red Devil Mine Kuskokwim	34	Mercury production
Alaska Red Top Mine, Inc. Rasmussen, C. T. 7933 Jewell Lake Road Anchorage, Alaska	Marsh Mountain Bristol Bay	4	Mercury production
Albertson, Everett O. 7 Mile Farmers Loop Road Fairbanks, Alaska	Alaska general Several	2	Prospecting
Almasy, Theodore J. McGrath, Alaska	Nixon Fork area Mt. McKinley	1	Prospecting
AMAX Exploration Inc. 601 - 535 Thurlow Street Vancouver 5, B.C., (Canada)	Alaska General Several	8	Recon exploration
American Exploration & Mining Co. (AMEX) P. O. Box 619 Anchorage, Alaska	Alaska General Several Nabesna area	6 12	Investigations Drilling

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
American Smelting & Refining Co. (ASARCO) 2212 Roosevelt Drive Anchorage, Alaska	Alaska general Several	16	Property exploration, recon, and drilling
Amoco Minerals Co. 1612 Court Place Denver, Colorado	Alaska general Several	5	Exploration
Anderson, Red Manley Hot Springs, Alaska	Glen Gulch Manley Hot Springs	2	Nonfloat (1)
Asbestos Corp. Ltd. 814 - 837 W. Hastings Vancouver, B.C., (Canada)	Alaska general Several	1	Investigations
Au Limited Henry Warner Box 674 College, Alaska	Porcupine Creek	2	Placer development
Bailey, George Box 2052 Fairbanks, Alaska	Eureka Creek (Kantishna) Fairbanks	2	Nonfloat (1)
Ballard, John D. Box 920 Sitka, Alaska	Chichagof Island Sitka	1	Prospecting
Banner Mining Co. P. O. Box 5605 Tucson, Arizona	SE Alaska	5	Recon exploration
Basey, Bill & Martin, Lloyd Box 1173 Ketchikan, Alaska	George Inlet Ketchikan	2	Lead-silver production
Bear Creek Mining Company Spokane, Washington	Kobuk region, Brooks and Alaska Ranges Several	40	Drilling, recon prospecting (3 crews), and aeromag
Beck, Bob Box 294 Nenana, Alaska	Wood River area Nenana	3	Antimony development

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Berg, Rhinehart Kobuk, Alaska	Kugruk Fairhaven	6	Exploration, drilling and underground drifting
Bliss, Patrick J. & Sons 129 East 11th Anchorage, Alaska	Ungalik Creek Cape Nome	3	Bucket line dredge
Bethlehem Steel Corp. 1510 Glen Ayr Lakewood, Colorado	Alaska General	1	Investigation
Bonanza Creek Placers Terry Gill Port Alsworth, Alaska	Bonanza Creek Iliamna	1	Placer development
Bonnell, Frank 1057 W. 80th Street Los Angeles, California	Kantishna Fairbanks	1	Lode prospecting
Brockway, John T. 1737 Glacier Avenue Juneau, Alaska	Baker Peak Sitka	1	Copper development
Burdick, Gordon McCarthy, Alaska	McCarthy McCarthy	2	Copper development
Buzby, Bob Mile 46 Richardson Hwy. Fairbanks, Alaska	Dry Creek Bonnifield	1	Drilling
Butler, Charles R. Box 1896 Fairbanks, Alaska	Stampede Mine Kantishna	1	Stibnite prospect
Cache Creek Exploration Co. Robert L. Foster 701 Welch Road Palo Alto, California	Interior Alaska Fairbanks	7	Recon exploration
Canyon Creek Mining Co. Albert H. Kvamme Akiak, Alaska	Canyon Creek Kuskokwim	4	Hydraulic (2)
Carlo, Bill 2111 Southern Fairbanks, Alaska	Hunter Creek Rampart	1	Hydraulic (2)

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Cassiar Asbestos Corp. W. N. Plumb Cassiar, B.C., (Canada)	Eagle Fairbanks	1	Prospect investigation
Chandalar Gold Mining Co. Mrs. Betty Jean Birch Box 1332 Fairbanks, Alaska	Chandalar Fairbanks	10	Nonfloat (1), underground mine, and mill
Cities Service Mineral Corp. Don Stevens 1016 West Sixth Avenue Anchorage, Alaska	Alaska General Several	16	Two recon parties and drilling
Craig, Glenn Box 936 Juneau, Alaska	Canyon Creek Fairbanks	4	Nonfloat (1)
Cordilleran Explorations 210 West Second Street Reno, Nevada	Alaska General	4	Investigations
Cyprus Exploration Corp. J. B. P. Sawyer 1011 - 510 W. Hastings St. Vancouver 2, B.C., (Canada)	Alaska General Several	2	Investigations
Davis, Bon Box 432 College, Alaska	Fairbanks Fairbanks	1	Gold lode maintenance
Dayo, Stanley Rampart, Alaska	Cooney Creek Rampart	1	Small hand scale
Deveny, Joseph E. 218 6th Avenue Fairbanks, Alaska	Wiseman	4	Nonfloat (1)
Dickman Mining Co. Orville J. Dickman Teller, Alaska	Eagle Creek Cape Nome	3	Nonfloat (1)
Dotson, R. L. Ketchikan, Alaska	Southeast Alaska	1	Prospecting
Dunbar Co. 7414 East Lincoln Drive Scottsdale, Arizona	Cape Creek Cape Nome	1	Placer maintenance

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Duval Corporation Robert Gale 506 - 602 W. Hastings St. Vancouver, B.C., (Canada)	East Central Alaska Fairbanks	16	Drilling
Edgecumbe Exploration Co. C. T. & G. H. Morgan Box 758 Sitka, Alaska	Silver Bay Sitka	2	Gold lode maintenance
Egnaty, Jack Sleetmute, Alaska	George River Kuskokwim	1	Prospecting
Elmer, Lewis G. 1624 Jessie Street Boise, Idaho	Slate Creek Fairbanks	1	Placer maintenance
El Paso Mining Division Robert Falk, Mgr. P. O. Box 1720 Ketchikan, Alaska	Southeast Alaska General	25	Recon exploration and drilling
Empire Jade Co. Gene Joiner Kotzebue, Alaska	Jade Creek Noatak-Kobuk	1	Jade recovery and cutting
Foster, Willie Nome, Alaska	Hannum Creek Fairhaven	3	Nonfloat (1) and lode prospecting
Fullerton Brothers Flat, Alaska	Willow Creek	4	Nonfloat (1)
Getty Mines, Ltd. George B. Griswold 1177 West Hastings St. Vancouver 1, B.C., (Canada)	Alaska General Several	16	Recon exploration and drilling
Gilbertson, George 314 Charles Street Fairbanks, Alaska	Dan Creek McCarthy	1	Prospecting
Goodnews Bay Mining Co. Charles Johnson Platinum, Alaska or 422 White Bldg., Seattle, Washington	Salmon River & Tribs. Bethel	40	Platinum dredge
Hanna Mining Corp. 2020 E. 13th Street Tucson, Arizona	Kennecott Property McCarthy	7	Exploration, drilling, geophysical

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Hassel Mining Co. Harold Hassel Box 1071 Fairbanks, Alaska	Ready Bullion Creek Fairbanks	2	Nonfloat (1)
Hawkins, W. A., Eichner, Ken and Lillie, Angus Ketchikan, Alaska	Southeast Alaska Several	2	Prospecting
Heflinger Mining Co. Carl Heflinger 409 Clara Street Fairbanks, Alaska	Livengood and Forty-mile Fairbanks	4	Nonfloat (1)
Heiner, Larry Petersburg, Alaska	Southeast Alaska Several	1	Prospecting
Hibberd, Bill 1723 A. Tongass Ketchikan, Alaska	Southeast Alaska Several	1	Prospecting
Hogendorn and Volkheiner Nome, Alaska	Seward Peninsula Cape Nome	2	Prospecting
Homestake Mineral Development Company Donald A. Hull Old National Bank Bldg. Spokane, Washington	Alaska General	1	Investigation
Holovics Placers Louis Holovics, Jr. Manley Hot Springs, Alaska	American Creek Fort Gibbon	1	Small scale hand
Holloway, D. and Rehard, R. Box 16 Aniak, Alaska	Kolmakof Property Kuskokwim	4	Mercury exploration and drilling
Hubbard, A. T. 445 East 2nd South Salt Lake City, Utah	Cinnabar Creek Mt. McKinley	3	Open pit mercury production
Hubbard, Lloyd Manley Hot Springs, Alaska	Omega Creek Manley Hot Springs	1	Placer prospecting
Hudson, E. and Wittrock, W. 817 Lakeview Trailer Court Fairbanks, Alaska	Livengood Fairbanks	2	Lode prospecting

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Huff, J. W. "Bill" Box 837 Ward Cove, Alaska	Southeast Alaska General	8	Prospecting
Humble Oil & Refining Co. Omer R. Humble P. O. Box 120 Denver, Colorado	Alaska General Several	2	Investigations
Ideal Cement Co. P. O. Box 531 Ft. Collins, Colorado	Alaska Road area	1	Limestone investigation
Inexco Phil R. Holdsworth 1009 Mendenhall Apts. Juneau, Alaska	McCarthy McCarthy	4	Lode development
Inlet Oil 345 6th Avenue, Suite 202 Anchorage, Alaska	Goodnews Bay Bethel	5	Offshore prospecting and surface geological mapping
Inspiration Development Co. Hugh W. Olmstead Box 69 Inspiration, Arizona	Central Alaska	9	Recon exploration and property development
International Mineral and Chemical Corp. Peter O. Sandvik 5401 Old Orchard Road Skokie, Illinois	Alaska General Several	25	Recon exploration and drilling
International Mine Service, Ltd. John McMullin Box 1052 Whitehorse, Yukon Terr.	Alaska General Several	1	Investigations
International Nickel Co. Henry F. Vuori Toronto-Dominion Centre Toronto 111, Ontario, (Canada)	Alaska General Several	2	Investigations
Kaiser Steel Corp. 300 Lake Side Drive Oakland, California	Kukpowruk River North Slope		Coal Leases

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Keystone Mining Co. Fairbanks, Alaska	Fairbanks Fairbanks	1	Gold lode maintenance
Kilbury, Claude E. 2415 E. Hemlock Ketchikan, Alaska	Unuk River Ketchikan	1	Nonfloat (1)
Kloss, Herman K & D Lode Sunset Cove, Alaska	Sunset Cove Juneau	1	Prospecting
Lanning, Tony Manley Hot Springs, Alaska	Thanksgiving Creek Manley Hot Springs	3	Nonfloat (1)
Lee, Dick Nome, Alaska	Goodwill Gulch Seward	2	Tin placer
Leonard, Harry Wiseman, Alaska	Wiseman	2	Nonfloat (1)
Lost River Mining Corp., Ltd. Ronald Sheardown P. O. Box 503 Nome, Alaska	Lost River Cape Nome	34	Lode drilling and development, fluorite and tin
Lowe, Grace Manley Hot Springs, Alaska	Pioneer Creek Manley Hot Springs	1	Small scale hand
Lucky Seven Mining Co. Walter E. Roman Box 141 Fairbanks, Alaska	Fish Creek Fairbanks	7	Nonfloat (1)
Lundgren, James 420 College Road Fairbanks, Alaska	Fortymile area Fairbanks	3	Exploration
Lyman Mining Co. Lyman, Robert McGrath, Alaska	White Mountain Kuskokwim	5	Mercury production
Marcona Iron Co. 1 Maritime Plaza San Francisco, California	Snettisham Juneau	10	Evaluating iron deposits
Marvel Creek Mining Co. Charles Awe and John Bloomquist Aniak, Alaska	Marvel Creek Bethel	4	Dredge

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
McGee, L. 836 Lingley Way Reno, Nevada	Tofty Manley Hot Springs	8	Nonfloat (1)
McGill, Fred Petersburg, Alaska	Admiralty Island Petersburg	1	Prospecting
Midwest Oil Corp. A. (Sandy) W. Dean 1700 Broadway Denver, Colorado	Alaska General	4	Recon exploration
Minorex Ltd. 1075 Melville Street Vancouver 5, B.C., (Canada)	Alaska General	1	Investigations
Miscovich, Andrew 779 8th Fairbanks, Alaska	Porcupine Creek Fairbanks	2	Nonfloat (1)
Mobil Oil Corporation P. O. Box 2448 Corpus Christi, Texas	Yukon River General	10	Recon exploration
Munz, William Nome, Alaska	Dahl Creek Noatak-Kobuk	1	Jade recovery
National Lead Jon Broderick E. 220 Wellesley Spokane, Washington	Alaska General Several	1	Investigations
Newmont Exploration Ltd. Robert B. Fulton 300 Park Avenue New York, New York	Prince of Wales Island and Brady Glacier Ketchikan and Juneau	45	Uranium production and nickel drilling
Northwest Explorations Wallace McGregor Box 297 Eureka, Nevada	Prince William Sound, Nabesna, Valdez and Fairbanks	20	Drilling
Occidental Minerals Corp. Thomas L. Wright 6073 West 44th Avenue Wheat Ridge, Colorado	Alaska General	6	Recon exploration
O'Carroll, Michael J. 14615 - 25th S. W. Seattle, Washington	Spruce Creek Nulato	3	Nonfloat (1)

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Olive Creek Mines Carl Parker Box 552 Fairbanks, Alaska	Amy Creek Fairbanks	4	Nonfloat (1)
Olson, Henry T. "Tiger" Taku Harbor, Alaska	Juneau & Admiralty Districts	1	Prospecting
Ott, Martin H. 332 N. Boundary Fairbanks, Alaska	New York Creek Manley Hot Springs	3	Nonfloat (1)
Otter Dredging Co. Miscovich, John Flat, Alaska	Otter Creek Mt. McKinley	2	Nonfloat (1)
Parker, Albert Box 289 Juneau, Alaska	Glacier Bay Juneau	2	Gold lode maintenance
Peterson, Steve Nome, Alaska	Council Nome	2	Nonfloat (1)
Phelps Dodge Exploration Corp. Drawer 1217 Douglas, Arizona	Alaska General Several	16	Recon exploration and drilling
Pitman, Red Manley Hot Springs, Alaska	Kentucky Creek Eureka	1	Small hand scale
Placid Oil 425 G. Street, Suite 800 Anchorage, Alaska	Interior Alaska Fairbanks	16	Recon exploration
Prince Creek Mining Co. Alvin H. Agoff Flat, Alaska	Prince Creek Mt. McKinley	1	Nonfloat (1)
Ptarmigan Co. Kirk Stanley Box 3-3959 Anchorage, Alaska	Nabesna River Fairbanks	15	Drilling and exploration
Radovan, Martin McCarthy, Alaska	Glacier Creek McCarthy	1	Copper lode prospecting
Red Rock Mines, Inc. Ray Renshaw 192 Douglas Highway Juneau, Alaska	Southeast Alaska Juneau	1	Prospecting and lode development

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Rhode Island Creek Mines A. W. Pringle Manley Hot Springs	Rhode Island Creek Manley Hot Springs	3	Nonfloat (1)
R. S. Richard & Associates Box 1817 Anchorage, Alaska	North Fork Kashwitna River & Alaska Peninsula area Several	3	Copper, iron and gold prospecting
Roberts, Don O. Box 1700 Fairbanks, Alaska	Seward Peninsula Cape Nome	1	Prospecting
Ross, Don Box 2307 Ketchikan, Alaska	Southeast Alaska Several	1	Prospecting
Rowan Drilling Company, Inc. 3023 Humble Building Houston, Texas	Bering Sea and Seward Peninsula Cape Nome	18	Lode and placer investigations; offshore prospecting
SEREM of Alaska, Inc. M. Michel Bertucat 426 Eagle St., Room 5 Anchorage, Alaska	Alaska General Several	7	Recon exploration
Shell-ASARCO Shell Bldg. 100 Bush Street San Francisco, California	Bering Sea Cape Nome	1	Offshore prospecting
Sirilo, Julius Box 625 Bethel, Alaska	Aniak District Kuskokwim	1	Prospecting
Skyline Labs, Inc. 12090 West 50th Place Wheat Ridge, Colorado	70 Mile Eagle	6	Geochemical sampling
Stout, Al Eagle, Alaska	Dahl Creek Kobuk	2	Nonfloat (1)
St. Eugene Mining Co. 504, 1200 W. Pender St. Vancouver, B.C., (Canada)	Kasna Creek Iliamna	2	Copper development

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Straus Exploration, Inc. Gavin Dirom 4554 West 6th Avenue Vancouver 8, B.C., (Canada)	Alaska General Several	1	Investigations
Texas Gulf Sulphur Co. 1612 Court Place Suite 350 Denver, Colorado	McCarthy McCarthy	4	Recon exploration
Tweet, N. B. & Sons Teller, Alaska	Kougarok River Cape Nome	6	Nonfloat (1)
U. S. Steel Corp. 525 William Penn Place Pittsburg, Pa.	Klukwan Haines	2	Iron development
U.S.S.R. & M. Co. Box 1170 Fairbanks, Alaska	Hogatza River Nulato	20	Gold dredge and exploration
Utah International Inc. 550 California Street San Francisco, California	Alaska General	6	Exploration
Vogler, Joseph E. Box 7 Fairbanks, Alaska	Deadwood Creek Fairbanks	2	Nonfloat (1)
Waterfield, Henry Box 4-11 Anchorage, Alaska	Kuskokwim	7	Prospecting
Wienard, Carl Nome, Alaska	Candle Fairhaven	2	Nonfloat (1)
Wigger, Walter 900 Park Drive Fairbanks, Alaska	Eva Creek Fairbanks	1	Nonfloat (1)
Wilson, John Box 376 Glennallen, Alaska	McCarthy McCarthy	6	Prospect development
Woodman, I. N. Box 573 Valdez, Alaska	Tonsina Lake Area Valdez	1	Prospecting

Table 19. Alaskan Prospectors, Miners (Continued)

Name and Address	Location of Operation and Recording District	Approx. Crew	Type of Operation
Wylie, James R. Box 208 Aptos, California	Kuskokwim Kuskokwim	1	Prospecting, drilling

NOTES: (1) "Nonfloat" indicates mechanical placer gold operation using draglines and/or bulldozers to transport gravel to nonfloating washing plant, bedrock sluiceboxes, or elevated sluices.

(2) "Hydraulic" indicates placer gold operation in which gravel is excavated and transported to sluiceboxes solely by water jets from hydraulic nozzles.

TABLE 20. ACTIVE COAL MINES

Name and Address	Location of Mine	Approx. Crew	Type of Operation
Alaska Matanuska Coal Co. Paul Omlin Box 13 Palmer, Alaska	Premier Mine Matanuska Field	2	Strip
B and R Coal Mining Co. Carroll Burnett and Bing Ringstad Box 40 Healy, Alaska	Otto Lake Nenana Field	10	Strip
Delta Mine Box 708 Fairbanks, Alaska	South of Delta	2	Strip
Usibelli Coal Mines, Inc. (1) Usibelli	Healy Creek Nenana Field	80	Strip

NOTES: (1) Usibelli includes the Healy Creek properties previously operated by Vitro Minerals Corp., and purchased by Usibelli in 1970.

TABLE 21. COMPANIES INTERESTED IN ALASKA MINING POSSIBILITIES

Company	Address	Person to Contact
Alakon Metals, Ltd.	202-569 Howe Street Vancouver 1, B.C., Canada	Donald W. Tully
Alaskamin Inc.	525 Failing Building Portland, Oregon 97204	William P. Murray
Alaska Mineral Exploration Co., Inc.	118 East 6th Avenue Anchorage, Alaska 99501	R. E. Lyle
American Exploration & Mining Co. (AMEX)	P. O. Box 619 Anchorage, Alaska 99501	Benno J. G. Patsch
American Metals Climax (AMAX)	601-535 Thurlow Street Vancouver 5, B.C., Canada	R. A. Barker
American Smelting & Refining Co. (ASARCO)	2112 Roosevelt Drive Anchorage, Alaska 99503	Joe Wojeik
Amoco Minerals Co.	1612 Court Place Denver, Colorado 80202	William D. Burton
Anaconda	P. O. Box 1764 Spokane, Washington 99201	
Anaconda American Brass	Brittania Beach, B.C., Canada or 116, 744 West Hastings St. Vancouver 1, B.C., Canada	Glenn Waterman
Arrow Inter-America Corp.	304-535 Thurlow Street Vancouver 5, B.C., Canada	F. B. Whiting
Asbestos Corp. (Explorations) Ltd.	814-837 West Hastings St. Vancouver 1, B.C., Canada	
Atlantic Richfield Co.	Box 59, Anchorage, Alaska 99501 or Box 749, Dallas, Texas 75221	
Bear Creek Mining Co.	E. 7621 Sprague	David M. Snyder

Table 21. Companies Interested in Alaska (Continued)

Company	Address	Person to Contact
Cache Creek Exploration Co.	701 Welch Road Palo Alto, California 94304	Robert L. Foster
Cambridge Mining Corp. Ltd.	1130 Bay Street Toronto, Ontario, Canada	
Canada Superior Exploration Ltd.	2201-1177 W. Hastings Vancouver 1, B.C., Canada	R. A. Dujardin
Canex (Placer Development, Ltd.)	800-1030 West Georgia St. Vancouver 5, B.C., Canada	L. Adie
Cassiar Asbestos Corp.	Cassiar, B.C., Canada	W. N. Plumb
Chandalar Gold Mining Co.	Box 1332 Fairbanks, Alaska 99707	Mrs. Betty Jean Birch
Cities Service Minerals Corp.	1016 West Sixth Avenue Anchorage, Alaska 99501	Don Stevens
Cominco Ltd.	1155 West Georgia Street Vancouver 1, B.C., Canada	S. J. Pedley
Conwest Exploration Co.	901-675 West Hastings St. Vancouver 2, B.C., Canada	
Copper Range Exploration Co., Inc.	1425 Brentwood Street Lakewood, Colorado 80215	C. Phillips Purdy, Jr.
Cordero Mining Co.	131 University Avenue Palo Alto, California	J. Eldon Gilbert
Cyprus Exploration Corp. Ltd.	1101-510 West Hastings St. Vancouver 2, B.C., Canada	J. B. P. Sawyer
Diamond Shamrock Corp.	300 Union Commerce Bldg. Cleveland, Ohio 44115	Don Deardorf
Duval Corp.	506-602 West Hastings St. Vancouver 2, B.C., Canada	Robert Gale
Dynasty Exploration Ltd.	330-355 Burrard Street Vancouver, B.C., Canada	Robert W. Nusbaum
Eagle Picher Industries, Inc.	Box 910 Miami, Oklahoma 74354	
Earth Resources	303 Expressway Tower Dallas, Texas 75206	

Table 21. Companies Interested in Alaska (Continued)

Company	Address	Person to Contact
El Paso Mining Division	P. O. Box 1720 Ketchikan, Alaska 99901	Robert Falk
Getty Mines, Ltd.	Suite 1904 1177 West Hastings Street Vancouver 1, B.C., Canada	George B. Griswold
Goodnews Bay Mining Co.	422 White Bldg. Seattle, Washington 98101	Charles Johnston
W. R. Grace and Co.	Ore and Mining Division 806-1860 Lincoln Street Denver, Colorado 80203	
Hanna Mining Co.	200-1200 W. Pender Street Vancouver, B.C., Canada	Alex G. Jones
Hecla Mining Co.	1177 W. Hastings Street Suite 2009 Vancouver 1, B.C., Canada	Phil I. Conley
Homestake Mineral Development Co.	Old National Bank Bldg. Spokane, Washington 99201	Donald A. Hull
Humble Oil and Refining Co.	P. O. Box 120 Denver, Colorado 80201	Omer R. Humble
Inexco	1009 Mendenhall Apts. Juneau, Alaska 99801	Phil R. Holdsworth
Inlet Oil	345 6th Avenue, Suite 202 Anchorage, Alaska 99501	
Inspiration Development Co.	Box 69 Inspiration, Arizona 85537	Hugh W. Olmstead
International Minerals & Chemical Corp.	5401 Old Orchard Road Skokie, Illinois 60076	Peter O. Sandvik
International Mine Services Ltd.	Box 1052 Whitehorse, Yukon Territory, Canada	John McMullin
International Nickel Company of Canada, Ltd.	Toronto-Dominoin Centre Toronto 111, Ontario, Canada	Henry F. Vuori
J. R. Simplot Co.	Box 2777 Boise, Idaho 83701	Joe Jemmett

Table 21. Companies Interested in Alaska (Continued)

Company	Address	Person to Contact
Kerr McGee Oil Industries	Kerr McGee Building Oklahoma City, Okla. 73102	
Lost River Mining Corp., Ltd.	P. O. Box 503 Nome, Alaska 99762	Ronald Sheardown
Marcona Corp.	1 Maritime Plaza San Francisco, Calif. 94111	Philip Morey
Minorex, Ltd.	1075 Melville Street Vancouver 5, B.C., Canada	A. (Sandy) W. Dean
Mobil Oil Co.	612 Flower Street, Room 1342 Los Angeles, California 90017	
Murph Metals	P. O. Box 6195 Dallas, Texas 75222	
National Lead Company	E. 220 Wellesley Spokane, Washington 99207	Jon Broderick
Newconex Canadian Exploration Ltd.	914-525 Seymour Street Vancouver 2, B.C., Canada	Paul W. Richardson
New Jersey Zinc Exploration Co., Ltd.	905-525 Seymour Street Vancouver 2, B.C., Canada	R. C. MacDonald
Newmont Exploration, Ltd.	300 Park Avenue New York, New York 10022	Robert B. Fulton
Nissho-Iwai American Corp.	Union Oil Bldg., Suite 130 909 W. Ninth Avenue Anchorage, Alaska 99501	
Northwest Explorations	Box 297 Eureka, Nevada 89316	Wallace McGregor
Occidental Minerals Corp.	6073 W. 44th Avenue Wheat Ridge, Colorado 80033	Thomas L. Wright
Ocean Science & Engineering	4905 Del Ray Avenue Washington, D.C. 20014	
P.C.E. Explorations, Ltd.	420-159 Bay Street Toronto, Ontario, Canada	Murray E. Watts
Phelps Dodge Exploration Corp.	140 Washington St., Suite 1 Reno, Nevada 89503	R. W. Ludden, Jr.

Table 21. Companies Interested in Alaska (Continued)

Company	Address	Person to Contact
Rio Tinto Canadian Explorations, Ltd.	615 Two Bentall Centre Vancouver 1, B.C., Canada	M. B. (Mike) Mehrtens
Rowan Drilling Co., Inc.	3023 Humble Bldg. Houston, Texas 77002	
SEREM of Alaska, Inc.	426 Eagle Street, Room 5 Anchorage, Alaska 99501	M. Michel Bertucat
Shell Canadian Exploration Co.	815 East Fourth South Salt Lake City, Utah 84102	
Shell Oil Co.	100 Bush Street San Francisco, Calif. 94104	
Silver Standard	808-602 W. Hastings St. Vancouver 2, B.C., Canada	William Dunn
Springer and Associates	502-1200 West Pender St. Vancouver 1, B.C., Canada	Karl J. Springer
Standard Oil Co. (Indiana)	910 South Michigan Chicago, Illinois 60605	P. N. Pitcher
St. Eugene Mining Corp. (Falconbridge)	504-1112 West Pender St. Vancouver 1, B. C., Canada	Alex Smith
Straus Exploration, Inc.	4554 West 6th Avenue Vancouver 8, B.C., Canada	Gavin Dirom
Superior Oil Co.	1 East First Street Reno, Nevada 89501	
Texas Gulf Sulphur Co.	1612 Court Place, Suite 350 Denver, Colorado 80202	James A. L. White
Thermal Energy Co.	4681 First National Bank Bldg. Dallas, Texas 75202	
Union Carbide Exploration Corp.	270 Park Avenue New York, New York 10017	
Union Oil Company of Calif.	2805 Denali Street Anchorage, Alaska 99503	
U. S. Smelting Refining & Mining Co.	Box 1170 Fairbanks, Alaska 99707 or 235 East 42nd Street New York, New York 10017	Dan Eagan

Table 21. Companies Interested in Alaska (Continued)

Company	Address	Person to Contact
U. S. Steel Corp.	Box 510 Provo, Utah 84601	J. K. Hayes
Utah International Inc.	550 California Street San Francisco, Calif. 94104	
Western Exploration	Suite 5-A 428 4th Avenue Anchorage, Alaska 99501	Locke Jacobs

TABLE 22. CONSULTANTS AVAILABLE FOR WORK IN ALASKA*

Company and Address	Company and Address
Alaska Drilling & Construction Co. Box 2325 Ketchikan, Alaska 99901	Boyd, Glen A., P. E. Rt. 3, Box 6377, Lake Sammamish Issaquah, Washington 98027
Alaska Exploration Corporation 1820 W. Northern Lights Blvd. Box 4-1261 Anchorage, Alaska 99509	Calderwood & Mangus 425 6th Street, Suite 980 Anchorage, Alaska 99501
Alaska Geological Consultants 2227 Spenard Road Anchorage, Alaska 99503	Chipp, Eddie R. Box 5-254 Fairbanks, Alaska 99701
Alaska Mineral Lab (Assaying) 2229 Spenard Road Anchorage, Alaska 99503	Colp, Douglas 1101 Gillam Way Fairbanks, Alaska 99701
Anderson, Eskil W. 924 22nd Avenue Spokane, Washington 99203	Cook, Donald J. Box 5-93 College, Alaska 99701
Anderson & Kelly 606 Idaho Building P. O. Box 1411 Boise, Idaho 83701	Cox, Manning W. 315 Montgomery Street, Suite 1120 San Francisco, California 94104
Archer, Cathro & Associates #1 Bentall Centre Vancouver 1, B.C., Canada <u>or</u> Casca Building Whitehorse, Yukon Territory, Canada	Daily, Arthur F. 488 Fairbanks Avenue Oakland, California 94610 / Dickinson-Oswald & Associates 433 9th Avenue Anchorage, Alaska 99504 (Mineral and Land Surveyors)
Bacon-Crowhurst 1111 W. Georgia Street Vancouver 1, B.C., Canada	Dolmage, Campbell & Associates Ltd. 100 Guinness Tower Vancouver 1, B.C., Canada
Bechtold, Ira C. 1987 Skyline Vista Drive La Habra, California 80631	Foster, Robert 701 Welch Road Suite 2209 Palo Alto, California 94304
Behre Dolbear & Company, Inc. 299 Park Avenue, Suite 2250 New York, New York 10017	/DeGolyer and MacNaughton 5625 Daniels Ave., Dallas, Texas 75206

*This list of consultants is not complete, nor does it necessarily constitute a recommendation. Anyone wishing to have his listing changed or added should write to the Editor, Division of Geological Survey at Box 80007, College, Alaska 99701.

Table 22. Consultants (Continued)

Company and Address	Company and Address
Ganopole, Gerald 1820 W. Northern Lights Blvd. Box 4-1261 Anchorage, Alaska 99509	Klopf, K. R. 2 1/2 Mile Steele Creek Road Fairbanks, Alaska 99701
Gardner, R. C. & Associates 615 S. Flower Street, Suite 303 Los Angeles, California 90017	Knaebel, Jeff J. Box 5-919 College, Alaska 99701
Glass, James R. 515-355 Burrard Street Vancouver, B.C., Canada	Lehmann, Ernest K. & Associates, Inc. 1409 Willow Street, Suite 302 Minneapolis, Minnesota 55403
Hawley, C. C. Box 48E, Star Route A Anchorage, Alaska 99502	Lindex Ventures, Ltd. 2403-2020 Hard Street Vancouver 5, B.C., Canada
Heinrichs Geoexploration Company P. O. Box 5671 Tucson, Arizona 85703	Lindgren Exploration Company 338 South Walker Avenue Wayzata, Minnesota 55391
Hoskins, B. C. 621 West Galer Street Seattle, Washington 98119	Lovely, Lum Room 440 Anchorage Legal Center Anchorage, Alaska 99501
Hubbell & Waller Engineering Corp. 100 116th Avenue, S.E. Bellevue, Washington 98004	McGregor, Wallace Box 297 Eureka, Nevada 89316
Huff, J. W. "Bill" Box 837 Ward Cove, Alaska 99928	Matsumoto, Tak P. O. Box 1019 Anchorage, Alaska 99501
Jasper, Martin W. 3007 W. 30th Avenue Anchorage, Alaska 99503	Moerlein, George A. Box 40, Star Route A Anchorage, Alaska 99502
Kaufman, M. A. Box 13296 Spokane, Washington 99213	Noble and Ruckmick 1475 East California Blvd. Pasadena, California 91106
Kelly Pittelko Fritz & Forssen Suite 900, 424 "G" Street Anchorage, Alaska 99501	O'Neill, William A. 505 8th Avenue Anchorage, Alaska 99501
Kelly, Thomas E. 700 "H" Street, Suite 2 Anchorage, Alaska 99501	Pilgrim, Earl R. Box 1896 Fairbanks, Alaska 99707

Table 22. Consultants (Continued)

Company and Address	Company and Address
R & M. Geological Consultants Box 2630 Fairbanks, Alaska 99707	Stevenson, William G. 509-475 Howe Street Vancouver 1, B.C., Canada
Reed, William M. Route 1, Box 118 Clinton, Washington 98236	Thompson, Raymond M. 5752 South Jasmine Englewood, Colorado 80110
Renshaw, A. L., Jr. 2229 Spenard Road Anchorage, Alaska 99503	Utermohle, George E., Jr. Box 5338 Fairbanks, Alaska 99707
Renshaw, Dan 519 Eighth Avenue Anchorage, Alaska 99501	Waterfield, Henry W. Box 4-11 Anchorage, Alaska 99503
Research Laboratories 16 Congress Pasadena, California 91105	Western Exploration Locke Jacobs 428 4th Avenue, 5-A Anchorage, Alaska 99501
Resource Associates of Alaska, Inc. Box 80006 College, Alaska 99701	Wetherell, Clyde E. Star Route A, Box 1550C Anchorage, Alaska 99502
Saunders, Robert H. P. O. Box 1801 Fairbanks, Alaska 99707	Wilson, L. Kenneth 315 Montgomery Street, Suite 1120 San Francisco, California 94104
Schmidt, Ruth A. M. 1040 C Street Anchorage, Alaska 99501	Wilson, Starkey A. 852 Wilson Building Dallas, Texas 75201
Seraphim, R. H. 427-470 Granville Vancouver 2, B.C., Canada	Wylie, James R. Box 208 Aptos, California 95003
Stanley, Kirk W. P. O. Box 3-3956 Anchorage, Alaska 99504	Zaegel, William G. Box 3464 Anchorage, Alaska 99501

Section VII

REPORTS

ALASKA DIVISION OF GEOLOGICAL SURVEY REPORTS

Reports issued by the Division of Geological Survey and preceding agencies are contained in Tables 23 through 31 as follows:

Table 23: Annual Reports of Division of Geological Survey and of Preceding Agencies, 1912-1970
Table 24: Geologic Reports
Table 25: Geochemical Reports
Table 26: Special Reports
Table 27: Bibliographies
Table 28: Information Circulars
Table 29: Laboratory Reports
Table 30: Laboratory Notes
Table 31: Miscellaneous publications.

There is no charge for available items listed in Tables 23 and 28-31. However, there is a charge of $1.00, unless otherwise noted, for all reports listed in Tables 24-27.

TABLE 23. ANNUAL REPORTS 1912-1970

Report Title	Year
* Report of the Mine Inspector for the Territory of Alaska to the Secretary of the Interior.	1912
* Report of the Mine Inspector for the Territory of Alaska to the Secretary of the Interior.	1913
* Report of the Mine Inspector for the Territory of Alaska to the Secretary of the Interior.	1914
* Report of the Territorial Mine Inspector to the Governor of Alaska.	1915
* Report of the Territorial Mine Inspector to the Governor of Alaska.	1916
* Report of the Territorial Mine Inspector to the Governor of Alaska.	1917
* Biennial Report of the Territorial Labor Commissioner to the Governor of Alaska.	1919 1920
* Annual Report of the Territorial Mine Inspector to the Governor of Alaska.	1920
* Annual Report of the Territorial Mine Inspector to the Governor of Alaska.	1921
* Biennial Report of the Territorial Labor Commissioner to the Governor of Alaska.	1921 1922
* Annual Report of the Mine Inspector to the Governor of Alaska.	1922
* Annual Report of the Mine Inspector to the Governor of Alaska.	1923
* Report upon Industrial Accidents Compensation and Insurance in Alaska.	1924
* Report of the Territorial Mine Inspector.	1925- 1926
* Report of Cooperation between the Territory of Alaska and the United States in making mining investigations and in the inspection of mines.	1929
* Report of Cooperation between the Territory of Alaska and the United States in making mining investigations and in the inspection of mines.	1931
* Report of the Commissioner of Mines to the Governor.	1936
* Report of the Commissioner of Mines to the Governor.	1938
* Report of the Commissioner of Mines to the Governor.	1940
* Report of the Commissioner of Mines to the Governor.	1944
* Report of the Commissioner of Mines.	1946

Table 23. Annual Reports (Continued)

Report Title	Year
* Report of the Commissioner of Mines.	1948
* Report of the Commissioner of Mines.	1950
* Report of the Commissioner of Mines.	1952
* Report of the Commissioner of Mines.	1954
* Report of the Commissioner of Mines.	1956
* Report of the Commissioner of Mines.	1958
* Report of the Division of Mines and Minerals.	1959
* Report of the Division of Mines and Minerals.	1960
Report of the Division of Mines and Minerals.	1961
* Report of the Division of Mines and Minerals.	1962
Report of the Division of Mines and Minerals.	1963
Report of the Division of Mines and Minerals.	1964
Report of the Division of Mines and Minerals.	1965
* Report of the Division of Mines and Minerals.	1966
* Report of the Division of Mines and Minerals.	1967
Report of the Division of Mines and Geology.	1968
Report of the Division of Mines and Geology.	1969
* Annual Report of the Division of Geological Survey.	1970

* Out of Print. On file at the Alaska Division of Geological Survey and at certain public and university libraries.

TABLE 24. GEOLOGIC REPORTS

Report Number	Title	Author	Date
1	Preliminary Report on Geologic Mapping in the Coast Range Mineral Belt, Alaska	G. Herreid	1962
* 2	Bedrock Geology of the Rainbow Mountain Area, Alaska Range, Alaska	L. G. Hanson	1963
* 3	Geology of the Portage Creek-Susitna River Area	D. Richter	1963
4	Geology and Mineral Deposits of the Denali-Maclaren River Area, Alaska	M. A. Kaufman	1964
* 5	Geology of the Niblack Anchorage Area, Southeastern Alaska	G. Herreid	1964
* 6	Geology and Mineral Deposits of the Ahtell Creek Area, Slana District, Southcentral Alaska	D. H. Richter	1964
7	Geology of the Dry Pass Area, Southeastern Alaska	G. Herreid M. A. Kaufman	1964
8	Geology of the Paint River Area, Iliamna Quadrangle, Alaska	D. H. Richter G. Herreid	1965
* 9	A Geologic and Geochemical Traverse Along the Nellie Juan River, Kenai Peninsula, Alaska	G. Herreid	1965
* 10	Geology of the Bluff Area, Solomon Quadrangle, Seward Peninsula, Alaska	G. Herreid	1965
* 11	Geology of the Omilak-Otter Creek Area, Bendeleben Quadrangle, Seward Peninsula, Alaska	G. Herreid	1965
* 12	Geology of the Bear Creek Area, Seward Peninsula, Candle Quadrangle, Alaska	G. Herreid	1965
13	Geology and Geochemical Investigations Near Paxson, Northern Copper River Basin, Alaska	A. W. Rose R. H. Saunders	1965
* 14	Geology and Mineral Deposits of the Rainy Creek Area, Mt. Hayes Quadrangle, Alaska	A. W. Rose	1965

Table 24. Geologic Reports (Continued)

Report Number	Title	Author	Date
15	Geology and Mineralization of the Midas Mine and Sulphide Gulch Areas Near Valdez, Alaska	A. W. Rose	1965
* 16	Geology and Mineral Deposits of Central Knight Island, Prince William Sound, Alaska	D. H. Richter	1965
17	Geology and Geochemistry of the Hollis and Twelvemile Creek Areas, Prince of Wales Island, Southeastern Alaska	G. Herreid A. W. Rose	1966
18	Geology of Chromite-Bearing Ultramafic Rocks Near Eklutna, Anchorage Quadrangle, Alaska	A. W. Rose	1966
19	Geology of Part of the Amphitheatre Mountains, Mt. Hayes Quadrangle, Alaska	A. W. Rose	1966
20	Geological and Geochemical Investigations in the Eureka Creek and Rainy Creek Areas, Mt. Hayes Quadrangle, Alaska	A. W. Rose	1966
* 21	Geology of the Slana District, Southcentral Alaska	D. H. Richter	1966
22	Geology and Geochemistry of the Nixon Fork Area, Medfra Quadrangle, Alaska	G. Herreid	1966
23	The Geology and Geochemistry of the Inmachuk River Map Area, Seward Peninsula, Alaska	G. Herreid	1966
24	Preliminary Geology and Geochemistry of the Sinuk River Area, Seward Peninsula, Alaska	G. Herreid	1966
25	Geological and Geochemical Investigations in the Metal Creek Area, Chugach Mountains, Alaska	D. H. Richter	1967
26	Geological and Geochemical Investigations Southwest of Farewell, Alaska	G. Herreid	1968
27	Geology and Mineral Deposits of the Dolomi Area, Prince of Wales Island, Alaska	G. Herreid	1967
28	Geology of the Upper Chistochina River Area, Mt. Hayes Quadrangle, Alaska	A. W. Rose	1967

Table 24. Geologic Reports (Continued)

Report Number	Title	Author	Date
29	Progress Report on the Geology and Geochemistry of the Sinuk Area, Seward Peninsula, Alaska	G. Herreid	1968
30	Geology of the Upper Slana - Mentasta Pass Area, Southcentral Alaska	D. H. Richter	1967
31	Geology and Stream Sediment Geochemistry of Anton Larsen Bay and Vicinity, Kodiak Island, Alaska	A. W. Rose D. H. Richter	1967
32	Geology of an Area on the Upper Talkeetna River, Talkeetna Mountains Quadrangle, Alaska	A. W. Rose	1967
33	Geologic and Geochemical Study, Solomon C-5 Quadrangle, Seward Peninsula, Alaska	R. R. Asher	1969
34	Geology and Geochemistry, Diana Lakes Area, Western Talkeetna Mountains, Alaska	R. E. Anderson	1969
35	Geology and Geochemistry, Sithylemenkat Lake Area, Bettles Quadrangle, Alaska	G. Herreid	1969
36(1)	Geology and Geochemistry of the Sinuk Area, Seward Peninsula, Alaska	G. Herreid	
37	Geology and Geochemistry in the Southeastern Part of the Cosmos Hills, Shungnak D-2 Quadrangle, Alaska	C. E. Fritts	1969
38	Uranium in Alaska	G. R. Eakins	1969
39	Geology and Geochemistry of the Cosmos Hills, Ambler River and Shungnak Quadrangles, Alaska	C. E. Fritts	1970
40	Geology of the Spirit Mountain Nickel-Copper Prospect and Surrounding Area	G. Herreid	1970
41	An Experiment in Geobotanical Prospecting for Uranium, Bokan Mountain Area, Southeastern Alaska	G. R. Eakins	1970
42	Geology and Geochemistry of the Chandalar Area, Brooks Range, Alaska	E. R. Chipp	1970

* Out of Print. On file at the Alaska Division of Geological Survey and at certain public and university libraries

NOTE: (1) Work in progress.

TABLE 25. GEOCHEMICAL REPORTS

Report Number	Title	Author	Date
1	Geochemical Investigations of Selected Areas in Southeastern Alaska (Included with 1965 work in Geochemical Report #6 and partially in Geological Report #17)	C. F. Herbert W. H. Race	1964
* 2	Geochemical Investigation of the Slana District, Southcentral Alaska 1963 and 1964	D. H. Richter	1965
* 3	A Geochemical Investigation in the Richardson Area, Big Delta Quadrangle, Alaska	R. H. Saunders	1965
4	Geochemical Investigations of Selected Areas in Southcentral Alaska, 1964	M. W. Jasper	1965
5	A Geochemical Investigation between Chatanika and Circle Hot Springs, Alaska	W. M. Burand	1965
6	Geochemical Investigations of Selected Areas in Southeastern Alaska, 1964 and 1965	C. F. Herbert W. H. Race	1965
7	Geochemical Investigations Along Highways and Secondary Roads in Southcentral Alaska, 1965	M. W. Jasper	1966
8	Geochemical and Geological Investigations of Admiralty Island, Alaska	W. H. Race A. W. Rose	1967
9	A Geochemical Investigation Along the Taylor Highway, East-Central Alaska	R. H. Saunders	1966
10	A Geochemical Investigation of the Nenana Highway Area, Central Alaska	W. M. Burand	1966
11	A Geochemical Investigation of Stream Sediments in the Elliott Highway Area, Alaska	W. M. Burand	1966
12	A Geochemical Investigation of Minook Creek, Rampart District, Alaska	W. M. Burand R. H. Saunders	1966
13	Geochemical Investigations of Selected Areas in the Yukon-Tanana Region of Alaska, 1965 and 1966	W. M. Burand	1968

Table 25. Geochemical Reports (Continued)

Report Number	Title	Author	Date
14	Geochemical Investigations Willow Creek Southerly to Kenai Lake Region, South-central Alaska	M. W. Jasper	1967
15	Geochemical Investigations Along the Valdez to Chitina Highway in South-central Alaska, 1966	M. W. Jasper	1967
16	A Geochemical Investigation of a Portion of the Fortymile District, East Central Alaska	W. H. Smith	1968
17	A Geochemical Investigation of the Wood River-Tikchik Lakes Area, Southwestern Alaska	G. R. Eakins	1968
Sup 17	A Geochemical Investigation of the Wood River-Tikchik Lakes Area, Southwestern Alaska (No charge)	G. R. Eakins	1969
18	Geology and Geochemistry of Part of the Iron Creek Area, Solomon D-6 Quadrangle, Seward Peninsula, Alaska	R. R. Asher	1969
19	Preliminary Geochemistry and Geology, Little Falls Creek Area, Talkeetna Mountains Quadrangle, Alaska	R. E. Anderson	1969
20	Geology and Geochemistry at Kontra-shibuna Lake, Lake Clark Region, Southwestern Alaska	G. R. Eakins	1970
21	Geochemical Survey and Geological Reconnaissance of the White River Area, Southcentral Alaska	J. J. Knaebel	1970
22	Geology and Geochemistry of the Belt Creek-Libby River Area, Seward Peninsula, Alaska	R. R. Asher	1970
Pre 23	Preliminary Report to Geochemical Report #23: A Geochemical Investigation in the Eagle A-1 Quadrangle, Fortymile District, Alaska (No charge)	R. R. Asher	1970
23	Geochemistry and Geology, Boundary Area, Fortymile District Eagle A-1 Quadrangle, Alaska	R. R. Asher	1970
24	Analysis of Rock and Stream-Sediment Samples Hetta Inlet Area, Prince of Wales Island, Craig Quadrangle, Alaska	G. Herreid	1971

* Out of Print

TABLE 26. SPECIAL REPORTS

Number	Title	Author	Date
1	History of Mines and Prospects, Ketchikan District, Prior to 1952	J. Bufvers	1967
2	Mineral Occurrences in the Yukon-Tanana Region, Alaska	R. H. Saunders	1967
3	A Petrified Forest on Unga Island, Alaska	G. R. Eakins	1970
4	Mineralization Near Stepovak Bay, Alaska Peninsula, Alaska	G. R. Eakins	1970

TABLE 27. BIBLIOGRAPHIES

Title	Author	Date
Geological Literature on the Cook Inlet Basin and Vicinity, Alaska (Price $1.50) (Out of print; to be reprinted)	J. C. Maher W. M. Trollman	1969
Geological Literature on the Gulf and Southeastern Coastal Regions of Alaska (Price $1.50)	J. C. Maher	1971
Bibliography of Alaskan Geology 1831-1918 (88 p.)	C. E. Fritts M. Brown	1971
Bibliography of Alaskan Geology 1919-1949 (92 p.)	C. E. Fritts M. Brown	In Press
Bibliography of Alaskan Geology 1950-1959 (82 p.)	C. E. Fritts M. Brown	1971
Bibliography of Alaskan Geology 1960-1964 (81 p.)	C. E. Fritts M. Brown	1971
Bibliography of Alaskan Geology 1965-1968 (112 p.)	C. E. Fritts E. Tuell	In Press

TABLE 28. INFORMATION CIRCULARS

Circular Number	Title	Date
1	Proper Claim Staking in Alaska	1970
2	Mineral Rights of Aliens in the State of Alaska	1968
3	Hand Placer Mining Methods	1968
4	Uranium Prospecting in Alaska	1968
5	General Alaskan Mineral Information	1971
6	Alaskan Prospecting Information	1971
7	Unassigned	
8	Exploration Companies and Available Consultants	1971
9	Alaska Rockhound Information	1971
10	Skin Diving for Gold in Alaska	1968
11	List of Reports Issued by the Division of Geological Survey and Corresponding Preceding Agencies	1971
12	Services of the Division of Geological Survey	1971
13	Dangers in Old Mine Openings	1962
14	Mining Laws Applicable in Alaska	1971
15	A Prospectors Guide to the Sale and Leasing of Mineral Properties	1969
16	Alaska Map Information	1971

TABLE 29. LABORATORY REPORTS

Number	Title	Author	Date
1	A Rapid Radiometric Analysis for Equivalent Uranium	P. L. Anderson M. Mitchel, Jr.	1969
2	Analysis of Copper, Lead, and Zinc by Atomic Absorption Spectrophotometry	P. L. Anderson N. Cho	1969
3	Geochemical Analytical Procedure for Copper, Lead, and Zinc by Atomic Absorption Spectroscopy	P. L. Anderson	1969

TABLE 31. MISCELLANEOUS PUBLICATIONS

Title	Author	Date
* Mining Investigations and Mine Inspections in Alaska, Including Assistance to Prospectors		1933
* Strategic Mineral Occurrences in Interior Alaska; Pamphlet No. 1.	H. R. Joesting	1942
* Strategic Mineral Occurrences in Interior Alaska; Pamphlet No. 2.	H. R. Joesting	1943
* Prospecting in Alaska.	L. R. Stewart	1944
* Asbestos Deposits of the Kobuk Region, Alaska; Pamphlet No. 3.	E. Anderson	1944
* Mineral Occurrences other than Gold Deposits in Northwestern Alaska; Pamphlet No. 5-R.	E. Anderson	1944
* Asbestos and Jade Occurrences in the Kobuk River Region, Alaska; Pamphlet No. 3-R.	E. Anderson	1945
* Industrial Minerals as a Field for Prospecting in Alaska including a glossary of Elements and Minerals, Revised 1946.	A. E. Glover	1945 1946
* Some High Calcium Limestone Deposits in Southeastern Alaska; Pamphlet No. 6. (Mimeograph copies available)	J. C. Roehm	1946
* Prospecting in Alaska (Revised)	L. R. Stewart	1949
* Preliminary Investigation of the Kings River Area Limestone Deposits, Anchorage Quadrangle, PE 85-22.	M. W. Jasper M. Mihelich	1961
Mespelt Mine of Strandberg Mines Inc., Nixon Fork District Medfra Quadrangle, Alaska, PE 65-1.	M. W. Jasper	1961
Alaska's New Mining Law for State Lands; (Reprinted from Mining Engineering magazine)	J. A. Williams	1961
Geology and Ore Deposits of Alaska. (Reprinted from Mining Engineering magazine)	G. Herreid	1961
* A Preliminary Map-MI, of the Bedrock Geology of The Fairbanks Mining District, Alaska, prepared by Department of Geology, College of Earth Sciences and Mineral Industry, University of Alaska for the Division of Mines and Minerals Rpt. 194-1.	R. B. Forbes J. M. Brown	1961

Table 31. Miscellaneous Publications (Continued)

Title	Author	Date
The Mineral Industry of the Kenai-Cook Inlet-Susitna Regions, Alaska.	W. H. Race	1962
Mine Safety Regulations, From the Alaska Administrative Code.		1963
Miscellaneous Paper No. 1., The Great Alaska Earthquake.		1964
Tectonics and Ore Deposits in Alaska; Presented at the 1964 Alaska AIME Conference, College, Alaska.	G. Herreid	1964
A possible Guide to Metal Deposits of Alaska; Presented at the 1964 Alaska AIME Conference, College, Alaska.	C. F. Herbert	1964
Mercury Mining revival in Alaska despite poor access and climate: Printed in 1971 issue of World Mining Magazine.	C. N. Conwell	1971
Deposits of the Kuskokwim District, Alaska; Presented at the 1971 AIME Pacific Southwest Mineral Industry Conference, Reno, Nevada.	C. N. Conwell	1971
Age of the sedimentation, plutonism, and regional metamorphism in the Clearwater Mountains region, Central Alaska. (Reprinted from Isochron/West, No. 2, August 1971)	T. E. Smith M. A. Lanphere	1971

* Out of print. On file at the Alaska Division of Geological Survey and at certain public and university libraries.