
UTAH GEOLOGICAL AND MINERALOGICAL SURVEY

QUARTERLY REVIEW

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Geologic Investigation in the State of Utah

August, 1966

HAS UTAH LOST THE KAIPAROWITS?

From an address by

J. M. Ehrhorn¹

The author's purpose in preparing this paper is to alert Utahns of their possible default of what holds the promise of being the most important single industrial development in Utah during the coming nineteen years, and to suggest a program for the Kaiparowits.

On September 3, 1965, then-acting State Engineer, Hubert C. Lambert, in a memorandum decision granted 102,000 acre feet of water to Resources Company, Application no. 35818, for use in generating electricity at Lake Powell from coal. Among certain stipulations agreed to was one calling for proof of appropriation by November 30, 1970.

IMPORTANCE TO UTAH ECONOMY

The program for a coal-fired electric-generating complex near the shores of Lake Powell comprises 5,000 Mw of capability, starting with

two units of 750 Mw, each operational by 1975; two additional units of the same capacity, each operational by 1980; and two additional units of 1,000 Mw, each operational by 1985. The program would require 4.2 million tons of coal per year for the first two units and 14.6 million tons of coal per year upon completion of the complex. The investment for generating plants and facilities and coal mines and ancillaries (\$96 million) at 1964 prices is estimated at \$600 million. The construction payroll is estimated at \$95 million over a 15-year period. Operating and maintenance crew is estimated at 150 people. Average coal production for 14.6 million tons per year and 225 working days is 65,000 tons per day. From 1,750 to 2,300 people may be required to produce this tonnage. The annual payroll of mines and generating facilities may total \$20 million.

Dr. Elroy Nelson² considered the Kaiparowits coal-fired steam program as the most important single item in Utah's economic development with respect to payrolls, taxes, and school finances.

At the start of operation, property taxes might total 12 cents per ton of coal mined, or \$500,000 per year. This may decrease to 9 cents per ton upon the completion of the complex. At the start of operations the coal mine alone would pay twice the property taxes collected in Kane County in 1964. By 1985 the coal mine taxes would be six times this amount.

ECONOMICS AND COMPETITIVE POSITION

Reserves - The author assumes that reserves of recoverable coal are adequate. The important reserves that might serve the power program are essentially under permit or lease to

the Resources Company group, the Atlantic Refining Corporation, and Peabody Coal Company. Coal deposits may underlie 150,000 acres of land, and recoverable coal may exceed one billion tons. Coal must be mined by underground procedures; deposits are amenable to low-cost methods.

Cost of the Coal - Three areas of the southwest contain sufficient coal to attract coal-fired electric generating plants: 4-Corners near Farmington, New Mexico; Mahave; and Kaiparowits.

Utah Construction furnishes coal to the 4-Corners Plant of Arizona Public Service Company for a price equivalent to about 12 cents per million btu; Black Mesa field of Arizona contains substantial reserves of coal which can be mined by open-pit methods, but the water supply appears to be inadequate. The plant consists of 2 units of 175 Mw each and one unit of 225 Mw; two units of 750 Mw each are to be added before the end of the sixties.

The Southern California Edison and Peabody Coal Companies have announced plans for a coal-fired electric-generating plant.

(Continued on Page 2)

FROM THE DESK OF THE STATE GEOLOGIST

In our February *Quarterly* we printed "Taxes and Taconite", a history of the economic rebirth of northeastern Minnesota in which the State of Minnesota played a vital part. Taconite investments represent a billion dollars worth of private enterprise, according to J. S. Abdnor (*Mining Congress Journal*, June 1966).

A proposal for State action to facilitate development of Kaiparowits coal is featured in this issue of the *Quarterly*. *Is it not possible that the obtaining of abundant, less expensive power within Utah would be to Utah's economy as the taconite potential has been to Minnesota's?*

QUARTERLY REVIEW

State of Utah.....Calvin L. Rampton
Governor
University of Utah.....James C. Fletcher
President
College of Mines & Mineral
Industries.....George R. Hill
Dean
Utah Geological & Mineralogical
Survey.....William P. Hewitt
Director

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2. Dr. Nelson, who is Vice President of First Security Bank of Utah and is an outstanding mineral economist in the State, made this statement in a televised program on December 14, 1964.

(Continued from Page 1)

tric generating plant to be located at the "Mohave Site" in Nevada. Nevada has granted 30,000 acre feet of its water allocation to this project, which will provide for 1,500 Mw of power. Costs of coal delivered to the Mohave site have not been announced, but may be 18 cents per million btu.

The price of coal from mines on the Kaiparowits has been estimated within limits of \$4.00 to \$4.50 per ton F.O.B. Lake Powell plant site. These limits are equivalent to 16½ to 18½ cents per million btu for the 12,200 btu per pound "as received" Kaiparowits coal. This price is thus not competitive. The author believes, however, that Kaiparowits coals may be competitive and suggests a target of 15 cents per million btu, equivalent to \$3.66 per ton, F.O.B., Lake Powell plant site as a maximum, based upon the suggestions that follow.

The possibility of meeting the proposed price target is based on *maximum mechanization and automation; elimination of coal preparation and washing;¹ substitution of private retirement insurance for the present miners' welfare;² and tax abatement.³ State Industrial Development Revenue Bonds to provide for facilities that otherwise must be provided by the investor are another means of reducing investment depreciation.*

The energy costs from coal at the three sites can be compared with some degree of confidence. Coal at the power plant at 4-Corners is the cheapest. Coal at not-to-exceed 15¢ per million btu at the Lake Powell Generating Site is next cheapest, and coal at the Mohave Site is most expensive.

Costs of Transmission - Secretary of the Interior, Stewart Udall, announced on April 12, 1966 an agreement with members of Western Energy Supply and Transmission Associates for the development of a massive coal-fired steam and electric generating and transmission complex in the southwestern United States. The agreement provides for water contracts, utilization of Indian-owned coal, and transmission rights-of-way across Federal and Indian lands. Measures for the abatement of air and water pollution are outlined. As a result of the agreement plants are to be completed at 4-Corners and Mohave Sites. Some 1860 miles of associated transmission lines will be constructed.

Plans are said to include a 500,000 KvAc transmission line from 4-Corners to Mohave to southern California. The course may be close to a straight line. Connection with the Lake Powell site may be 70 miles or less. Noteworthy is the connection of these facilities with the Federal Intertie from the Dalles, Oregon to Hoover Dam.

Nuclear Power - The place of nuclear power may be expected to grow in importance. Since January, 1966 plans have been announced for over 5,000 Mw of nuclear capability, some of which are within the coal areas of the Mississippi and Ohio River Valleys. In addition, the National Power Survey (October, 1964, p. 284) predicted that by 1980 the cost of fuel for electric generating plants for the total industry will be 1.7 mills per kwh; whereas nuclear power will be as low as 1.0 mill per kwh. Even in the southwestern United States nuclear power may account for 20% of installed capacity — improvements may be expected in coal-burning plants but these may be minor compared with improvements in nuclear plants.

A SUGGESTED PROGRAM FOR THE KAIPAROWITS

The opinion expressed by Dr. Elroy Nelson on December 14, 1964 appears to be as valid today as when made. If the Kaiparowits development is the biggest single addition that can be made to Utah's economy, it behooves the State of Utah to move aggressively. The author proposes that Governor Rampton appoint a *coordinator for the Kaiparowits-Lake Powell Development* in order to exploit the coals of the Kaiparowits and hasten the electric generating plant of the Resources Company. The purposes of the coordinator would be:

(1) *To consolidate by unitizing or communitizing the separate land ownerships so that mine developments might be made most efficiently.*

(2) *To propose the granting of tax concessions, particularly during the initial years, that might reduce coal costs. For instance, 12¢ per ton is one-half cent per million btu.*

(3) *To integrate and coordinate federal, state and private interests relative to air and water pollution, rights-of-way, transmission and exchange of power.*

(4) *To develop community of interests between the investor, labor*

and the State. To eliminate or substantially reduce the 40¢ per ton to Miners' Welfare. The elimination of this charge would by itself make the Kaiparowits coals competitive.

The Kaiparowits coordinator should be supported by a council of representatives of state and federal agencies, the power companies, the property owners and labor.

CONCLUSION

Capital may be expected to invest where profits appear adequate, where risks are least, and where the political and economic climates are attractive. It is the responsibility of the State to make the Kaiparowits attractive to capital. Failure to do so may penalize other efforts to expand Utah's economy.

Because of the time limitations, because the demand for power may not reach the predictions of those demands, and because of nuclear power, development of the Kaiparowits may be tabled.

The State of Utah acted boldly and wisely on September 3, 1965 in granting 102,000 acre feet of Lake Powell water to Resources Company for electric power generation; the State is admonished to continue such bold and wise action.

1. Coal as mined may contain 2 to 4 percent more ash than coal that is washed, but as losses in washing may approach 10 percent, this author believes that ash collection after burning is cheaper than washing.

2. The Miners' Welfare Fund is for the purpose of providing a retirement income of \$100 per month, and is based on 40¢ per ton of coal marketed which is equivalent to 1.64¢ per million btu.

3. The State of Utah and Kane County might grant a waiver of property taxes and income taxes for a 3- to 5-year period as an inducement to the early selection of the Kaiparowits.

Thank You

Our equipment pool has been enhanced by donations from Mountain Fuel Supply Company: a scintillometer, nucliometer, babble counter, and 3 geiger counters.

From the estate of the late Harlan Walker we received the private library, as well as a geiger counter and an old-style hanging compass, which is not only useful for underground reconnaissance - some say it's a collector's item.

Thanks also are due to George D. Fehr, for electrologs.

NATURAL RESOURCES AGENCY

By executive order of Governor Rampton the following agencies of the State were grouped, for administrative purposes, under the agency for "Natural Resource Services" with Mr. Jay Bingham, Director of the Water and Power Board, as Coordinator: Utah Water and Power Board, State Engineer, State Board of Forestry and Fire Control, State Land Board, Oil and Gas Conservation Commission, and Utah Geological and Mineralogical Survey Advisory Board. The Coordinator will be expected to resolve conflicts or duplications, wherever possible, and to act as liaison between the Governor and the various departments.

The Order, pursuant to authority of HJR 3, passed by the Second Special Session of the Thirty-sixth Legislature, took effect July 1, 1966.

WHO'S WHO

Dr. William P. Hewitt, Director of the Utah Geological Survey, and Dr. James C. Fletcher, President of the University of Utah, were among 40 Utahns whose names have been added to the listing of the 1966-1967 edition of Who's Who in America. Also named were two University Regents, Roy W. Simmons and W. W. Clyde, and 5 University faculty members, including Milton E. Wadsworth, Chairman of the Department of Metallurgy.

OUTWARD BOUND — You may not know her name . . . but you've seen her work in the Quarterly and in the manuscripts she's edited. Utah Survey will miss Barbara Childers when she moves with her family to Casper, Wyoming, where her husband has taken a position with the Union Carbide Company. The Survey said "Welcome" early in 1965. August '66 and the Survey says "Good-bye editor" and "Thanks Barbara".

THE GREAT SALT LAKE Guidebook 20

"The Great Salt Lake," the *Utah Geological Society's* Guidebook to The Geology of Utah number 20, edited by Wm. Lee Stokes contains the following articles: Introduction and acknowledgements, by W. L. Stokes; Great Salt Lake: an historical sketch, by D. E. Miller; Biology of the Great Salt Lake, by B. G. Quinn; Geologic setting of the Great Salt Lake, by R. E. Cohenour and K. C. Thomson; Some Cenozoic structural basins in the Great Salt Lake area, Utah, indicated by regional gravity surveys, by K. L. Cook, J. W. Berg, Jr., W. W. Johnson, and R. T. Novotny; Precursors of Great Salt Lake, by R. B. Morrison; Sediments of Great Salt Lake, by A. J. Eardley; Hydrology and climatology of Great Salt Lake, by E. L. Peck and E. A. Richardson; Great Salt Lake: chemistry of the water, by A. H. Handy and D. C. Hahl; Industrial development and potential of Great Salt Lake, by R. E. Cohenour; The rights of states to the beds of their navigable lakes and streams, and some special problems of determining boundaries establishing Utah's claim to the Great Salt Lake, by J. R. Mahoney.

ALL ABOUT SALT

At the *Second Symposium on Salt* held by the *Northern Ohio Geological Society* in Cleveland on May 3-5, 1965, contributions to the rapidly growing knowledge of salt were made by geologists, geochemists, miners, briners, and salt technologists. The papers were recently published in 2 volumes. Volume 1, which is concerned with the geology, geochemistry, and mining aspects of salt, contains 3 papers by geologists of the Utah Geological Survey: *Salt Deposits of Sevier Valley, Utah*, by A. R. Pratt, E. B. Heylmun, and R. E. Cohenour; *Great Salt Lake, Utah, and its Environment*, by Robert E. Cohenour (Research Geologist with Utah Geol. Survey), and *Complex Salts and Brines of the Paradox Basin*, by E. T. Mayhew and E. B. Heylmun.

Conflicts Concerning The Use Of Public Lands

Abstract of an article by
EDWARD W. CLYDE¹

There are numerous conflicts which exist or are developing in the use of our public lands. By far the most serious conflict is between those who desire to keep the public lands in economic use, and those who desire to withdraw large portions of them from economic use and to preserve them in their natural state, or develop them exclusively for public recreation use. We have reached a point where the public land laws consist literally of thousands of statutes, some overlapping, some outdated and not in use, and some no longer in harmony with the needs and the policies of the nation. Congress has created a Land Law Review Commission which, under the able leadership of Congressman Wayne Aspinall, will recommend to Congress a policy for the lands which are to be maintained and managed, and a policy for the disposal of the lands which are classified for disposal. *General public interest now suggests that Congress, upon completion of the current study, will adopt long-range policies regarding the public lands, and the West is, or at least should be, vitally concerned that this policy will leave the major portion of these lands open to economic use.*

1. Chairman, Board of Regents, Univ. of Utah; member law firm of Clyde, Mecham & Pratt, Salt Lake City. Full article on p. 4, "Pay Dirt," June 17, 1966.

Welcome Back

We are pleased to welcome Hellmut H. Doelling back to the staff of the Utah Geological Survey as *Economic Geologist*. Dr. Doelling was chief draftsman for the Survey during 1955-56 and 1959-64. Since receiving his Ph. D. degree in geology from the University of Utah in 1964, he has been Assistant Professor of Geology at Midwestern University, Wichita Falls, Texas.

Please

Return the postcard with your corrected address so that we can complete our mailing list review. We do not want to drop your name from our mailing list.

BITUMINOUS SANDS OF SUNNYSIDE AREA TESTED

Signal to start thermal recovery program in Utah

Signal Oil and Gas Company of Los Angeles, California, who previously had announced plans for a series of test holes into the bituminous sands of Sunnyside area, Carbon County, Utah, has filed notices to drill seven thermal recovery test holes. All are located in sec. 4, T. 14 S., R. 14 E., SLM, on lands which are privately owned - fee acreage.

Signal's attempted thermal recovery of oil from these lands will be situated in the adjoining section to a similar project of Shell Oil Company in sec. 3, same township and range. Shell's project was suspended during winter weather, however Shell was reported to have completed the shallow drilling part of its steam-flood project.

Pan Am bituminous test

Pan American Petroleum Corporation has located a 2,500-foot Green River bituminous sands test in the Sunnyside area - NE SW SW sec. 1, T. 14 S., R. 14 E., SLM.

GULF RECEIVES U.S.G.S. APPROVAL OF LARGEST UTAH UNIT

Gulf Oil Corporation will drill four wildcat wells in the northwestern portion of the Uintah Basin on its newly approved STRAWBERRY RIDGE UNIT, approved by the U.S.G.S. on June 2, 1966. It is the largest unit in the State of Utah (89,504.59 acres), and lies in Wasatch and Utah Counties. Some 2,442.26 acres are patented-fee lands, and the balance, more than 87,000 acres, are federal public domain. Nearest production is at Duchesne Field, 32 miles northeast. There has been only sparse drilling within the area, none of which has been productive of commercial oil or gas. Gulf's No. 1 Strawberry Ridge Unit, located in T. 5 S., R. 11W., U.S.M., will be a 6,000-foot Wasatch test.

REVISED WELL-SPACING LAW REVIVES DEEP DRILLING IN UTAH

After six years of continually declining exploration activity including drilling and production of oil and gas in Utah, a recently revised well-spacing law offers opportunity to revive the industry in the state. The new law brings oil and gas regulations into line with all other major oil-producing states by eliminating close spacing of wells in fields. It now allows the Utah Oil and Gas Conservation Commission authority to set wider well-spacing patterns, particularly with reference to deep-well discoveries. The wider spacing can adequately drain an area and thereby save operators appreciable cost in drilling if they are not required to drill additional wells to meet requirements of the commission.

Mountain Fuel Supply Company Intensifies Search For Natural Gas Reserves

Mountain Fuel Supply intends to drill a wildcat test in Utah County to test an old and well-known structure, Thistle Dome, which has been recently unitized. The new federal unit contains 24,453.76 acres and is located 7 miles west of Gulf Oil Corp. No. 1 Strawberry Ridge Unit. Working interests at Thistle Dome are held by Skyline, Gulf, Marathon, Norris, and Texas Eastern Panhandle Oil Companies, and Mountain Fuel Supply, the operator. The No. 1 Thistle Dome Unit is located in T. 9S., R. 6E., SLM, and will test the Mesaverde Formation at about 3,500 feet.

* * *

Mountain Fuel's new Red Cliffs unit in T. 26 S., R. 4E., Sevier County, contains 6,854 acres and calls for a Kaibab (Permian) test. The initial test is scheduled to reach the Kaibab at 5,100 feet.

* * *

Also in Sevier County, Mountain Fuel's No. 1 Desert Wash unit at the NW end of Last Chance anticline is intended to test the Kaibab at 4,300 feet.

DEEP TESTS IN CARBON COUNTY

Tenneco Deep Test

Tenneco Oil Co. is presently drilling a wildcat well intended to be 500 feet deeper than any previous test in Utah in the Clear Creek gas field, Carbon County, Utah. The deep test will go 16,800 feet to test the Mississippian, and may require 6 to 8 months to drill. At last report they had drilled 1,010 feet, and were reaming to run casing.

Humble Tests Devonian

Humble Oil and Refining Company's No. 1 Hiawatha Unit (Carbon County) has been planned to go to 15,000 feet to test the Elbert (Devonian). At last report they had drilled 3,740 feet and were reaming to set casing.

MESAVERDE DISCOVERY AT RED WASH

Chevron Oil Company's No. 212 Red Wash, NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 8, T. 8S., R. 24E., SLM, Uintah County, Utah, flowed gas, oil and water from lower Mesaverde Formation on a test of perforations after sand-frac treatment. This is an indicated new field discovery since all production in the immediate Red Wash area is from basal Green River and above. The lower Mesaverde test produced 1,440,000 cubic feet of gas, 19 barrels of oil and 18 barrels of water per day.

Phillips Reportedly Has Confirmation At Bridger Lake

Phillips Petroleum Company has staked additional new locations at Bridger Lake Field in Summit County, Utah. The field opener which flowed 2,753 barrels of oil per day is the No. 1 Bridger Lake Unit-Fork "A", SE NW SW sec. 25, T. 3N., R. 14E. It represents Utah's deepest oil production. The operator released no data on the No. 2A Unit or No. 3A Unit and reports nothing will be released on the wells until after both are completed, however, rumor has it that cores in No. 2A compared favorably with the discovery well.

Phillips is moving its production to its Woods Cross, Utah (North Salt Lake City) refinery via tank-truck. If production is increased appreciably and if reserves warrant, the company is preparing to build a pipeline to its Utah Refinery.

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The Utah Geological Survey has requested sample cuts from the Phillips Petroleum Company numbers 1A, 2A, and 3A Bridger Lake Fork Units.

Wyo. Symposium Slanted To Oil Geologist

The Wyoming Geological Association and Casper College will present a symposium on **Recently Developed Geologic Principles and Sedimentation of the Permo-Penn. rocks of the Rocky Mountains** on August 31, Sept. 1, and Sept. 2. A field trip will be conducted in the Casper area on the afternoon of Sept. 2.

The intent of the symposium is to present usable, practical and readily identifiable data from recent work that can be applied directly to oil exploration.

Petroleum Council Meets

Annual meeting, Utah Petroleum Council, Hotel Utah, S.L.C., Aug. 31, with morning sessions and luncheon—Gov. Jack Campbell of New Mexico will be luncheon speaker and three speakers are scheduled for the 2-hour morning session.

Mining Congress To Meet

The Salt Lake City sessions, September 11-14, will concern mine finance, labor relations, exploration and geology, safety policies and impact of federal legislation, land reclamation, air and water pollution, and public lands (of special interest because of an intensive study being made by the Public Land Law Review Commission). Technical sessions are planned for Monday through Wednesday and three field trips are scheduled Thursday, Sept. 15 to Cane Creek potash mine at Moab, Texas Gulf Sulphur as host; Geneva Works at Provo, U. S. Steel as host; and Utah Copper Division of Kennecott. (For information write Amer. Mining Cong., 1100 Ring Rdg., Wash., D.C.)

FIELD CONFERENCE ON GREAT SALT LAKE

The Utah Geological Society will sponsor a field conference September 9-10 to study the Great Salt Lake.

A pre-conference opening session is planned for 7:30 the evening of September 8 (Thursday) at the auditorium of Orson Spencer Hall, University of Utah. According to Dr. Stokes, who is editor of the guidebook, speakers include some of the guidebook contributors: Robert E. Cohenour, Roger B. Morrison, David E. Miller, Eugene L. Peck, and A. H. Handy or D. C. Hall.

Due to the large circumference of the Lake and lack of roads, the bus trip of September 9 will visit points of interest on the southern and eastern shores of the Lake. On September 10 participants of the conference will take a boat trip on Great Salt Lake and side trips to such points as the salt plants, Saltair, Solar Salt intake, and area of the tailings test.

The field conference committee includes Lowell S. Hilpert (Utah Geological Society President), Robert E. Cohenour (Chairman), Walter R. Buss (Registration and Publicity), Howard F. Bartlett (Transportation). Total cost of the conference including transportation and guidebook is (tentatively) \$10.00; questions concerning registration will be handled by Dr. Walter R. Buss, Weber State College, Ogden, Utah.

GEOLOGY FIELD CAMP

Eleven students participated in the Summer Field Camp of the University of Utah Geology Department (Geology 140s) under the direction of Dr. Harry D. Goode. Dr. Goode reported that $\frac{2}{3}$ of Alton NW quadrangle and $\frac{2}{3}$ of Alton SW quadrangle in Kane County, Utah, had been mapped, and it is planned to complete the work next year. Results of the mapping are on open-file and are available at the office of Dr. Goode, 101 Geology Building, University of Utah.

G.S.A. COAL SECTION FIELD TRIP

A field trip for the Coal Section of the Geological Society of America will be conducted November 12 and 13 in connection with the Annual Meetings of the Society this Fall. The trip will begin with an orientation program on the campus of Brigham Young University Friday evening, November 11, and will spend the following two days studying the Cretaceous coal section in Price Canyon and along the Book Cliffs in Carbon County. Emphasis will be placed upon stratigraphic and ecologic settings of the coals and methods of mining unique to the region. A guidebook of solicited papers is being edited by Dr. W. K. Hamblin, field trip chairman, and Dr. J. Keith Rigby. Papers have been prepared on regional stratigraphy of the coal-bearing sequence, sedimentary features and environments of deposition, economics of Utah coals, petrography and palynology and paleobotany of the coals, seismic disturbances associated with mining in the region, in addition to a road log of the trip.

Initial stops will be made in Spanish Fork and Price Canyons to examine associated stratigraphic units and to establish a regional setting of the coal-bearing strata. Most of the field trip will concern excellent exposures of rhythmic sequences associated with coal beds in new highway cuts in Price Canyon, and in adjacent canyons in the Book Cliffs. Much of the second day will be spent in the mines at Sunnyside where long-wall mining techniques unique in North America will be demonstrated.

The cost including transportation, meals, lodging, and guidebooks will be \$36.00. The field trip will be by bus and will return to Salt Lake City Sunday in time for participants to fly to San Francisco for the annual convention of the Society.

For additional information contact Dr. W. Kenneth Hamblin, Department of Geology, Brigham Young University, Provo, Utah, 84601.

FINANCIAL STATEMENT

The Survey receives financing from the following sources: a legislative appropriation (121 . . .), and dedicated credits from Federal leasing funds (122 . . .) and the receipts from publications sold by the

Survey (123 . . .). For fiscal 1966 the legislature appropriated \$35,000 to procure transportation on Great Salt Lake.

INCOME:

Balance Carried Forward:

Survey Fund (Utah Code 53-36-2-7) (123-401010)	\$ 9,969.15	
Mineral Leasing Fund (122-401011) (Carry-over)	39,543.81	
Research Grant for Oil Well Sample Library	132.36	
		\$ 49,645.32

Appropriations:

Mineral Leasing Fund (122-401011) Allotted	\$111,343.00	
Fiscal Year Appropriations (121-401012)	117,000.00	
Great Salt Lake Equipment (124-401019)	35,000.00	
		\$263,343.00

Receipts:

Sale of Maps & Bulletins - Gross Receipts		
(Utah Code 53-35-2-7) (123-401010)	\$ 18,990.11	
		\$ 18,990.11

TOTAL INCOME

\$331,978.43 \$331,978.43

EXPENSES:

Operations:

Salaries

Administrative & Office	\$ 24,612.10
Research	19,921.91
Publications	2,612.50
Drafting	4,289.89
Part-time Field Parties	
Deep Creek (Tooele County)	2,293.75
Garfield County	3,013.84
Sevier County	187.50
Star Mining District (Milford County)	6,170.00
Sanpete County	1,252.28
Great Salt Lake	6,880.00
PR Springs (Grand & Uintah Counties)	5,202.80
Mining Directory	863.80
Thesis Support (Shale Oil Extractions)	1,600.00

Time Cards

Administrative & Office	1,499.50
Research	5,398.03
Publications	8,742.33
Drafting	3,444.00
Field Parties	5,256.75
Mining Directory	860.48
Thesis Support (Geologic Hazards)	2,321.65
Sample Library	6,226.60
Analysts (Analytical Laboratory)	2,019.58
Assaying (X-Ray)	810.00
Maintenance & Improvements	\$ 963.69

Employee Benefits:

Social Security	3,911.32
State Retirement	655.46
T.I.A.A.	1,651.33
Medical & Hospital Insurance	257.57
Workmen's Compensation	88.25
Group Life Insurance	62.80

\$123,069.71

Supplies:

Office	\$ 5,125.69
Publications	909.32
Drafting	2,886.69
Sample Library	365.13
Analytical Laboratory	1,618.44
Field Parties	3,589.74
Great Salt Lake	10,368.99

\$ 24,864.00

Publication Expenses:

Utah Relief Maps	\$ 3,963.18
Manuscript Preparation (Minerals of Utah)	1,200.00
Consignment Payments*	7,504.59

Bulletin 69*	1,976.30	
Bulletin 75*	442.50	
Bulletin 77*	767.55	
Circular 46*	266.66	
Circular 47*	248.64	
Special Studies 13*	453.00	
Special Studies 14*	330.00	
Special Studies 15*	394.50	
Water Resources 3 Part 2*	96.00	
Earth Science Studies 1*	160.20	
List of Publications*	428.50	
Dinosaur National Monument Maps*	1,018.00	
Quarterly Reviews*	691.00	
Mailing Supplies*	87.52	
Overpayments & Returns*	43.10	
Misc. Expenses*	65.60	
		\$ 20,136.84
United States Geological Survey Coop:		
Chemical Characteristics, Waters of Western Utah	\$ 7,500.00	
Chemistry of Great Salt Lake Brines	5,000.00	
Springs of Utah	5,000.00	
Topographic Mapping	25,000.00	
Aerial Mosaic Great Salt Lake	5,000.00	
		\$ 47,500.00
United States Bureau of Mines Coop:		
Oil Field Brines	\$ 3,000.00	
		\$ 3,000.00
Travel Expenses:		
Staff Travel	\$ 2,212.84	
Field Parties	10,434.20	
Rental on Vehicles	4,650.40	
		\$ 17,297.44
Sales Tax (\$148.03*)	\$ 186.79	
Assaying	2,142.48	
Postage	1,121.75	
Aerial Photographs	833.25	
Freight	54.99	
Telephone & Telegraph	259.42	
Maintenance - Parts & Repairs	175.34	
Research Grant for Oil Well Sample Library - Cancelled and transferred to General Fund	132.36	
		\$ 4,906.38
Equipment:		
Seismic Listening Equipment (Portable)	\$ 7,167.76	
Air Conditioners	2,468.00	
Office Equipment	1,486.80	
Drying Oven & Accessories	1,023.20	
Corvascope & Case	472.63	
Dodge Truck, Auger Rig & Rotauger	10,166.73	
Inboard Dory Type Boat & Trailer	5,429.65	
Boat Hull & Propulsion Parts	15,572.97	
3 Amphibious Trucks & Freed Motor	1,115.00	
Jeep	265.00	
Welding Torch	129.00	
Grinder	65.14	
Pump	250.00	
Arc Welder	767.50	
Unexpended Great Salt Lake Equipment Fund (124-401019) - Reverts to State	81.75	
		\$ 46,461.13
CARRIED FORWARD:		
Mineral Leasing Fund (122-401011)	\$ 30,903.78	
Survey Fund (123-401010)	13,837.57	
Fiscal Year Appropriation (121-401012)	1.58	
		\$ 44,742.93
TOTAL SUMMARY	\$331,978.43	\$331,978.43
NET WORTH:		
Balances carried forward on Fund Accounts (above)		\$ 44,742.93
Accounts Receivable (Unpaid Invoices)		1,305.89
Oil Well Sample Library (15,000 boxes \$1.00 each)		15,000.00
Inventory of Publications (Selling Price)		124,821.15
Equipment (Actual Cost)		68,618.38
LIABILITIES		NONE
TOTAL NET WORTH		\$254,488.35
* Paid from Publication Fund "380" (123-401010)		

Geological Survey Work Aids Mineral Exploration

As a direct result of the publication of Special Studies 12, four major clay producers became interested in the Blawn Mountain alteration zone, Beaver County, and it is reported that Minerals and Chemical Phillip Corporation, Menlo Park, New Jersey, either successors to or affiliated with Georgia Kaolin, now have an exploration agreement on the Blawn Mountain property of Patton Corporation of Salt Lake City and will commence drilling during the first week of August to determine tonnage.

Due to suggestions made by Utah Geological Survey personnel, drilling and bulldozing work was carried out by Ruland Veater, of Panguitch, Utah, the owner of claims in the Spry Intrusive alteration area, Garfield County. Mercury mineralization was uncovered in a larger area than previously realized; the samples have yielded assays of commercial value. Cinnabar is found in altered andesite as well as in brecciated opaline rock. The owner is presently attempting to interest outside parties in further development of the properties and in the installation of a retort.

Monitoring Earth Movements Along Faults In Utah

Portable seismic equipment will take field measurements along faults and in areas of earthquake swarms and micro-earthquakes. Many small earth movements probably will be detected and the following information obtained: 1) epicenter, 2) depth of focus, 3) dip of fault, 4) direction of fault movement, 5) focal mechanism. Protection of municipalities along the Wasatch front may eventually depend upon data obtained from this type of study.

A special feature of the first portable field unit, ordered with funds of the Utah Geological and Mineralogical Survey, is that the seismic record of the microearthquakes will be obtained in analog form on magnetic tape. The project is under the direction of Professor Kenneth L. Cook and Associate Professor John K. Costain, Department of Geophysics, University of Utah.

Publications Of The Utah Geological Survey

Special Studies 17, Igneous complex at Wah Wah Pass, Beaver County, Utah by M. P. ERICKSON, 14 p., geol. map and aeromag. vellum overlay, \$1.50.

Water Resources Bulletin 8, Second reconnaissance of water resources in western Kane County, Utah, by H. D. GOODE, 44 p., 10 figures, 12 photographs, 6 tables, \$1.00.

IN PRESS

Bulletin 79, A Directory of the mining industry of Utah: 1965.

Special Studies 18, Geology and coal resources of the Tropic area, Garfield County, Utah, by R. A. ROBISON.

Circular 49, Semi-quantitative estimates of bulk mineralogical composition of some Utah shales, siltstones, and related materials, by J. A. WHELAN and others.

Progress Report On Garfield County

Garfield County is rich in undeveloped mineral resources and lies in the heart of the scenic Colorado Plateau "Golden Circle." Work on Garfield County by the Utah Geological Survey is now in its third and final field season. The work will feature a summary of geology and catalogue of mineral deposits, including some heretofore unreported deposits. The work includes magnetometer and soil sample surveys of a mercury deposit in the northwest corner of the county, uranium-vanadium mine mapping in the Trachyte-Crescent Creek area, and field mapping of coal seams in the Escalante area.

SAMPLES AND CORES ADDED TO SAMPLE LIBRARY DURING LAST 3 MONTHS

	Location	Operator	Well	Footage
UTAH				
Duchesne Co.	33-1S-7W ¹	Zion Petr.	Carter No. 2	0-5,000S ²
Duchesne Co.	20-3S-8W ¹	Skelly	No. 1 M.A. Smith	3,446-8,347S
Emery Co.	21-20S-7E	Pacific Nat. Gas	Barton 41-21	300-1,050S
Emery Co.	9-21S-7E	Pacific Nat. Gas	Ferron 42-9	350-3,500S
Garfield Co.	15-37S-2W	Tenneco	No. 1 USA Tropic	1,630-6,820S
Grand Co.	16-25S-23E	Gold Bar Resources	No. 1 Fee	260-6,430S
San Juan Co.	18-31S-26E	Lone Star Prod.	Fed. Utah A1	21-3,000
San Juan Co.	30-39S-23E	Continental	Bluff No. 10	5,610-5,732S
San Juan Co.	32-43S-25E	Marathon	No. 1 Navajo, Chili Baja	5,260-5,296C ³
Sevier Co.	8-25S-4E	Pacific Nat. Gas	Paradise Lake 43-8	2,000-4,000S
Summit Co.	6-2N-6E	Mountain Fuel	Chalk Creek-Govt. No. 1	950-2,118Ch ⁴
Uintah Co.	21-8S-25E	Amerada	Coyote Basin No. 2	2,120-2,345S
Utah Co.	20-5S-1W	U.S.G.S.	Test Hole No. 3	0-300S
Utah Co.	24-5S-2W	U.S.G.S.	Test Hole No. 2	0-147S
Utah Co.	1-6S-2W	U.S.G.S.	Test Hole No. 1	0-300S
Utah Co.	27-6S-2W	U.S.G.S.	Test Hole No. 4	0-510S
Wasatch Co.	14-3S-11W ¹	Pan American	Strawberry No. 1	355-7,450S
COLORADO				
Mesa Co.	34-8S-99W	Marathon	No. 2 DeBeque	266-4,200S
Mesa Co.	2-9S-92W	Pacific Nat. Gas	Buzzard Creek B-31-2	7,100-8,450S
Moffat Co.	16-3N-96W	Northwest Prod.	Coyote Basin-No. 1 State	950-6,915S
Moffat Co.	23-8N-92W	Sinclair	No. 1 Clara Sturman	100-4,900S
Moffat Co.	4-11N-101W	Mountain Fuel	No. 10 Sugar Loaf	12,880-13,950S
Rio Blanco Co.	27-1N-102W	Texaco	Wolf A No. 1	0-9,140S,C
Rio Blanco Co.	31-4S-103W	Cristie, Mitchell & Mitchell	Urado No. 4	310-7,003S
WYOMING				
Sweetwater Co.	11-19N-104W	Mountain Fuel	U.P.R.R. No. 4	6,405-6,914Ch
Sweetwater Co.	27-24N-102W	San Jacinto Petr.	Monument Ridge No. 1	600-7,500S
Uinta Co.	2-16N-121W	O. M. Slosson & Sun Oil	Cole No. 1	3,800-4,930S
ARIZONA				
Coconino Co.	6-29N-15E	Miller, Moore & Moore	Hopi No. 1	1,000-6,998S
Navajo Co.	9-28N-15E	Atlantic Refining	Hopi 9-1	10-6,640S
1. Uinta Special Meridian		3. C = core		
2. S = samples		4. Ch = core chips		

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