

**GEOCHEMICAL
BRIEFING
1-30-81**

Alaska State Legislature

BETTYE FAHRENKAMP, CHAIRMAN
VIC FISCHER, VICE-CHAIRMAN
BRAD BRADLEY
DICK ELIASON
DON GILMAN
BOB MULCAHY
ARLISS STURGULEWSKI



POUCH V
STATE CAPITOL
JUNEAU, ALASKA 99811
(907) 465-3834
(907) 465-3835

Senate

Committee on Resources

January 30, 1981
11:00 a.m.

Beltz Room
211 Capitol

MEMBERS PRESENT

SENATOR FAHRENKAMP
SENATOR MULCAHY
SENATOR ELIASON
SENATOR GILMAN
SENATOR STURGULEWSKI

MEMBERS ABSENT

SENATOR FISCHER
SENATOR BRADLEY

The Committee was briefed on the need to complete the analysis of geochemical samples by Dr. Gene Rutledge, Energy Scientist and Dr. Thomas A. Weaver, Group Leader, Los Alamos Scientific Laboratory.

Dr. Gene Rutledge indicated that the Department of Energy plans to phase out the Hydrogeochemical and Stream Sediment Reconnaissance program. 18,000 water and sediment samples at about 9,000 separate locations have been taken in Alaska on some lands where it is now impossible to obtain such samples because of the recent land withdrawals. The samples were scheduled to be analyzed for 44 different elements. There is enough money to analyze a few more samples. It is only one-half of the amount needed. He urged the Committee to support an appropriation of \$800,000 as matching funds to finish analyzing the samples.

Dr. Thomas A. Weaver showed the Committee slides of the Laboratory facilities and the types of work they produce. He indicated that the geochemical data from Alaska they are working on can compliment the work being conducted by the Department of Natural Resources Division of Geological and Geophysical Surveys. If the samples are shipped to archives, they will most probably be lost forever for scientific purposes.

The motion was made by Senator Mulcahy to have the Committee sponsor a bill appropriating the funds. With no objections the motion passed.

ALASKAN BUSINESS BRIEFS

SELDOVIA

The city of Seldovia is considering its sales tax from 1 to 3 cents on the dollar and raising utility charges in an effort to balance the budget and chip away at a \$40,000-\$70,000 deficit from 1978 and '79. A special city election on the sales tax will be held May 27 if it wins city council endorsement. The monies would be earmarked for the city's general fund. Under the plan water and sewer charges would go from \$6.67 to \$18.47 a month; utility hookups—now \$5—would go up to \$4.5 for water and \$165 for sewer. For fish processors, the standard utility charge of \$200 a month would increase to \$1,300 or the company could choose to be metered.

CHUGIAK - EAGLE RIVER

Chugiak-Eagle river has experienced "phenomenal growth" in the past decade, says Jackie Russel, director of Anchorage office of the Bureau of Census. Despite projections built into planning for census takers, enumerators have found more residents than expected. In some areas where we had expected 500, we are finding times that many," she said.

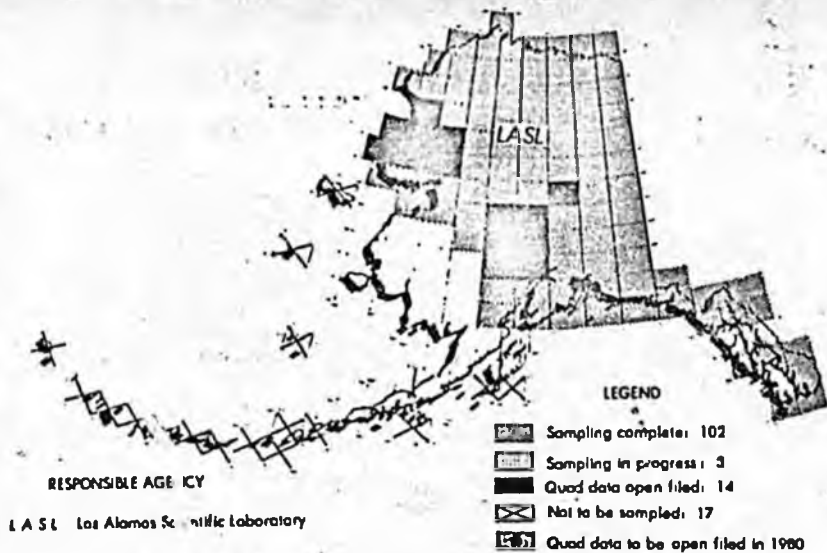
JAPAN

Mitsubishi Petrochemical Co. and ARCO Chemical Co. have signed an agreement to launch an equally owned joint venture in this country for production of chemicals from waste oil recovery. ARCO will supply production know-how. Production is expected to start in the spring of 1982. Test production is planned by Mitsubishi, the largest petrochemical company in Japan, on specially imported raw materials. ARCO chemical produces more than 300 chemical products used for petroleum recovery.

WRANGELL

The owners of Stikine Air Service have applied to the Alaska Transportation Commission for authority to provide scheduled commuter air service between Wrangell, Chitkin, Petersburg, Sitka and Juneau. Camps Inc., which owns Stikine, says the new commuter service would be operated under 'LeConte Airlines,' providing commuter service only. Stikine would continue to operate its air charter business. Both airlines would operate out of Camps Inc.'s hanger and office at Wrangell. Opposition to the proposed action, Camps Inc. says, is minimal. Service could start late this month or early June. The fleet consists of a twin-engine, 9-passenger Piper Chieftains are planned for the service.

STATUS HYDROGEOCHEMICAL PROGRAM



RESPONSIBLE AGENCY

LA S L Los Alamos Scientific Laboratory

March 1980

DOE cancels HSSR, minerals info stopped

By GENE RUTLEDGE
AJC Staff Writer

Another Alaskan resource information tragedy is about to unfold.

The Department of Energy (DOE) plans to phase out the Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) program.

Dr. Robert Sharp of Los Alamos Scientific Laboratory (LASL) supervised the collection of about 18,000 water and sediment samples at about 9,000 separate locations in Alaska on lands where it is now impossible to take such samples because of recent land withdrawals by top federal officials.

The samples were scheduled to be analyzed for 44 different elements including uranium, copper, silver, gold, chromium, cobalt, manganese, and titanium.

Now LASL, because of inadequate funding, may be forced to analyze only about 3,000 of the samples.

The above is only the tip of the iceberg—LASL has in hand about 130,000 samples from about 70,000 locations all over Alaska, but only 18,000 samples are to be analyzed. To cover all of the state, another 16,000 locations need to be sampled as originally planned.

Alaska isn't the only state that has been benefitting from DOE's Hydrogeochemical and Stream Sediment Reconnaissance

program, which is the collection and analysis of small samples of surface waters, ground waters and stream sediments from the entire U.S.

This national effort involves a total of more than 1 million samples, each of which will be analyzed for the concentration of uranium and other elements. However, only 30 per cent of the nation's million samples now are scheduled to be analyzed.

By the end of 1981, DOE will have spent about \$50 million on the HSSR national program. To continue it would take three years and \$5 million per year. But compared with an annual DOE budget of more than \$11 billion, the \$5 million is indeed very modest.

A significant recommendation of the recent Alaska Regional Energy Resource Planning Project report, which was funded by DOE and administered by the state, states:

"A major increase in energy resource exploration (surface and subsurface) should be initiated immediately. Without adequate knowledge of the magnitude, quality and location of Alaska's energy resources, these issues (i.e. land) and other critical energy-related development questions cannot be properly addressed by governmental and private decision makers."

One defense procurement authority recently said "since we import 90 per cent of six or seven strategic materials vital to modern propulsion systems, we are concerned about availability."

Program Background

In 1973, the Resource Division of the U.S. Atomic Energy Commission (now DOE) initiated a 10-year program to assess more accurately the nation's uranium resources and make available to industry information for use in the development of uranium resources.

This program, entitled the National Uranium Resource Evaluation (NURE), has three primary parts:

- an airborne geophysical survey of the entire country;
- research studies of geologic environments and natural mechanisms that favor uranium concentrations; and,
- a nationwide hydrogeochemical survey of surface and ground waters and water-deposited sediments.

In 1975, LASL, the Oak Ridge Gaseous Diffusion Plant, and the Savannah River Lab were asked to conduct the hydrogeochemical portion of NURE in their respective parts of the U.S.

DOE uses information from HSSR in conjunction with airborne geophysical data and geological data to identify and

Continued on Page 8

Was behind the business

Alaska Business

• half of samples will not be analyzed

Continued from Page 1 delineate areas that hold the most promise for containing uranium mineralization.

These areas are usually then reexamined, generally more samples and more geological and geophysical data are collected.

Based on the reconnaissance and detailed follow-up, a realistic appraisal of uranium resources can be produced. This work involves applied geology, ground- and surface-water hydrology, geochemistry, geophysics and computer science, as well as extensive field operations.

However, these same NURE data can be evaluated for other strategic resources (chromium, cobalt, manganese and titanium, among others) at little increased expense which can be very important to Alaskans.

LASL works with Alaskan scientists in order to evaluate the data and maximize the information that can be retrieved.

Program Status

After five years the HSSR portion of NURE is proposed for cancellation by DOE, as a result of budget cuts in favor of other uranium assessment programs (airborne radiometric reconnaissance, geologic investigations and world-class uranium deposit studies).



Alaska Miners Association President Howard Grey peruses some of the material that has been reported as a result of the HSSR program.

The NURE budget has been cut from \$65 million in FY 77 to \$28 million in FY 81. If the HSSR were cancelled, much of the country will not be surveyed and many of the samples already collected will not be analyzed.

During the national reconnaissance, 60 per cent of the country was sampled, including 85 per cent of Alaska; about 680,000 samples have been collected.

Most of the sampling was done in mountain regions of the west, southern portion of the midwest, Rocky Mountains, the Basin and Range province, and Alaska. By the end of FY 80, if the program is closed out, samples from only 30 per cent of the country will have been analyzed.

A close-out means more than one half of the samples already collected will not be analyzed and reported, including those

from most of Alaska.

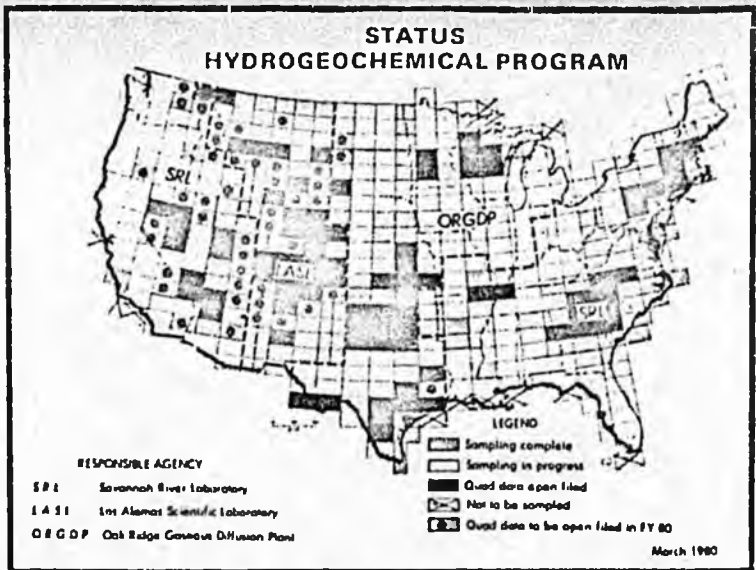
Multi-element HSSR data has been reported for about a year. For these analyses, all three labs developed high-volume, low-cost automated systems that will not be used for other projects in the foreseeable future. The capital investment in these systems approaches \$4 million.

Since the samples are on hand and the analytical and report producing systems are operational, continuing the HSSR program would involve little money, about \$5 million for each of three years.

Program Problems

A national program of the scope of HSSR is not without problems. The analytical tools to analyze may get more and more sophisticated so the parts per billion of an element can be identified; however, the analysis is no good if the sediment sample is a "dry lab."

In order to obtain a water and sediment sample in the rugged Rocky Mountain regions of the U.S. and interior of Alaska, the cost is high and the risk to life is real. It is much easier, for example, to take 10 samples at a single location and merely label the samples for 10 hard-to-get locations.



director, Alaska Miners Association, feels the program should be completed but believes private industry could do the analysis work at a more economical cost. LASL estimates a cost of about \$50 per location (two samples) for an analysis of 44 elements.

Program should continue

By DR. GENERUTLEDGE

Secretary of Energy Duncan should see that the HSSR program is continued and promote closer coordination with other interested federal agencies.

LASL, ORGDP and SRI should work with potential users of the data collected including state agencies, state university scientists and, especially, the resource scientists in industry.

However, DOE must avoid 'too many cooks in the kitchen' to the point that little or nothing is done. DOE should be commended for taking the 'bull by the horns' and getting under way the HSSR program which can be one, but only one, significant link in the chain of

needed national resource information.

As for the entire NURE program, it too should be continued as originally planned even though the cost for FY 81 is \$65 million, which is much higher than the \$5 million for the HSSR but still only a tiny part of the \$11 billion DOE budget.

While we must give very important credit to Duncan's staff members for far sighted national sampling for uranium and other elements, it is vital that the HSSR program not be brought to an abrupt end and precious and strategic samples not analyzed.

Certainly to collect thousands of samples at great government expense with the literal risk of life (Dr. Sharp survived a plane crash in the Alaska interior) and then not to proceed in a timely manner with their analysis is indeed unwise.

Editor's Note: Dr. Rutledge was the project leader of the Alaska Regional Energy Resource Planning Project from 1976 until late 1978. During that time he met Dr. Sharp and obtained from him considerable information on the National Uranium Resource Evaluation (NURE).

The Payoffs for Completion of NURE

Baseline geochemical data, collected and analyzed by standardized procedures, would be available to the public for the entire conterminous U.S. and Alaska. From these data, a comprehensive geochemical atlas of the U.S. would be prepared that would illustrate the areal concentrations of major and trace elements and water quality measurements (e.g., pH, temperature, dissolved oxygen, etc.) throughout the U.S.

Such baseline data are needed by environmentalists, industrialists, geoscientists, resource explorationists, and various state, federal and local agencies. These data also provide some measure of ground truth for geologic mapping and for use with remotely sensed data (LANDSAT imagery).

For the first time, there would be geologic maps available for the entire U.S. at a scale of 1:250,000. This would be a direct result of the NURE program, which generates these maps (where they are not already available) for use in correlating the hydrogeochemical and airborne data with the local geology.

AK Interstate reports earnings

Alaska Interstate co. says its net earnings for the first quarter were greater than its earnings for the entire year of 1979.

Net earnings in the first quarter of '80 were a record \$14.2 million compared to \$978,000 in first quarter '79 as reported and \$13.1 million for the entire year of '79.

Revenues in the first quarter were a record \$83 million,

compared to \$81 million in the same period of 1979. Primary earnings per share for the quarter were \$2.68 compared to 20 cents in the first quarter of 1979.

The company's Indonesian oil and gas operations accounted for most of the increase in earnings, reflecting the first full quarter of the company's higher workint in the Huffco Group oil and gas JV.

program for use in Volume II of "Alaska's Energy Resources."

Upon learning of the planned cancellation of the HSSR program, his concern was so great, he traveled to Los Alamos, N.M., to meet with the scientists involved.

SEMICONDUCTORS

Semiconductors accounted for \$2.6 billion of the \$3.9 billion worth of electronic components exports from the U.S. in '79. Imports of semiconductors amounted to \$2.4 billion total of the \$3.6 billion total of electronic components imports.

...a few points about the Alaska Journal of Commerce

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is a member of the National Association of Business Publications

is published by the Alaska Journal of Commerce, Inc.

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Rutledge volume confirms vast Alaskan energy resources

ANCHORAGE — The Alaska State Division of Energy and Power Development has released the first two volumes of a statewide assessment of Alaska's energy resources, operations and issues which shows that Alaska is a storehouse of nation's energy resources.

Alaska may contain about one-third of the nation's energy resources, but because of land tenure environmental constraints and other issues, the report concludes "a resource is one thing, the development of that resource is quite another."

Conclusions and recommendations on Alaska's energy status reached by the research team include:

—The immediate expansion of surface and subsurface exploration activities. Without adequate knowledge of the magnitude, quality and location

of the resources, critical energy-related and land-related questions cannot be properly



Gene P. Rutledge

addressed by government and private decision-makers.

—Immediate attention must be given to technologies for large-scale energy operations, which could either extend the recovery life of a specific resource site, or would enable development in areas which are otherwise marginal or uneconomic.

—An inventory of alternate energy sources (small hydro, wind, geothermal, solar and peat) for rural Alaskan communities should be conducted and technologies (waste heat recovery systems, fluidized bed units, heat pumps and fuel cells) to match the available resources should be evaluated.

The analysis of resource estimates indicates that the extent and location of all the energy resources are not fully known. Volume I (290 pages) is entitled "Alaska's Energy Resources: Findings and Analysis." Volume II (431

pages) is called "Alaska's Energy Resources: Inventory of Oil, Gas, Coal, Hydroelectric and Uranium Resources."

The planning project documents have been written and compiled by a five-member team with Gene P. Rutledge as the project leader. Other members are Dee Lane, William McConkey, Clarissa Quinlan and Mike Rahm.

The project, which is funded by \$150,000 from the Federal Department of Energy, is an analysis of documented reports and previously completed research conducted by a wide range of private and government agencies.

Volume I identifies Alaska's energy resources (oil, gas, coal, hydro, uranium, geothermal, wind, tides, wood, solar, oil, shale, peat and waste heat), operations (exploration/discovery, development/recovery, storage, transportation/transmission, processing/generation, end use, decommission/reclamation) and issues (economic, social, environmental, governmental, conservation and technology). The land tenure issues (D-2, Native Claims, easements, coastal zone lands) are addressed as these issues relate to energy development.

Several energy scenarios have been developed and written on a regional (geographical and political) basis. Each entails a brief chronology of events that seem most likely to occur in view of the information available now.

Energy sites likely to be developed between now and the year 2000 have been tabulated and ranked for oil and gas

(onshore and offshore), coal, hydroelectric, and uranium, based on information obtained from numerous experts in the energy field.

An earlier draft printing of Volume I has been used as the textbook for a number of courses taught by Dr. Rutledge at the University of Alaska and Alaska Methodist University.

Volume II collects and summarizes by five color maps, ta-

bles and bibliography; all written reports on the quantity and quality of oil, gas, coal, hydroelectric and uranium resources in Alaska. Volume II also includes a brief history of development and production of these energy resources, a list of key contact persons, and extensive bibliography, by six regions: arctic, northwest, interior, southwest, southcentral, and south Alaska.

IDAHO POST REGISTER

12/3/78

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

March 11, 1981

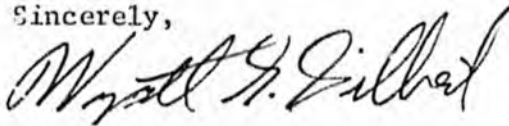
Senator Bettye Fahrenkamp
Pouch V
Juneau, AK 99811 (Mail Stop 3100)

Dear Senator Fahrenkamp:

Enclosed is a summary of the quadrangles and samples for which Los Alamos is requesting State funding. As you requested we have looked over the list of 32 quadrangles to determine where the information would be most valuable to the State. Ten of these quadrangles (4992 samples), Barrow, Wainwright, Mead River, Teshekpuk, Utukuk River, Lookout Ridge, Ikpikpuk River, Misneguk Mountain, Howard Pass, and Killik River, lie within the National Petroleum Reserve and data from these quadrangles will have little effect on resource evaluation of State lands. Data from the balance of the quadrangles (14,579 samples) might provide information that can be used to assess the State's mineral resources, although the sampling density in these quadrangles is several times lower than is generally taken by industry (e.g. U.S. Borax) or DGGs. Samples that are not analyzed by Los Alamos can be stored by DGGs and be made available for future analyses by either DGGs or industry.

As we discussed in Juneau the raw data provided by Los Alamos will only be useful if DGGs can process and model the information. A DGGs project that would provide a minimum processing and modeling capability is also enclosed.

Sincerely,



Wyatt G. Gilbert
Deputy State Geologist

Enclosures

cc: Jeff Haynes
Ross Schaff
Milton Wiltse

50-11
169
MAR 17 1981
JAY S. HAMMOND, GOVERNOR

P.O. BOX 80007
COLLEGE, ALASKA 99708

(907) 479-7147

SB164

March 1, 1981

Dr. Milton Wiltse
Alaskan Department of
Geological and Geophysical Surveys
P. O. Box 80007
College, Alaska 99708

Dear Milt:

The enclosed map shows the status of the analyses of the National Uranium Resource Evaluation geochemical sediment samples from Alaska. The samples from areas colored in blue are being analyzed with DOE funds. These will be open filed as data tapes only through the Oak Ridge Data Center. The areas in yellow are those for which there are insufficient DOE funds to do the analyses. These quadrangles would be analyzed by State of Alaska funds if they become available (Table I lists these quadrangles and the approximate number of sediment samples in each quadrangle). There are a total of 19,571 sediment samples in the yellow areas. The final count upon completion of analysis may be as much as 200 samples above or below that number. All quadrangles have an approximately uniform sampling density of one sample location per 23 square kilometers in areas where lakes predominate and one sample location per 11 square kilometers in areas where streams predominate.

With the \$800,000 requested from Alaska, we will guarantee the completion of these sample analyses, using the uniform analytical methodologies employed thus far by Los Alamos. We will also provide to the State Geologist's office a hard copy data listing and a 1:250,000-scale, sample-location overlay for each quadrangle in Alaska that has been sampled under this program no matter who paid for the analyses. As you can see, the sample location overlay is one of the end products of analyses and clean up of data; therefore, we are not able to provide at this time a sample location overlay for the quadrangles in Table I. We also believe that for the \$800,000 we will be able to complete multielement analysis of those samples that we have analyzed for uranium only to date (green quadrangles in the Seward Peninsula region).

In order to get this response to you as quickly as possible, I am sending you this bootleg copy of the map and table. I anticipate being in Fairbanks on March 11 or 12 and would be able to handcarry the master sampling maps for your perusal.

I hope this answers the questions concerning what Los Alamos will provide the State for the \$800,000 requested. If you have further questions, do not hesitate to call me.

Sincerely,

TOM

Thomas A. Weaver
Group Leader, G-4
Resource Characterization

TAW:jab

Enc. As noted

Table I

SEDIMENT SAMPLES TO BE ANALYZED WITH FUNDS
REQUESTED FROM THE STATE OF ALASKA

<u>1° x 3° Quadrangle</u>	<u>Approximate Number of Sediment Samples</u>	<u>Comments</u>
Barrow	90	
Wainwright	209	
Meade River	579	
Teshkepuk	474	
Harrison Bay	239	
Beechey Point	214	
Point Lay	124	
Utukok River	479	
Lookout Ridge	599	
Ikpikpuk River	664	
Umiat	499	
Sagavanviktok	564	
Point Hope	299	
DeLong Mtns.	630	SE corner unsampled
Misheguk Mtn.	629	Southern half unsampled
Howard Pass	629	Southern third unsampled
Killik River	639	Southern third unsampled
Chandler Lake	499	Southern half unsampled
Coleen	630	
Shungnak	756	
Bettles	923	
Black River	631	
Kateel River	756	
Melozitna	668	
Tanana	669	
Circle	1340	
Charley River	1340	
Nulato	700	
Ruby	700	
Kantishna River	499	
Ophir	700	
Iditarod	1200	
TOTAL	19,571	

NOTE: ORIGINAL DOCUMENT IS COLOR-CODED. IF NECESSARY
TO PROPER INTERPRETATION, REFER TO ORIGINAL DOCUMENT
IN THE ALASKA STATE ARCHIVES

PROJECT TITLE: Statewide Placer/Geochemical Assessment

AGENCY Natural Resources

STATUTORY BASIS: AS 27.05.080

CATEGORY _____

COVER PROGRAM Mgmt. of Mineral Resources
Energy
BRU Minerals & Management

PROJECT DESCRIPTION:

This project will use computer modeling to establish an improved service to miners, prospectors, and interested numbers of the public by establishing a systematic means of evaluating statewide placer, geochemical, and public assay data. The models service will steadily improve as new information is added to the system.

COMPONENT Mineral Development

SHORT FORM PAGE _____

SOURCE OF REQUEST:

PROJECT LOCATION:

Field work in various areas of the state. Office work in Fairbanks.

OBJECTIVES/POLICIES:

The objective of this project is to provide an effective means of placing assay results from miner's and prospector's samples in the context of district and regional mineralization and to improve the methods of evaluating the significance of the assays for the prospector.

It is the policy of this project that the prospector's data will be supplemented by the available geologic and geochemical data of ADGGS.

DEPARTMENT PRIORITY:

_____ OF _____

GOVERNOR'S ACTION:

INTEREST GROUPS AFFECTED:

Miners, prospectors, Borough governments.

LEAD DIVISION/PROJECT MANAGER:

Div. of Geological & Geophysical Surveys, Milton Wiltse, Chemist V (473-7147)

LEGISLATION/REGULATIONS REQUIRED:

None

SUMMARY OF PROJECT COST:

GGS

CODE	EXPENDITURES BY OBJECT	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	TOTAL
100	PERSONAL SERVICES	12.8								12.8
200	TRAVEL	5.8								5.8
300	CONTRACTUAL SERVICES	68.7								68.7
400	COMMODITIES	7.7								7.7
500	EQUIPMENT	25.0								25.0
600	LANDS, BLDGS., ETC.									
700	GRANTS, CLAIMS, ETC.									
800	MISCELLANEOUS									
	TOTAL	120.0								120.0
	1-A TRANS. (non-add)									
FED. RECEIPTS - CODE:										
GF MATCH.										
GEN. FUND		120.0								120.0
1-A RCPTS.										
PGM RCPTS.										
OTHER										
OTHER										
CAPITAL										

DESCRIPTION OF ASSOCIATED CAPITAL COSTS:

All capital costs are directed towards peripheral computer devices needed to upgrade current data processing equipment to a level at which it can model geochemical and placer data. These devices are primarily memory storage disks and tape storage units.

COSTS TO OTHER AGENCIES

None

PROJECT DURATION/LIFE CYCLE COST:

PERSONAL SERVICES DETAIL

PCN/JOB TITLE	LOCATION	DIVISION	SALARY	BENEFITS	NO. OF MONTHS	POSITION COST
NEW/Publication Spec. II	Fbx	GGG	2837	1568	2	7,242
NEW?Clerk Typist II	Fbx	GGG	1475	1439	3	5,864
						<u>13,106</u>
					Less vacancy	<u>327</u>
						<u>12,779</u>

<u>TRAVEL DETAIL</u>	AMOUNT	DIVISION	PURPOSE
	5.8	GGG	On site prospect investigation, consultation on modeling programs.
<u>CONTRACTUAL DETAIL</u>	AMOUNT	DIVISION	PURPOSE
	68.7	GGG	Acquisition of expertise to execute the computer interfacing systems and modeling programing necessary to meet the objective of this project
<u>COMMODITIES DETAIL</u>	AMOUNT	DIVISION	PURPOSE
	7.7	GGG	To purchase disks, drafting supplies, incidental hook up parts, office supplies.
<u>EQUIPMENT DETAIL</u>	AMOUNT	DIVISION	PURPOSE
	25.0	GGG	Hard disk memory, floating point operator, tape drive peripherals.

RESULTS DELIVERED (Narrative)

This project will provide a modern routine procedure for displaying specific miner's prospector's or other public member's assay data in conjunction with pertinent associated data of district of regional extent, and thus improve DNR's service in helping the interested public evaluate mineralization.

RESULTS DELIVERED (Quantified)

DIVISION

GGG

MEASURE

- 1) An operational connection of the ADGGS Tektronix 4051 graphics system and a larger capacity computer which will allow computer modeling of miner prospectors, and ADGGS assay and geochemical data.
- 2) A working program for digitizing sample locations, identity, and geochemical data.
- 3) An assay and geochemical storage, retrieval, and sort program.
- 4) Three operational geochemical modeling programs.
- 5) Graphics display of the modeled data.

POSSIBLE ADJUSTMENTS

UPWARD INCREMENT

RESULT

Upward increments would allow more sophisticated models to be incorporated earlier in this project.

COST
\$100,000

DOWNWARD INCREMENT

RESULT

Downward increments would jeopardize the projects ability to purchase the necessary peripheral components or execute the required computer program development.

COST
Any

SUMMARY OF PRIOR YEAR PROJECT COST:

GGG

CODE	EXPENDITURES BY OBJECT	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	TOTAL
100	PERSONAL SERVICES									
200	TRAVEL									
300	CONTRACTUAL SERVICES									
400	COMMODITIES									
500	EQUIPMENT									
600	LANDS, BLDGS., ETC.									
700	GRANTS, CLAIMS, ETC.									
800	MISCELLANEOUS									
	TOTAL	0								
	1-A TRANS. (non-add)									
FED. RECEIPTS - CODE:										
FED MATCH.										
GEN. FUND										
1-A RCPTS.										
FGM RCPTS.										
CAPITAL										

CHANGES FROM PRIOR YEAR (INCLUDE CIRCUMSTANCES, COSTS, POSITIONS, RESULTS DELIVERED)

New project

LASL PROPOSAL

ANALYSIS OF GEOCHEMICAL SAMPLES FROM THE STATE OF ALASKA

For submission to the State of Alaska

by the

Los Alamos Scientific Laboratory

P. O. Box 1663

Los Alamos, NM 87545

Prepared by:

David E. Broxton

David E. Broxton
Principal Investigator

Glenn R. Waterbury

Glenn R. Waterbury
Principal Investigator

Merle E. Bunker

Merle E. Bunker
Principal Investigator

Approved by:

Robert R. Brownlee

Robert R. Brownlee
G Division Leader

George A. Keyworth

George A. Keyworth
P Division Leader

William J. Maraman

William J. Maraman
CMB Division Leader

George A. Cowan

George A. Cowan
Associate Director for
Chemistry, Earth, and
Life Sciences

Harry C. Hoyt

Harry C. Hoyt
Associate Director for
Energy Programs

Robert N. Thorn

Robert N. Thorn
Associate Director for
Physics and Mathematics

Ann Teller

Ann Teller
Financial Management Office

Larry S. Germain

Larry S. Germain
Deputy Assistant Director
for Alternate Energy Sources

STATUTORY BASIS:

PROJECT DESCRIPTION: The nationwide Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) portion of the National Uranium Resource Evaluation, sponsored by the US Department of Energy, is being terminated in September 1981. The present status of the HSSR in Alaska is shown in Figure 1. With its remaining HSSR monies, the Los Alamos Scientific Laboratory (LASL) will be able to analyze only one-half of the remaining collected but unanalyzed sediment samples (i.e., 20,000 out of 40,000 unanalyzed samples or 33 of the 66 remaining quadrangles). This effort will require \$800,000 of the LASL's \$1,500,000 HSSR budget, the remainder to be used for analyses in the lower states and program closeout.

If funded by the State of Alaska for \$800,000 to match the LASL's \$800,000, the LASL would be able to complete the analysis of all remaining Alaskan HSSR sediment samples. Each sediment sample would be analyzed for 12 elements by x-ray fluorescence (Ag, As, Bi, Cd, Cu, Nb, Ni, Pb, Se, Sn, W, and Zr) and for 32 elements by neutron activation analysis (Al, Au, Ba, Ca, Ce, Cl, Co, Cr, Cs, Dy, Eu, Fe, Hf, K, La, Lu, Mg, Mn, Na, Rb, Sb, Sc, Sm, Sr, Ta, Tb, Th, Ti, U, V, Yb, and Zn). The analytical costs and detection limits are comparable to or better than those obtainable commercially.

OBJECTIVES/POLICIES:

The principal objective of this proposal is to complete the analysis of all HSSR sediment samples collected from the State of Alaska and open file these analytical data to the public. These data provide baseline geochemical information, covering approximately 85% of Alaska, that can be used for formulating policy decisions regarding natural resources and environmental quality.

INTEREST GROUPS AFFECTED:

- Alaska Department of Natural Resources (State Geologist, Division of Geological and Geophysical Services, Division of Parks, Fish and Game Department.)
- Alaska Department of Environmental Conservation.
- Alaska Department of Commerce and Economic Development (Alaska Energy Office - Division of Energy and Power Development.)
- Alaskan Senate Committee on Natural Resources.
- All Alaskan Native and Village Corporations.

LEGISLATION/REGULATIONS REQUIRED:

CATEGORY _____

COVER PROGRAM _____

BRU _____

COMPONENT _____

SHORT FORM PAGE _____

SOURCE OF REQUEST:

PROJECT LOCATION:

DEPARTMENT PRIORITY:

_____ OF _____

GOVERNOR'S ACTION:

LEAD DIVISION/PROJECT MANAGER:

DNR
PROJECT

EQUIPMENT

AMOUNT

DIVISION

PURPOSE

POSSIBLE ADJUSTMENTS

UPWARD INCREMENT

It would cost \$2,000,000 to complete the sample collection, analysis, and open filing of 18000 locations from the unsampled areas of Alaska exclusive of the Aleutian Island chain west of the Unimak quadrangle (Fig. 1).

DOWNWARD INCREMENT

For each downward increment of \$24,000, one quadrangle will remain unanalyzed.

RELATION TO LAST YEAR:

PERSONAL SERVICES

JOB TITLE	LOCATION	DIVISION	SALARY	BENEFITS	NO. OF MONTHS	POSITION COST

<u>LEVEL</u>	AMOUNT	DIVISION	PURPOSE

<u>CONTRACTUAL</u>	AMOUNT	DIVISION	PURPOSE
Los Alamos Scientific Laboratory	\$800,000	Geosciences Div.	Analyze and open file data listings, 1:250,000 scale location maps, and data tapes for 44 elements in 20,000 Alaskan sediment samples.

For each quadrangle, a data listing, a sample location overlay (1:250,000 scale), and, if desired, a computer data tape will be delivered to the State Geologist's office. Details of payment schedules and deliverable schedules to be negotiated between the State of Alaska and the Los Alamos Scientific Laboratory.

SUMMARY OF PROJECT COST:

CODE	EXPENDITURES BY OBJECT	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	DIVISION	TOTAL
00	PERSONAL SERVICES								
00	TRAVEL								
00	CONTRACTUAL SERVICES	Los Alamos Scientific Laboratory							\$800,000
00	COMMODITIES								
00	EQUIPMENT								
00	LANDS, BLDGS., ETC.								
00	GRANTS, CLAIMS, ETC.								
00	MISCELLANEOUS								
	TOTAL								\$800,000
	1-A TRANS. (non-add)								

ED. RECEIPTS - CODE:

OF MATCH.	
EN. FUND	
ARCPTS.	
GM RCPTS.	
OTHER	
OTHER	

CAPITAL

DESCRIPTION OF ASSOCIATED CAPITAL COSTS:

NONE

COSTS TO OTHER AGENCIES

NONE

PROJECT DURATION/LIFE CYCLE COST:

Project Duration: 1 year

January 7, 1981

Senator Bettye Fahrenkamp
Alaska State Senate
Pouch V
Juneau, Alaska 99811

Dear Senator Fahrenkamp:

The Los Alamos Scientific Laboratory (LASL) has submitted a proposal to the State of Alaska requesting \$800,000 to complete analysis of geochemical samples remaining from an extensive geochemical exploration program carried out in Alaska by IASL over the past four years. Enclosed is a copy of their proposal and a brochure describing the LASL program.

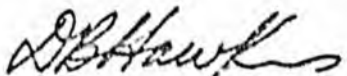
I am writing to request your support of the LASL proposal.

My position in this matter is that through the Institute of Water Resources, University of Alaska-Fairbanks, I was a recipient of two grants from LASL to carry out pilot studies of the Fairbanks and Bettles quadrangles as part of the statewide LASL project. As a result of this work I was a consultant to LASL, which arrangement has since been terminated. At present I have received data only for the Fairbanks quadrangle. The Bettles data are part of the pending request. I am very concerned that hard-won data may be irretrievably lost. The funds requested by LASL will only provide a computer listing of the data which must subsequently be interpreted by geologists, presumably within the State Division of Geological and Geophysical Surveys.

The funds requested by LASL appear to me to be about the minimum needed. I don't think the project funds can be reduced. Quite frankly, I think that in addition to funding the LASL request an additional \$250,000 should be given the DGGs for the purpose of interpreting and publishing the data in a form useful to the geologic community. I strongly urge your support of this proposal.

I stress that I have no financial interest but only a scientific interest in seeing my data and those for other quadrangles. Thank you for your consideration. If you have any questions, please contact me.

Sincerely,



Daniel B. Hawkins
Professor of Geology
University of Alaska, Fairbanks

cc: Rep. Sally Smith
Enclosures

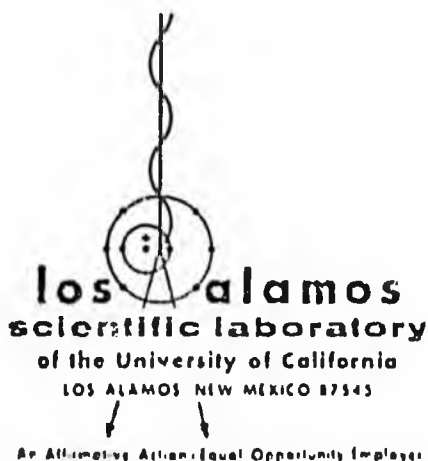
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LASL-77-34

December 1977

Hydrogeochemical and Stream Sediment Reconnaissance for Uranium

Paul L. Aamodt



UNITED STATES
DEPARTMENT OF ENERGY
CONTRACT W-7400-ENG. 24

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INTRODUCTION

In 1973, the Resource Division of the US Atomic Energy Commission [now the Department of Energy (DOE)] initiated a ten-year program to assess more accurately the nation's future uranium resources. This program, entitled the National Uranium Resource Evaluation (NURE), has three primary parts: an airborne radiometric survey of the entire country, research studies of geologic environments and natural mechanisms that favor uranium concentration, and a nationwide hydrogeochemical survey of surface and ground waters and water-deposited sediments. In 1975, the Los Alamos Scientific Laboratory (LASL) was asked to design and manage the hydrogeochemical reconnaissance throughout the Rocky Mountain states of New Mexico, Colorado, Wyoming, and Montana, and the state of Alaska. Other DOE laboratories are conducting the hydrogeochemical portion of the NURE in other regions of the country. The information provided by the Hydrogeochemical and Stream Sediment Reconnaissance (HSSR), in conjunction with that produced by the other NURE programs, will make it possible to estimate more accurately the nation's long-range uranium resources and will also identify promising areas for future private exploration.

HOW AND WHY HSSR WORKS

Geochemistry, in its broadest sense, is the study of both the relative and absolute abundances of elements that make up the earth. Included are the relationships, distribution, and migration of these elements in air, water, soil, rock, and vegetation. Geochemistry encompasses all aspects of geology that deal with chemical change in the natural environment. Geochemical prospecting uses the principles of geochemistry to identify local or regional areas having abnormal concentrations of selected elements. By establishing the normal, or background, abundance of a selected element within particular geologic environments, it is possible to delineate areas that are relatively enriched or depleted with respect to that element. This information, combined with that from supportive surveys and technical and economic criteria, can be used to forecast future reserves of that element. The resulting data can also be used to identify promising areas for more detailed exploration.

On a regional or reconnaissance basis, hydrogeochemical surveys can provide information on the relative abundances of water-soluble elements, such as uranium, even when they occur at considerable depths below the surface. As water migrates through the crustal environment, it continuously dissolves, precipitates, and redissolves soluble minerals with which it is in contact, thus providing a record of the mineral environment through which it passes. Surface water from streams and small lakes can also reflect subsurface conditions because they are constantly fed by and mix with ground water from springs and seeps. Figure 1 illustrates some of the ways ground water can circulate in the earth's crust.

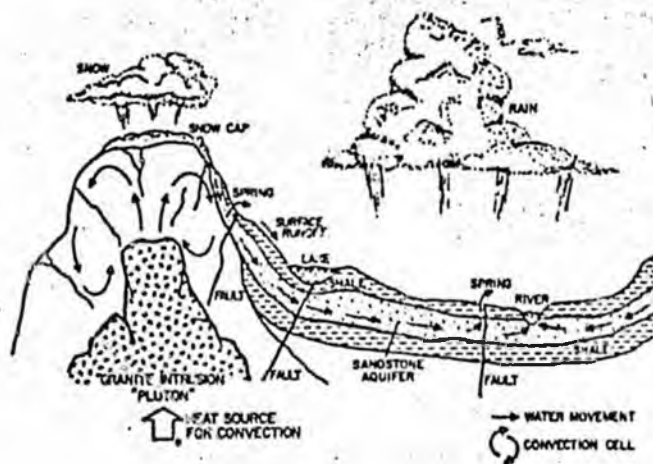


Fig. 1.

Many uranium minerals, as they commonly exist in nature, are soluble in water (that is, they dissolve in water much like salt), and when chemical conditions are favorable (oxidizing environment), they are carried for long distances in solution. When the chemical conditions change (reducing environment), the uranium precipitates out of solution, and, over many thousands of years, large local concentrations can develop. Because of the solubility of uranium minerals, waters sampled in uraniferous areas will generally possess relatively higher concentrations of uranium than waters sampled in areas with no uranium. Underground waters typically possess more uranium than surface waters because of their longer transit time through, and more intimate contact with, the rock and soil. Average

uranium concentrations in ground waters range between 0.5 and 4 parts per billion (ppb) and in surface waters between 0.1 and 3 ppb. In northern latitudes (such as Alaska), the average uranium concentrations in water are less, usually in the parts per trillion (ppt) range.

When evaluating water data, it is usually not possible to compare the ground water results directly with surface water results. However, because similar concentration trends are often visible in both, they are complementary sets of information. By analyzing many samples taken over a large area, it is possible to determine the average or background uranium levels for that area. This information provides a basis for defining the significance of uranium concentrations that are considerably higher (or lower) within that area.

Sediment, transported and deposited by water in streambeds, small lakes, and ponds, is also collected and analyzed for uranium. The sediment results provide a completely distinct set of data from the water results, and must be evaluated separately. The normal background uranium levels in sediment range between 1 and 10 parts per million (ppm), depending on the predominant rock type from which the sediment was derived. The sediment analyses can be used like the water analyses to establish background values on which to compare higher and lower concentrations within geologically similar areas.

Because both water and sediment data can be used to define regional patterns of uranium mineralization, they are both important to a meaningful resource study.

THE LASL HSSR

The LASL program was designed largely on the basis of the results of similar surveys conducted in many parts of the world during the past 30 years. Consultation with experts in the field plus pilot studies in each of the five LASL states have been and continue to be used to refine and improve the methodology and effectiveness of the LASL program. The expertise of LASL Groups G-5, CMB-1, P-2, and Q-12 has provided the necessary technical knowledge required for this complex program.

FIELD SAMPLING

Water and waterborne sediment samples are collected at an average density of one location every four square miles throughout each of the lower four states and in mountainous regions of Alaska. Whenever possible, both water and sediment are collected at each location. In lake areas of Alaska, which include approximately two-thirds of the state, lake water and bottom sediment are collected from one location every nine square miles. All of the sampling in Alaska is done using helicopters. Upon completion of the field work, about 240,000 locations will ultimately be sampled in the LASL region, which includes about 35% of the US land area. Nearly half of these have already been sampled.

All samples are collected and treated in the field according to stringent standards established by LASL. The water samples are filtered to remove particulates (except in Alaska where the waters are usually very pure) and acidified to keep the uranium in solution. The sediment is dried with low heat and then sieved to remove all coarse material. In addition to improving the analytical results, standard collection and treatment procedures make the data more directly comparable.

Each sample location is assigned an identification number and is marked precisely on the best available map for that area, usually large-scale United States Geological Survey (USGS) topographic maps. Selected water chemistry measurements (pH, specific conductivity, and temperature) and a measurement of the ground radiation are made at each sample location to further aid in evaluating the data. Finally, general information about each site, including the local geology, hydrology, geography, weather, and possible sources of contamination, are noted on the field data form.

When the samples arrive at LASL, they are verified individually and sent to two LASL analytical groups. The waters are all analyzed for uranium, using a fluorometric method, at an analytical chemistry laboratory. By using an evaporative concentration technique, as little as 0.02 ppb uranium can be measured. All sediment samples, and those water samples having more than 10 ppb uranium, are analyzed by a delayed-neutron

counting method. Here, each sample is injected automatically into a reactor-generated neutron field, extracted, and counted after a short time delay. Uranium measurements as low as 0.25 ppb in water and 0.05 ppm in sediment are possible using this analytical technique. After analysis, the samples are placed in archival storage. Figure 2 is a simplified flow diagram of the overall LASL HSSR program.

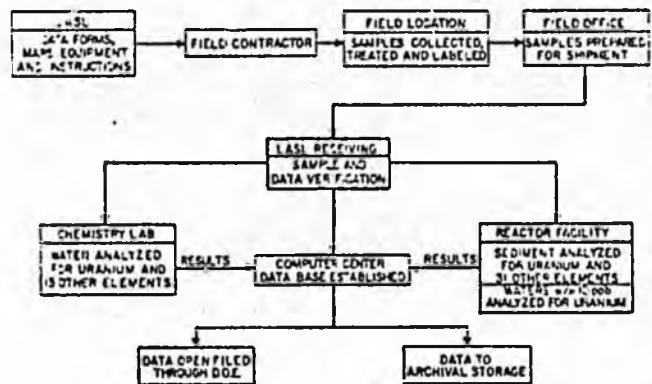


Fig. 2.

The information resulting from the HSSR is made public as open-file reports through the DOE Grand Junction, Colorado, office and at other DOE regional offices across the country. A typical LASL HSSR report includes information about the sampling methodology, general geographic and climatic summaries, an overview of the hydrologic and geologic setting of the area, descriptions of known mineral occurrences (with particular attention to uranium), and finally, a brief evaluation of the data, noting those factors most likely to influence the analytical results. All the information collected at each field location, along with the exact location coordinates and the analytical data, are listed as appendixes to the reports. A geologic base map, and location and uranium concentration overlays, all at 1:250,000-scale (as simulated in Fig. 3) are also included with each report. This basic report format was developed to make the HSSR data as easy to understand and use as possible, while still making the information available to the DOE and the general public on a timely basis.

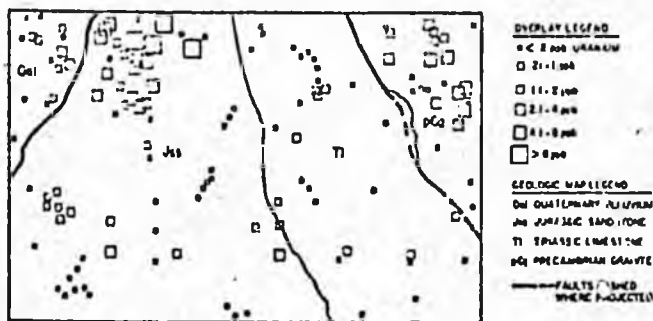


Fig. 3.

HSSR MULTIELEMENT CAPABILITY

Beginning in October 1977, the scope of the HSSR was broadened considerably to include not only uranium, but also thorium, lithium, and several other elements as selected by each participating laboratory. LASL plans to analyze and report on 43 elements in addition to uranium. Water samples will now be analyzed by emission spectrography for calcium, cobalt, chromium, copper, iron, magnesium, manganese, molybdenum, nickel, lead, zinc, and titanium. Sediment samples will be analyzed for beryllium and lithium by emission spectrography, and for silver, bismuth, cadmium, copper, niobium, nickel, lead, tin, and tungsten by x-ray fluorescence. Sediment samples will also be analyzed for aluminum, barium, calcium, chlorine, dysprosium, potassium, magnesium, manganese, sodium, strontium, titanium, and vanadium using neutron activation with a short time delay before analysis; and for gold, cerium, cobalt, chromium, cesium, europium, iron, hafnium, lanthanum, lutetium, rubidium, antimony, scandium, samarium, tantalum, terbium, thorium, ytterbium,

and zinc by using neutron activation with a long time delay before analysis. The use of short- and long-delay times is required because some of the energy spectra for the short-delay elements mask the energy spectra for the long-delay elements. By waiting a few days before measuring the long-delay elements, the masking effect is diminished sufficiently to allow reasonably accurate concentration measurements. All results of the multielement analyses will be published as separate listings in appendixes of LASL HSSR reports. As with the uranium results, all water analyses will be in weight ppb and all sediment analyses in weight ppm.

Expansion of the HSSR to include multielement analyses greatly enhances the overall program. Several of these additional elements will be useful for evaluating the uranium data in a more thorough manner; but even more significant, many of them are very important in their own right as essential raw materials. In effect, the HSSR has assumed a key role in assessing the long-range mineral resources of the US both for energy planning and for future economic growth.

ABOUT THE AUTHOR

Paul Aamodt is Assistant Group Leader of LASL's Geochemical Applications Group, G-5. He is a graduate of the University of Nevada, Las Vegas, with a degree in geology. Before joining Group G-5, Aamodt worked at the Nevada Test Site where he was involved in nuclear test containment studies, and in industry, siting underground hydrocarbon storage facilities. He has been involved with the NURE HSSR since 1975, the year LASL began its program.

This work was supported by the US Department of Energy, Division of Uranium Resources and Enrichment. Program Code B048.

Mini-Review
readers are encouraged
to correspond directly
with the author

LASL PROPOSAL

ANALYSIS OF GEOCHEMICAL SAMPLES FROM THE STATE OF ALASKA

For submission to the State of Alaska

by the

Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, NM 87545

Prepared by:

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Principal Investigator

Glen R. Waterbury
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Principal Investigator

Approved by:

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Life Sciences

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Physics and Mathematics

Ann Tellier
Ann Tellier
Financial Management Office

Larry S. Gernain
Larry S. Gernain
Deputy Assistant Director
for Alternate Energy Sources

STATUTORY BASIS:

PROJECT DESCRIPTION: The nationwide Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) portion of the National Uranium Resource Evaluation, sponsored by the US Department of Energy, is being terminated in September 1981. The present status of the HSSR in Alaska is shown in Figure 1. With its remaining HSSR monies, the Los Alamos Scientific Laboratory (LASL) will be able to analyze only one-half of the remaining collected but unanalyzed sediment samples (i.e., 20,000 out of 40,000 unanalyzed samples or 33 of the 66 remaining quadrangles). This effort will require \$800,000 of the LASL's \$1,500,000 HSSR budget, the remainder to be used for analyses in the lower states and program closeout.

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BRU _____

COMPONENT _____

SHORT FORM PAGE _____

SOURCE OF REQUEST:

PROJECT LOCATION:

DEPARTMENT PRIORITY:

_____ OF _____

GOVERNOR'S ACTION:

LEAD DIVISION/PROJECT MANAGER:

DNR

PROJECT

BUDGET

EQUIPMENT

AMOUNT

DIVISION

PURPOSE

POSSIBLE ADJUSTMENTS

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RELATION TO LAST YEAR:

GENERAL SERVICES

JOB TITLE	LOCATION	DIVISION	SALARY	BENEFITS	NO. OF MONTHS	POSITION COST
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<u>REL</u>	AMOUNT	DIVISION	PURPOSE
------------	--------	----------	---------

<u>ACTUAL</u>	AMOUNT	DIVISION	PURPOSE
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	EQUIPMENT									
	LANDS, BLDGS., ETC.									
	GRANTS, CLAIMS, ETC.									
	MISCELLANEOUS									
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	1-A TRANS. (non-add)									
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V. FUND										
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M RCPTS.										
IER										
IER										
ITAL										

DESCRIPTION OF ASSOCIATED CAPITAL COSTS:

NONE

TRANSFERS TO OTHER AGENCIES

NONE

PROJECT DURATION/LIFE CYCLE COST:

Project Duration: 1 year

