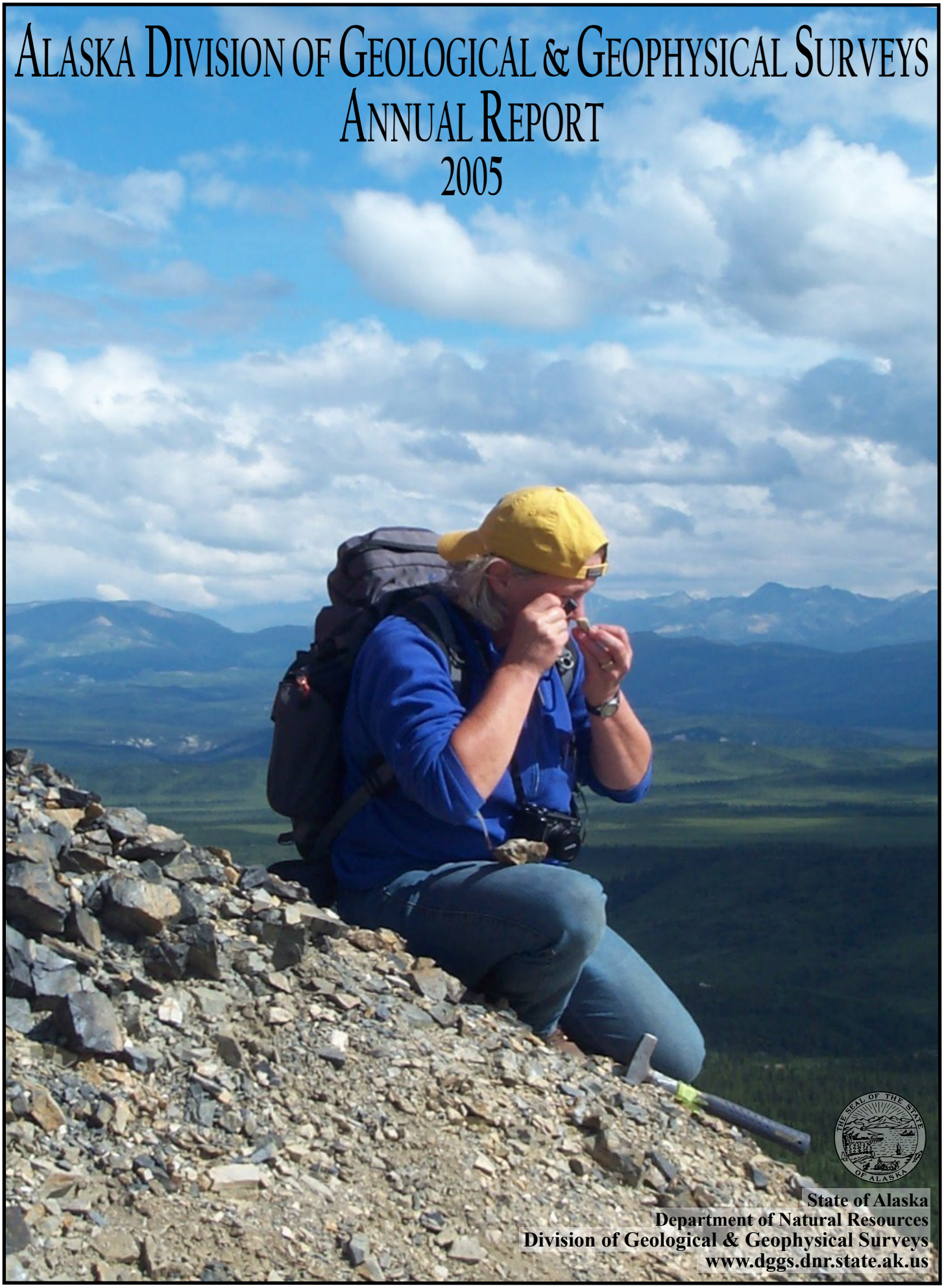
Alaska Division of Geological & Geophysical Surveys
Annual Report
2005



State of Alaska
Department of Natural Resources
Division of Geological & Geophysical Surveys
www.dggs.dnr.state.ak.us

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Annual Report
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Cover Photo: DGGS Mineral Section geologist Robin Smith examines quartz–tourmaline–arsenopyrite veins in altered phyllite and gabbro along an old prospecting trench on the Liberty Bell property, western Bonnifield mining district, Alaska. DGGS Mineral Resources section geologists conducted geologic mapping and geochemical sampling in the Liberty Bell area during 2005 as part of the Airborne Geophysical/Geological Mineral Inventory project. *Photo by David Szumigala.*

State of Alaska
Department of Natural Resources
Division of Geological & Geophysical Surveys
February 2006

STATE OF ALASKA
Frank Murkowski, *Governor*

DEPARTMENT OF NATURAL RESOURCES
Mike Menge, *Commissioner*

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
Robert F. Swenson, *Acting State Geologist and Acting Director*

Division of Geological & Geophysical Surveys publications can be inspected at the following locations. Address mail orders to the Fairbanks office.

Alaska Division of Geological
& Geophysical Surveys
3354 College Road
Fairbanks, Alaska 99709-3707

University of Alaska Anchorage Library
3211 Providence Drive
Anchorage, Alaska 99508

Elmer E. Rasmuson Library
University of Alaska Fairbanks
Fairbanks, Alaska 99775-1005

Alaska Resource Library
3150 C Street, Suite 100
Anchorage, Alaska 99503

Alaska State Library
State Office Building, 8th Floor
333 Willoughby Avenue
Juneau, Alaska 99811-0571

Publication of this report is required by Alaska Statute 41.08.

CONTENTS

FIGURE

Governor's Foreword

Responsible development of Alaska's natural resources is the key to a bright future for Alaskans. Our Constitution places a serious responsibility on state government to manage these resources wisely for the common good. In fulfilling that duty we generate revenue to fund important state services, support industries that provide good-paying jobs for Alaskans, encourage exploration and settlement of our land, and continue to grow the Permanent Fund for future generations.

Our resource-based economy would not be possible without the work of the Division of Geological and Geophysical Surveys (DGGS). The division's mission is to determine the resource potential of state land, identify sources of water and construction materials, and be vigilant against geological hazards. Data gathered in the field and published in peer-reviewed reports and maps by DGGS help reduce private investment risk and provide the state with important information for managing our resources.

Alaska's mining industry is continuing a gratifying resurgence, due to Alaska's reputation for mineral wealth, a rational and responsive regulatory environment, and strong prices for metals. We are seeing predictions of longer life for current mines like Ft. Knox, the start-up of operations at the Pogo gold mine, and continued expansion of estimates of the size and quality of the Pebble deposit. DGGS has been doing important work in support of this trend, including airborne geological and geophysical inventory on the gold-rich Seward Peninsula, on-the-ground evaluation of the mineral inventory near the Liberty Bell gold prospect, and compilation and promulgation of information in the Annual Mineral Industry Report.

Oil and gas continue to play a dominant role in Alaska, and the division plays an important role in supporting this industry. Last year, DGGS studied the Brooks Range foothills, one of the most promising new regions for oil development; provided information to support lease sales in the Bristol Bay and Alaska Peninsula, which could become Alaska's newest oil and gas province; evaluated the potential for coal bed methane to provide energy to rural Alaska; and began a multi-year effort to identify geological hazards and construction materials along a potential natural gas pipeline corridor.

The division's work has serious ramifications of health and safety in Alaska, as well. This year it kept the world informed as Augustine Volcano rumbled and erupted, and modeled areas of the state's southern coast at risk of potential inundation from tsunamis. The division's research on geologic hazards provides much of the information needed to help reduce these risks and to plan for the major events that are inevitable in this geologically active state.

The field work, research, and publications that DGGS is doing today will lead to new and continuing benefits to Alaskans in the future. I offer my congratulations to the men and women of the division on a successful 2005, and look forward with confidence to their continued service to all Alaskans.

Governor Frank H. Murkowski

Commissioner's Foreword

Alaska's natural resources are the foundation of our economy and way of life; reliable information about our minerals and hydrocarbon resources is the foundation of the Department of Natural Resources' success in fulfilling its mission to develop, conserve, and enhance natural resources for present and future Alaskans.

The Division of Geological & Geophysical Surveys (DGGS) plays a key role in that mission by collecting and publishing reliable earth-science information to support resource exploration, sound land-use management, and public safety. It fulfills its responsibility in a number of ways, including field work in coordination with the Division of Oil & Gas, Division of Mining, Land & Water, and other divisions, and an ambitious program of resource evaluation, geologic hazards identification, research, publication and outreach.

The Division's continuing success in sharing its work through its Web site and other distribution systems has provided an ever-widening audience with detailed, reliable, and useful data about Alaska's resources and hazards. The fruits of this success are reflected in the continuing strong interest from around the world in Alaska as a treasure house of oil and gas, coal, and other minerals and mining opportunities.

As you will read in the following report, 2005 held many challenges and many successes for the Division of Geological & Geophysical Surveys. I am especially proud to know that our primary success lay in maintaining our commitment to manage Alaska's resources according to sound scientific principles. By building on this foundation, the Division is providing the geologic information and analysis necessary for Alaska to support a strong resource industry, safe and secure public, and a healthy environment that will mean a bright future for us all.

Michael L. Menge, Commissioner, Department of Natural Resources

Director's Foreword

Thank you for reviewing the Alaska Division of Geological & Geophysical Surveys (DGGS) Annual Report. As you can see in the project summaries, DGGS has been extremely busy in 2005, with many important programs undertaken to achieve our mission and goals. There have been a number of changes in the organization since our last report, and through it all, the staff has stayed on task and produced many products of which we are all very proud. Mark Myers became State Geologist and Director early in the year, and I was appointed Deputy Director for Research for the Division of Oil and Gas and the Division of Geological & Geophysical Surveys. Rod Combellick continued to smoothly run the operations of DGGS, and the combined effort of all the DNR research staffs produced immediate, positive results through the incorporation of additional subsurface data and interpretations.

Significant management changes occurred in October and I was appointed Acting Director and State Geologist by our new DNR Commissioner, Mike Menge. Rod Combellick was appointed Deputy Director, and the single-director relationship that had been established

for the two divisions earlier in the year was dissolved. Nevertheless, the scientific and research relationship that was established remains very healthy and active with numerous cross-division projects and collaborations continuing into the new year.

Our Mineral Resources Section had a banner year, publishing yet another excellent geologic map of the Council area, as well as acquiring 2,364 square miles, and publishing more than 200 square miles, of high-resolution airborne geophysical data. Not only were the data gathered over high-mineral-potential state land, but an additional 3,151 square miles of airborne geophysics data were acquired along the proposed gas pipeline corridor from Delta Junction to the Canadian border. These data will allow the state to maximize the information obtained from the geologic-mapping effort that will begin along the corridor in the summer of 2006, focusing on geologic-hazards assessment, construction-materials resources, and bedrock geology.

The Energy Resources Section finalized the surface geologic mapping in the Siksikpuk River STATEMAP area near Anaktuvuk Pass in the Brooks Range and held a successful industry sponsor tour, taking numerous industry geologists and representatives to critical areas exposing the newly discovered geologic relationships that increase our understanding of the thrust belt-foreland basin evolution. The Bristol Bay team spent a second year assessing the geology and hydrocarbon potential in this emerging frontier, and published a series of preliminary reports in time for the first State lease sale in this region since 1984. The information provided in these reports will be critical to both local prospectivity and our understanding of the resource potential of the basin as a whole.

The Engineering Geology Section initiated an important rural geoscience education and outreach program, MapTEACH, and dealt with myriad geohazard-related issues and programs including the Denali fault earthquake response, tsunami-inundation mapping, coastal zone management, and many others. Our Alaska Volcano Observatory (AVO) group was incredibly busy, working with the U.S. Geological Survey (USGS) and others to provide new, cutting-edge information on the history and potential hazards associated with the arc volcanic complex of southern Alaska, as well as building and managing AVO's award-winning Web site.

Our Geologic Communications section published 13 new maps and reports and kept the industry and public informed through data distribution and information response. The DGGS Web site has received a significant amount of positive press because of the great job our staff is doing in both design and ease of data access. The Geologic Materials Center continued to accept samples from across the state and industry, and to protect this valuable asset for current and future geologists and resource developers.

The year 2005 was clearly a busy and exciting one at the Division of Geological & Geophysical Surveys and we look forward to providing you with the latest up-to-date information on the geology in the state of Alaska.

Please stop by, write, or visit our Web site and take advantage of the many sources of geologic information we work so hard to provide.

Robert Swenson, Acting Director and State Geologist, Division of Geological & Geophysical Surveys

DIVISON OF GEOLOGICAL & GEOPHYSICAL SURVEYS
ANNUAL REPORT 2005

INTRODUCTION

MISSION STATEMENTS

DEPARTMENT OF NATURAL RESOURCES

Mission: *Develop, conserve, and enhance natural resources for present and future Alaskans*

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

Mission: *Determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources, the locations and supplies of groundwater and construction material; and the potential geologic hazards to buildings, roads, bridges, and other installations and structures (AS 41.08.020)*

HISTORY

The present Division of Geological & Geophysical Surveys evolved from Alaska's Territorial Department of Mines. That heritage is reflected in the Division's ongoing commitment to the application of geology to improve the welfare of Alaska citizens. The current name and mission of the Division were established in 1972 with the passage of Alaska Statute AS 41.08.

Territorial Department of Mines, 1959
Division of Mines and Minerals, 1959–1966
Division of Mines and Geology, 1966–1970
Division of Geological Survey, 1970–1972
Division of Geological & Geophysical Surveys, 1972–Present

LEADERSHIP

Ten qualified professional geoscientists have served as State Geologist:
Jim Williams, 1959–1971
William Fackler, 1971–1973
Donald Hartman, 1973–1975
Ross G. Schaff, 1975–1986
Robert B. Forbes, 1987–1990
Thomas E. Smith, 1991–1995
Milton A. Wiltse, 1995–2002
Rodney A. Combellick (Acting), 2003–January 2005
Mark D. Myers, February–October 2005
Robert F. Swenson (Acting), November 2005–present

By statute the State Geologist also serves as the Director of the Division of Geological & Geophysical Surveys within the Department of Natural Resources (DNR) and is appointed by the DNR Commissioner. Since the early 1970s, the State Geologists have been selected from lists of candidates prepared by the geologic community and professional societies within Alaska. A department order in 2002 formalized a process whereby the Geologic Mapping Advisory Board oversees evaluation of candidates and provides a list to the Commissioner. The qualifications and responsibilities of the State Geologist and the mission of DGGS are defined by statute.

STATUTORY AUTHORITY

Alaska Statutes Sec. 41.08.010. Division of geological and geophysical surveys. There is established in the Department of Natural Resources a Division of geological and geophysical surveys under the direction of the state geologist. (1 ch 93 SLA 1972)

Sec. 41.08.015. State geologist. The commissioner of natural resources shall appoint the state geologist, who must be qualified by education and experience to direct the activities of the Division. (1 ch 93 SLA 1972)

Sec. 41.08.020. Powers and duties. (a) The state geologist shall conduct geological and geophysical surveys to determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources; the locations and supplies of groundwater and construction materials; the potential geologic hazards to buildings, roads, bridges and other installations and structures; and shall conduct such other surveys and investigations as will advance knowledge of the geology of Alaska. With the approval of the commissioner, the state geologist may acquire, by gift or purchase, geological and geophysical reports, surveys and similar information.

Sec. 41.08.030. Printing and distribution of reports. The state geologist shall print and publish an annual report and such other special and topical reports and maps as may be desirable for the benefit of the state,

including the printing or reprinting of reports and maps made by other persons or agencies, where authorization to do so is obtained. Reports and maps may be sold and all money received from these sales shall be paid into the general fund. (§ I ch 93 SLA 1972)

LOCATION

The Division's administrative headquarters and personnel were moved to Fairbanks in 1987. The close proximity of the Division to the earth science research laboratories of the University of Alaska Fairbanks campus has a strategic benefit to the DGGS program. University staff and students are important adjunct members of many DGGS project teams.

Current DGGS staff totals 31 permanent full-time professional and support personnel, four non-permanent professional geologists, a Director, Deputy Director, and six student interns hired through the State of Alaska internship program.

DGGS operates the Alaska Geologic Materials Center in Eagle River, Alaska, staffed by two professional geologists.

ORGANIZATION

DGGS is one of seven Divisions and nine Offices in the Alaska Department of Natural Resources (fig. 1).

Division of Geological & Geophysical Surveys offices in Fairbanks

Geologic Materials Center in Eagle River

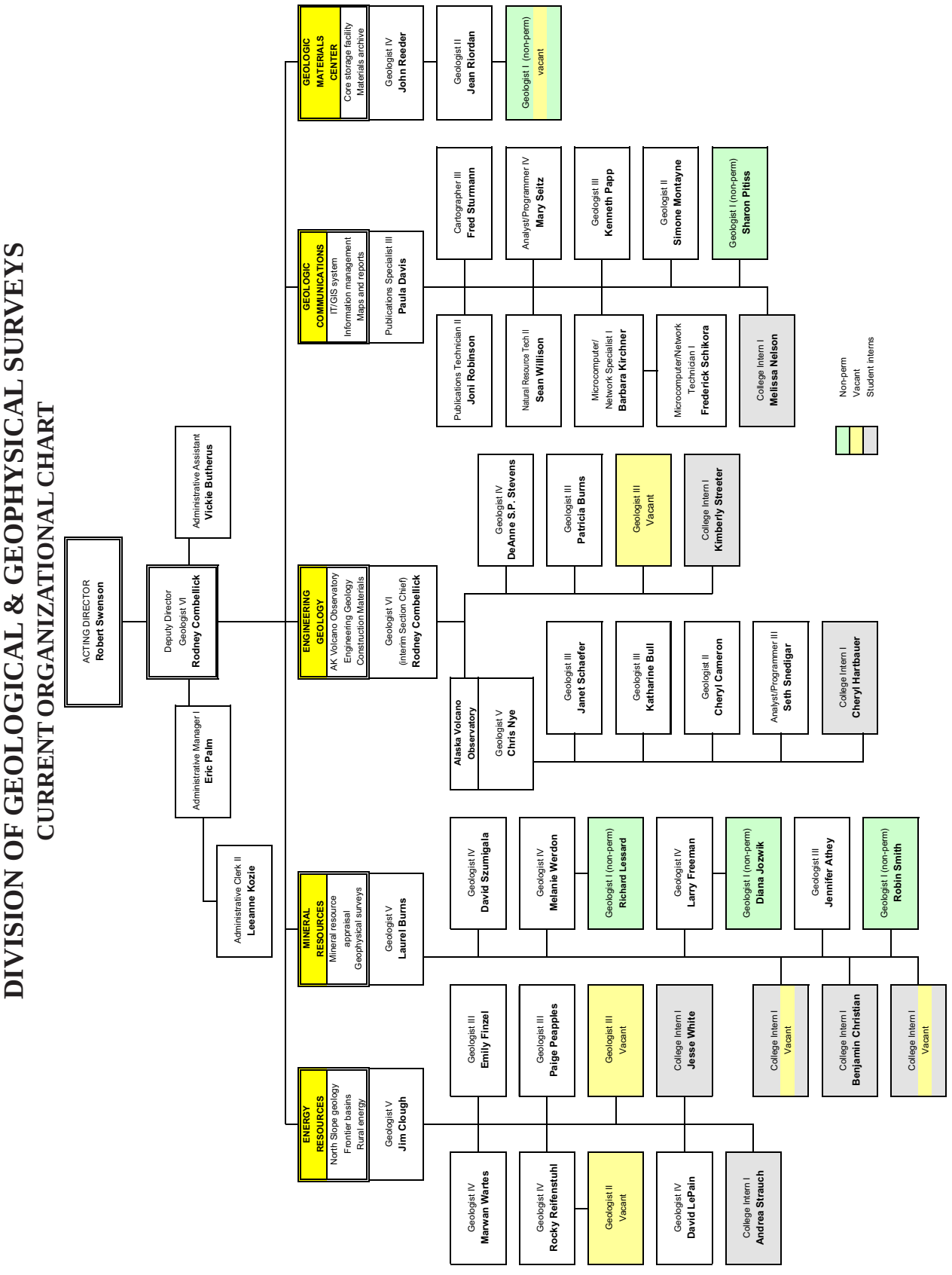


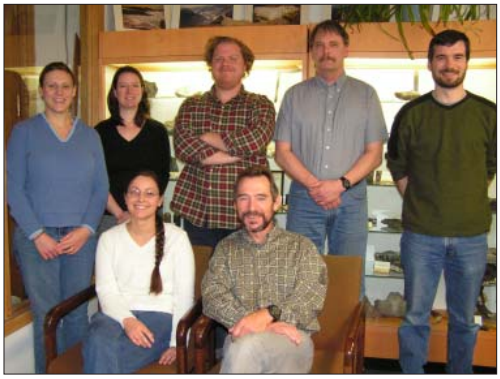
Figure 1. *Organizational chart for the Alaska Division of Geological & Geophysical Surveys.*

Under the overall administration of the Director's Office, the Division of Geological & Geophysical Surveys is organized into four sections and the Geologic Materials Center:

The **Director's Office** provides strategic planning for the Division's programs to ensure that DGGS is meeting the needs of the public within the guidelines of AS 41.08.020, manages the Division's fiscal affairs, and provides personnel and clerical services. The Director acts as a liaison between the Division and local, state, federal, and private agencies; seeks out and encourages cooperative geologic programs of value to the state; and advises the Commissioner of the Department of Natural Resources about geologic issues.

Back L to R: Bob Swenson, Rod Combellick
Front L to R: LeeAnne Kozie, Vickie Butherus, Eric Palm

The **Energy Resources Section** generates new information about the geologic framework of frontier areas that may host undiscovered oil, gas, or coal resources. Summary maps and reports illustrate the geology of the state's prospective energy basins and provide data relating to the location, type, and potential of the state's energy resources. The Energy Resources Section's activities seek to improve the success of state-revenue-generating commercial oil and gas exploration and development and to identify local sources of energy for rural Alaska villages and enterprises.



Back L to R: Emily Finzel, Paige Peapples, Jesse White, Jim Clough, Marwan Wartes.
Front L to R: Andrea Strauch, Rocky Reifenstuhl

The **Mineral Resources Section** collects, analyzes, and makes available information on the geologic and geophysical framework of Alaska as it pertains to the mineral resources of the state. Summary maps and reports illustrate the geology of the state's prospective mineral terranes and provide data on the location, type, and potential of the state's mineral resources. The Mineral Resources Section seeks to improve the success of mineral discovery in Alaska so that new employment opportunities are created for Alaska's citizens.

Back L to R: Richard Lessard, Melanie Werdon, Dave Szumigala, Larry Freeman
Front L to R: Laurel Burns, Robin Smith, Diana Jozwik, Jen Athey

BACK L TO R: Dee Anne Stevens, Janet Schaefer, Cheryl Cameron, Kim Streeter, Chris Nye
FRONT L TO R: Kate Bull, Patty Burns, Seth Snedigar

The **Engineering Geology Section** collects, analyzes, and compiles geologic data useful for engineering and hazard-mitigation purposes. Surficial-geologic maps portray the distribution of surficial geologic materials and provide information on their engineering properties and potential as construction-materials sources. Studies of major geologic hazards such as earthquakes and volcanoes result in reports outlining potential impacts on susceptible areas and estimated frequencies of occurrence.

BACK L TO R: Joni Robinson, Paula Davis, Sharon Pitiss, Fred Schikora, Bobby Kirchner, Susan Seitz, Fred Sturmann
FRONT L TO R: Ken Papp, Simone Montayne, Sean Willison, Melissa Nelson

The **Geologic Communications Section** has the primary responsibility for transferring Division-generated geologic information to the public and for maintaining and improving public access to Alaska-related geologic information. Increased utilization of computer technology is resulting in faster preparation of maps and reports and a wider awareness of Alaska geologic information available at DGGS. This section manages the design and implementation of a computer-hosted database for the Division's digital and map-based geologic and geophysical data, as well as the Division's Web site <www.dggs.dnr.state.ak.us>.

John Reeder, Jean Riordan

The **Geologic Materials Center** is the state's single central repository for representative geologic samples of oil- and gas-related well cores and cuttings, mineral deposit core samples, and regional geologic voucher samples. These materials are routinely used by industry to enhance the effectiveness and success of private-sector energy and mineral exploration ventures. New materials are continuously acquired. Access to the materials at the GMC is free. To ensure that the value of the GMC holdings is maintained over time, any new data or processed samples generated from privately funded analyses of the geologic materials stored there must be donated to the GMC database.

RELATIONSHIPS WITH OTHER STATE AGENCIES

DGGS provides other DNR agencies with routine analyses and reviews of various geologic issues such as geologic-hazards evaluations of pending oil lease tracts; competitive coal leases; geologic assessments of land trades, selections, or relinquishments; mineral potential; and construction materials availability. DGGS's interaction with the Land Records Information Section in the DNR Support Services Division continues to increase as more geologic data are compiled and organized in digital format amenable to merging with other land information. The DGGS Energy Resources Section works closely with geologic personnel in the Division of Oil and Gas (DOG) on issues related to energy sources and in providing geologic control for the subsurface oil-related geologic analyses conducted by DOG. Each year DGGS prepares an annual report on the status of Alaska's mineral industry in cooperation with the Office of Economic Development in the Department of Commerce, Community & Economic Development. DGGS works closely with Division of Homeland Security & Emergency Management in the Department of Military and Veterans Affairs to evaluate hazards, design scenarios for hazards events, and develop the State Hazard Mitigation Plan.

Funding to support work requested by other DNR agencies mostly has been drawn from DGGS's yearly general fund appropriation. For larger inter-division efforts, however, the work is supported by interagency fund transfers, Capital Improvement Project (CIP) funding, federal cooperative agreements, or private industry grants that supplement DGGS's general funds.

RELATIONSHIPS WITH LOCAL GOVERNMENTS

Most of the cooperative efforts implemented by DGGS with borough and municipal governments are conducted on a mutually beneficial but informal basis. For example, DGGS participates in a federally funded cooperative program to develop tsunami-inundation maps for coastal communities. In Kodiak, Homer, and Seldovia, the first communities for which maps were prepared, the City and Borough governments worked closely with DGGS and other project cooperators to help design the project outputs to best benefit their needs for planning evacuation areas and routes. Similar cooperative efforts are currently underway or will soon be initiated with Seward and Sitka for the next tsunami-inundation maps to be generated by this program. The Engineering Geology section has also worked closely with rural communities such as Minto, Nome, and Nenana to develop a field-geoscience outreach program for middle- and high-school students in rural Alaska. Similarly, the Energy Resources section has worked closely with rural communities to help assess local potential for shallow gas as a potential energy source.

RELATIONSHIP WITH THE UNIVERSITY OF ALASKA

DGGS has had a long and productive professional association with geoscientists and students in various departments of the University of Alaska. University of Alaska faculty work as project team members on DGGS projects and provide special analytical skills for generating stratigraphic, structural, geochemical, and radiometric-age data. University students employed as DNR/DGGS interns also are an important part of the DGGS work force. While working on current DGGS projects, the students learn a wide variety of geology-related skills ranging from conventional geologic mapping and sample preparation techniques to modern digital database creation and geographic information systems. DGGS and the University make frequent use of each other's libraries and equipment.

RELATIONSHIPS WITH FEDERAL AGENCIES

DGGS has ongoing cooperative programs with the U.S. Geological Survey (USGS), the U.S. Bureau of Land Management (BLM), and the U.S. Department of En-

ergy. Periodically, DGGS also engages in cooperative programs with the U.S. Minerals Management Service (MMS) and National Aeronautics and Space Administration (NASA). Recently DGGS was successful in receiving its first-ever funding from the National Science Foundation through a highly competitive proposal process. DGGS receives some federal funds from matching grants for which we must compete nationally with other organizations on a yearly basis. In the past we have been successful in securing funds to support mineral inventory mapping, surficial and earthquake hazards-related mapping, volcanic-hazards evaluations, and studies related to oil and gas potential. Although DGGS has historically been very successful in receiving federal grants and appropriations, the process is highly competitive and these funds are therefore project specific or complementary to state funded programs and do not replace state General Fund money. Federal funding is pursued only for projects that are needed to advance the division's statutory mission.

Three ongoing cooperative programs with federal agencies have provided support for key elements of the DGGS mission in recent years. One is the Alaska Volcano Observatory (AVO), a partnership of USGS, DGGS, and the University of Alaska Fairbanks Geophysical Institute that was established in 1988. The USGS funds and administers the program for the purpose of providing a coordinated approach to mitigating volcano hazard risks to the public, the state infrastructure, and air commerce. A second longstanding cooperative federal program is the STATEMAP component of the National Cooperative Geologic Mapping Program, established by Congress in 1992 and also administered through USGS. STATEMAP provides matching funds for geologic-mapping projects according to priorities set by the Geologic Mapping Advisory Board (see below).

A third major federal program is the Minerals Data & Information Rescue in Alaska (MDIRA) program, established by Congress in 1997. DGGS participates in numerous MDIRA projects, administered by either USGS or BLM, for the purpose of recovering, indexing, archiving, and making publicly available minerals information at risk of becoming lost due to downsizing of public and private minerals-related programs.

ALASKA GEOLOGIC MAPPING ADVISORY BOARD

The Alaska Geologic Mapping Advisory Board guides DGGS in pursuing its goal of providing earth science information to the Alaska public. A number of prominent geologists and community leaders, with a variety of backgrounds and a broad spectrum of experience in Alaska, have agreed to serve on the advisory board. The purpose of the board is multifold:

- To identify strategic geologic issues that should be addressed by the state.
- To inquire into matters of community interest relating to Alaska geology.
- To provide a forum for collection and expression of opinions and recommendations relating to geologic investigation and mapping programs for Alaska.
- To make recommendations toward identifying Alaska's diverse resources and promoting an orderly and prudent inventory of those resources.
- To increase public awareness of the importance of geology to the state's economy and to the public's health and safety.
- To promote communication among the general public, other government agencies, private corporations, and other groups that have an interest in the geology and subsurface resources of Alaska.
- To facilitate cooperative agreements between DGGS and other agencies, professional organizations, and private enterprise to develop data repositories and enhance the state's resource inventory and engineering geology programs.
- To communicate with public officials as representatives of groups interested in the acquisition of Alaska geologic information.
- To enlist public and legislative support for statewide geologic resource inventories and engineering geology programs.

The board held its first meeting in Fairbanks on October 22, 1995, and meets at least three times a year to discuss state needs, review DGGS programs, and provide recommendations to the State Geologist. The mem-

bers solicit and welcome comments and suggestions from the public concerning state needs and DGGS programs throughout the year.

Members of the board are:

Jim Rooney
R & M Consultants, representing the engineering geology and geotechnical community
James W. Rooney, P.E., is President of R&M Consultants, Inc., and an original partner of this Alaskan engineering firm that celebrated its 35th year in business in 2004.

Curt Freeman
Avalon Development Corporation, representing the minerals industry

Curt Freeman is President of Avalon Development Corporation, a consulting mineral exploration firm based in Fairbanks, Alaska.

David Hite
Hite Consultants, representing the energy industry
Dr. David Hite is based in Anchorage, Alaska, and has extensive knowledge of the geologic issues associated with Alaska's oil industry.

Paul Layer
University of Alaska Fairbanks Department of Geology and Geophysics, representing the academic community
Dr. Paul Layer is an Associate Professor of Geophysics at the University of Alaska Fairbanks and former Head of the Department of Geology and Geophysics, a position he held for 6 years.

Irene Anderson
Bering Straits Native Corporation, representing rural Alaskans in western Alaska
Irene Anderson is the Assistant Land Manager for Bering Straits Native Corporation. Mrs. Anderson has first-hand knowledge of the mineral, energy, and engineering geology needs throughout a wide region of rural Alaska.

Greg Beischer
Bristol Environmental & Engineering Services Corporation, a wholly owned subsidiary of Bristol Bay Native Corporation
Greg Beischer is a geologist and mining engineering technologist with 17 years of experience in the industry, specializing in exploration, development, and management of mineral resources.

FY2005 ACCOMPLISHMENTS

The Division of Geological & Geophysical Surveys (DGGS) is charged by state statute to generate new, objective, peer-reviewed information about the geology of Alaska, the potential of Alaska's land for production of minerals, fuels, and construction materials, and the potential geologic hazards to its people and infrastructure. As in past years, in FY2005 the Division successfully pursued multiple funding avenues to finance geological and geophysical mineral inventory mapping, generate new geologic data to support North Slope and Bristol Bay energy exploration, perform rural energy geologic assessments, conduct earthquake hazard investigations, expand volcano monitoring and hazards studies in the Alaska Peninsula and Aleutian Islands, and streamline geologic data archival and dissemination.

MAJOR ACCOMPLISHMENTS IN FY2005

Energy Resources

- Conducted structural and stratigraphic studies on the North Slope in collaboration with the Division of Oil & Gas and U.S. Geological Survey, collecting geologic data relevant to assessing the hydrocarbon potential of the Brooks Range foothills. This work is funded in part through contributions from oil and gas companies.
- Convened a gathering of industry geologists in Anaktuvuk Pass to present recent technical results bearing on the petroleum geology of northern Alaska. Conducted a geologic tour of North Slope field localities that illustrate structural and stratigraphic relationships that are key to oil and gas exploration.
- Completed Year 2 of a two-year geologic mapping project in the Siksikpuk River area in the central Brooks Range foothills area of the North Slope. The new bedrock mapping is conducted in conjunction with ongoing petroleum-resource evaluations and will be released in 2006 for use by industry and government in lease sales on state and federal lands.
- Conducted a detailed gravity survey along the Tiglukpuk Creek–Siksikpuk River trend in the North Slope Brooks Range foothills to investigate major subsurface structural and stratigraphic features.
- Completed the first year of a three-year field program as part of a federally funded (USDOE) geologic evaluation of petroleum potential in the Bristol Bay region. Released a summary report (DGGS PIR 2005-1), *Bristol Bay and Alaska Pen-*

insula 2004: Fieldwork and sample analyses compilation report.

- Completed slim-hole drilling at Fort Yukon in August 2004 as part of the U.S. Department of Energy-funded project to assess coalbed methane potential in rural Alaska, and organized and held a community informational meeting on the project in Fort Yukon.

Mineral Resources

- In collaboration with the Alaska Department of Commerce, Community and Economic Development, published *Alaska's Mineral Industry* (Special Report 59), an authoritative annual report of statewide mining activity.
- In collaboration with DNR's Division of Mining, Land & Water, provided rankings on all remaining state-selected lands with mineral potential as part of DNR's BLM2009 Project, which was prompted by the federal Alaska Land Transfer Acceleration Act (S.1466).
- Completed ground-truth bedrock- and surficial-geologic mapping of 268 square miles of the Council mining district airborne-geophysical survey tract. This included the third and final year of geologic ground-truth mapping in support of a NASA-funded project to use high-resolution remote-sensing data to identify previously unrecognized deposits that may be favorable sources of placer minerals.
- Initiated the ground-truth bedrock- and surficial-geologic mapping project of 130 square miles of the western Bonnifield mining district airborne-geophysical survey tract. These maps and data of the Liberty Bell area will be released to the public by the end of FY06.
- Initiated airborne geophysical surveys of 850 square miles of mineral districts near Fairbanks, Richardson, and Black Mountain (near the Pogo gold deposit) in Interior Alaska.
- Initiated airborne geophysical surveys of 1,448 square miles of the southern National Petroleum Reserve–Alaska (NPRA). This project is funded by the U.S. Bureau of Land Management and data will be used to aid land management recommendations and decisions.

Engineering Geology & Construction Materials

- Completed year one of MapTEACH (*Mapping Technology Experiences with Alaska's Cultural Heritage*), a pilot project funded by the National Science Foundation (NSF) to develop an educational program for middle- and high-school students in Alaska emphasizing hands-on experience with geospatial technology (GPS, GIS, and remote sensing imagery) in conjunction with traditional activities and geoscience. The project is a collaborative effort with the University of Alaska Fairbanks and University of Wisconsin Madison.
- Reviewed and commented on natural hazards sections of 16 Coastal District Plans.
- Conducted field studies of volcano hazards and geology at Chiginagak Volcano, Alaska Peninsula.
- Provided helicopter and ship logistical coordination for Alaska Volcano Observatory (AVO) field operations, including a major expansion of AVO volcano monitoring capabilities on the Alaska Peninsula. Currently 27 of Alaska's historically active volcanoes are being seismically monitored.
- Transitioned the AVO internal and external World Wide Web sites to dynamic, database-driven sites, resulting in a two-fold increase of the Web site's usage; the public site is visited about 120,000 times per month. These pages have become crucial to daily monitoring of volcanoes and are technologically at the cutting edge worldwide.

Geologic Information Management and Delivery

- Produced 13 new geologic maps, 13 new reports, and 3 CD-ROMs for publication, including *Alaska's Mineral Industry* annual report for 2004, plus two newsletter issues and a pictorial calendar.
- Sold 603 professional maps and reports, distributed approximately 140 free educational publications, and responded to more than 700 significant geologic information requests.
- Added U.S. Geological Survey Professional Papers and Bulletins on Alaskan geology to the Geologic & Earth Resources Information Library of Alaska (GERILA) database and made them available on the DGGS Web site, achieving another major objective of the federally funded Minerals Data & Information Rescue in Alaska (MDIRA) project.
- In collaboration with federal agencies (U.S. Geological Survey, U.S. Bureau of Land Management, and U.S. Forest Service) and DNR's Land Records Information Section (LRIS), released a Web interface (http://www.bib.akgeology.info/) for a combined interagency bibliography of geologic and geophysical publications for Alaska.
- Redesigned the publications pages on the DGGS Web site to reflect the Governor's desired look and feel for State Web sites.

Geologic Materials Center

- Hosted 492 visitations to the Alaska Geologic Materials Center in Eagle River by industry, government, and academic personnel to examine rock samples and processed materials. These visitations helped generate 12,314 processed oil and gas related microscope slides (includes Minerals Management Service and Chevron Foraminifera slide donations) and five hard-rock mineral and oil and gas technical data reports.
- Received, stored, and inventoried three 40-foot trailer loads of rock samples representing collections from Forest Oil Corporation, Alaska Earth Sciences, and University of Alaska Fairbanks Museum, as well as the released well samples from the Alaska Oil and Gas Conservation Commission. In total, rock samples for more than 26 oil and gas wells, representing 114,515 feet of well samples, and 37 hard-rock mineral holes, representing 6,728 feet of hole samples in 685 core boxes, were received during FY2005.
- Completed an inventory of the former U.S. Bureau of Mines rock sample collection at the GMC.

KEY ISSUES FOR FY2006–2007

Trends in the Reduction of Federally Funded Appropriations

- Federal budget initiatives have shown recent trends toward budget reduction across the board. Examples of proposed presidential budget cuts that will directly affect DGGS include: (1) Zeroing out of the Department of Energy's budget, and (2) Repeated administration proposals to reduce the USGS Minerals program budget. The USGS STATEMAP cooperative geologic mapping program has also undergone substantial cuts over the last few years.
- Recent changes in the chairmanship of critical U.S. congressional committees has had a dramatic effect on our ability to secure funds through special appropriations. Of the four appropriations (totaling $9.7 million) requested for FY05 through DGGS and DOG, only one request for $500,000 was approved, but the money was earmarked for Alaska projects through the USGS.
- Many DGGS programs that are critically important to the state and allow fulfillment of the division's mission are partially funded by these dollars via collaborative work. For example, the FY05 DGGS expense budget was nearly 51 percent federal receipts and included funding for the MDIRA program, federal STATEMAP geologic mapping programs, and minerals potential identification in collaborative work with MMS, BLM, and USGS.
- Identifying new funding sources, improving our documentation and lobbying effort, and reallocating personnel to critical areas will be a key component of the coming fiscal year.

Updating and Improving the Geologic Materials Center

- A repository of rock core, samples, and data is critical for any state (or country) that relies on resource development as a key component of its economy.
- The Geologic Materials Center (GMC), located in Eagle River, is Alaska's rock-sample repository and is the "first stop" for any industry or academic researcher who is attempting to identify and understand the complex geology in the numerous resource-rich areas throughout the state.
- Providing efficient and comprehensive access to these data is critically important for viable exploration programs, for both seasoned Alaska explorers and newcomers who are trying to identify potential entry areas
- The current condition of the facilities at the GMC have been characterized as "inadequate" by industry representatives using the facility when compared with other resource-rich state's archives.
- The GMC currently employs 55 semi-truck Connex boxes as temporary storage facilities that are unlighted and unheated and house thousands of feet of core (some of which will disintegrate with repeated freeze–thaw cycles). These collections represent millions of dollars of acquisition and preservation costs and should not be archived in this manner.
- The core and sample observation areas are essentially unusable for confidential work and description of any more than a few feet of core length. A company's ability to maintain confidentiality of their exploration activities is critical to success in a fiercely competitive environment. Often the core must be taken off-site for substantial projects, which creates a significant security threat to the

unique core, and an expensive alternative for the exploration company.

- A significant challenge for DGGS over the near term will be to educate lawmakers and government officials as to the importance of upgrading this facility and providing the funding necessary to keep this important data source safely maintained and accessible.

Sustained High-level Commodity Prices

- Although this is very good news for the State as a whole, increased price structure in most natural resource commodities presents a challenge for DGGS.
- Dramatic increases in minerals and oil and gas exploration efforts by private industry puts a noticeable strain on all facilities and programs. Our effort to provide critical data to these entities will be challenged as more and more end-users of our products demand quicker and more comprehensive response. The main challenge will arise from a relatively static state budget and our ability to plan for the rapidly changing needs of the resource development community.
- Spikes in the exploration cycle also create a situation where high-paying jobs become abundant, and opportunities for experienced geoscientists become commonplace. A significant challenge for DGGS will be our ability to attract and retain key personnel in this very competitive environment.

Communities at Risk

- Continued population growth and development in Alaska will continue to encroach on areas with heightened geohazard risk.
- The documented warming of the arctic climate will create dramatic changes in many surficial processes that have remained unchanged for decades. Glacial melt-back and surges, changes in permafrost, heightened coastal and river erosion are just a few of the potential hazards that will affect the many communities and infrastructure around the state.
- Recent media coverage of these phenomena points out the necessity of acquiring data and producing maps that can be used for identifying risks and for both short- and long-term planning.
- In some cases it will be critical to have these data available in a crisis situation.
- DGGS will be challenged to provide pertinent and timely data on numerous fronts and plans to initiate a long-term program that addresses this important issue.

Geologic Mapping and Field Operations Costs

- Rising costs of field operations and a tightening of federal funding sources decrease DGGS's ability to accomplish its mission.
- Much of DGGS's most valuable work in Alaska is done in the frontier areas of the state. Our work provides the geologic framework that is used by the private sector to guide new energy and mineral investments. Providing this kind of information means that our field work is moving farther away from the state's limited transportation infrastructure. This, alone, adds to logistical supply costs.
- During the past 5 years, DGGS field operation costs have risen nearly 50 percent for geologic mapping and more than 40 percent for airborne geophysical surveys.
- All our remote field programs require fixed-wing and helicopter support for daily operations and these costs continue to rise dramatically; most increases are specifically associated with increased fuel costs.
- A significant and continued challenge will be to provide comparable levels of this critical research, while limiting the impacts to a relatively constant budget.

Limited Detailed Geologic Mapping Coverage

- Alaska is a unique geographic region of the United States and contains the most diverse distribution of geologic provinces in North America.
- When compared to any other state, the geology of Alaska is critically under-mapped at a reasonable scale for planning and resource exploration.
- Less than 10 percent of the state's surface area is covered by 1:63,360-scale geologic mapping. This provides a unique opportunity for resource explorers and land owners alike; limited data and geologic knowledge in vast areas provide significant potential for discovery when the mapping and studies are completed.
- Nowhere else in the United States are there areas so poorly understood geologically.
- This limited coverage, when combined with escalating field mapping costs and declining budgets, presents a major challenge to DDGS in its mission to cover the critical areas and identify the potential resources contained within.
- One of the key sources of funding for geologic mapping projects in DGGS has been the USGS STATEMAP program. DGGS has continued to rate very highly in this competitive proposal process and has secured more than $1.2 million of

federal matching funds over the past 12 years.
- DGGS will continue to pursue innovative funding avenues in order to attain its goal of mapping the critical areas of the state, and will work towards securing federal, state, and industry funds in this effort.

Commercial Energy
- New oil and gas exploration in Alaska is increasingly being undertaken by smaller, independent petroleum companies that lack the depth and experience of the major oil companies. The independent companies rely heavily on publicly available geologic data from Alaska's sedimentary basins. In addition to providing this information, DGGS makes available the opportunity for these companies to sponsor and participate in field studies that provide a better understanding of the geologic framework of potential hydrocarbon sources in active and future lease areas. To this end, we actively seek both independent and major company partners in this program through frequent meetings with industry groups.

DGGS responds to many inquiries from companies seeking the geologic information that will assist their exploration efforts in Alaska. The challenge for DGGS is to meet the geologic needs of accelerated leasing and exploration licensing with limited staff and financial resources. We have redirected internal resources toward oil and gas geology to the extent possible and have been successful acquiring external funding from the federal government and industry. One way in which we have met these challenges with minimal increase in permanent state staff is to involve contract geologists, university faculty, student interns, industry partners, and occasional non-permanent employees in multi-organization cooperative projects.

Infrastructure Projects
- Alaska may be on the threshold of a major development cycle similar in scale to the construction of the trans-Alaska oil pipeline. There is increasing activity among industry and government to seek ways to expedite the construction of a delivery system to the Lower 48 for North Slope natural gas and possible extension of the Alaska Railroad to Canada. A fundamental and prudent first step in undertaking infrastructure development enterprises of this magnitude is a comprehensive, public geologic resource evaluation and geologic hazard assessment of the greater land corridors through which such construction must pass. Such assessments should be made prior to finalizing detailed alignments and prior to detailed geotechnical engineering assessments of those alignments and as a basis for evaluating permit applications. By statute AS 41.08, DGGS is charged with determining the potential geologic hazards to buildings, roads, bridges, and other installations and structures as well as inventorying the state's geologic resources.
- Prior knowledge of the kind and extent of geologic hazards affecting these projects is the first step in reducing future economic losses and casualties from the hazards. Such knowledge can be factored into design criteria to improve public safety, decrease long-term maintenance costs, and decrease the cost of reconstruction resulting from encountering unforeseen obstacles. Additionally, knowledge of geologic resources in the vicinity of the transportation corridors may improve their projected economic feasibility and identify sources of construction materials.

DGGS FY06 PROGRAM

PROGRAM FOCUS

DGGS develops its strategic programs and project schedule through consultation with the many users of geologic information—state and federal agencies, the federal Congressional delegation, the Alaska State Legislature, professionals in the private sector, academia, and individual Alaska citizens. Their input to DGGS programs comes through the Alaska Geologic Mapping Advisory Board, liaison activities of the Director, and personal contact between DGGS staff and the above groups.

The FY06 DGGS program is focused on projects designed to foster the creation of future Alaskan jobs and resource revenue and to mitigate adverse effects of geologic hazards. To maintain general prosperity, Alaska must encourage major capital investment for job creation in the state. For the foreseeable future, much of the economy will continue to depend on developing the state's natural resources. Within that future, energy and mineral resources constitute a major portion of the state's wealth. Mitigating the effects of geologic hazards helps preserve public safety and private investments by fostering sound design and construction practices.

The role of DGGS in state revenue generation and the maintenance of Alaska's economy is strategic. DGGS provides objective geologic data and information used by in-state, national, and international mineral and energy companies, construction companies, air carriers, other DNR agencies, Department of Commerce, Community & Economic Development, Department of Transportation & Public Facilities, Division of Homeland Security & Emergency Management, and the Federal Emergency Management Agency. DGGS geologists provide geological and geophysical information to assist prospectors, mineral, oil, and gas explorationists, and others to explore for, discover, and develop Alaska's subsurface resources. DGGS is a central repository of information on Alaska geologic resources and a primary source of information for mitigating geologic hazard risks. To focus attention on Alaska's subsurface resource potential and geologic hazards, DGGS makes the state's geologic information available on statewide, national, and international levels. Through its Geologic Materials Center in Eagle River, DGGS also provides access to physical samples collected by private companies and government agencies.

Minerals Data and Information Rescue in Alaska (MDIRA) Program

Downsizing of federal and state agencies in Alaska during the late '80s and early '90s placed at risk an extensive body of geologic, geochemical, mineral, and mineral-development data that had been collected by federal, state, and private organizations over the past century. These data are archived in various locations offering various levels of storage capacity, quality, and accessibility. The budget shortfalls for federal and state archival functions created a need to develop aggressive plans for assembling, maintaining, and most importantly, creating value from this data legacy. For the purpose of this effort, "at risk data" is defined as any data or voucher samples existing in substandard storage sites or in a mode in which data may be subject to irretrievable loss or degradation, or may be unavailable to meet the needs of its intended users. A liaison committee comprising representatives from the Alaska Miners Association, Alaska Federation of Natives, University of Alaska, Alaska Department of Natural Resources, and independent mining industry consultants guides the implementation of the Alaska minerals data rescue efforts through a Federally funded program entitled *Minerals Data and Information Rescue in Alaska (MDIRA)*. DGGS projects supported in whole or in part by this program are being undertaken by the Mineral Resources and Geologic Communications sections. In the FY06 Program Summaries that follow, MDIRA projects are indicated by an asterisk (*).

FY06 DIVISION EXPENSE BUDGET
(amounts in thousands of dollars)

Program	General Fund	CIP	Federal Receipts	Interagency Receipts	Program Receipts	Total
Energy Resources	647.4	75.0	332.1[1]	0.0	125.0	1,179.5
Mineral Resources	400.0	0.0	498.0	0.0	25.0	923.0
Engineering Geology	235.0	0.0	108.4	15.0	0.0	358.4
Alaska Volcano Observatory	0.0	0.0	1,867.3	0.0	0.0	1,867.3
Geologic Communications	425.0	35.0	410.0	0.0	15.0	885.0
Geologic Materials Center	150.0	0.0	157.6	50.0	0.0	357.6
Airborne Geophysics–Minerals	0.0	423.3	1,050.0	0.0	0.0	1,473.3
Airborne Geophysics–Gas pipeline	0.0	1,601.7	0.0	0.0	0.0	1,601.7
Administrative Services	340.0	0.0	0.0	0.0	0.0	340.0
Total by funding source	**2,197.4**	**2,135.0**	**4,423.4**[1]	**65.0**	**165.0**	**8,985.8**

[1]Includes $196.0K in federal funds received through Reimbursable Services Agreements with the University of Alaska Fairbanks

PROGRAM SUMMARIES

STATE GEOLOGIST/DIRECTOR

The Director's Office provides leadership and coordination for the activities of the Division through the State Geologist/Director, Deputy Director, and administrative staff.

OBJECTIVES

1. Provide executive leadership for the Geological Development Component and act as liaison between the Division and the DNR Commissioner's Office, other state agencies, Legislature, and local, federal, and private entities.
2. Stimulate exploration, discovery, and development of the geologic resources of the state through implementation of detailed geological and geophysical surveys as prescribed by AS 41.08.
3. Provide geologic information to mitigate the adverse effects of natural geologic hazards.
4. Provide secure archival storage and efficient public access to the state's growing legacy of geologic information, and energy- and minerals-related reference cores and samples.

TASKS

- Prepare annual Division funding plan including Alaska General Fund base budget, Capital Improvement Project budget, interagency programs, and federal initiatives.
- Inform Alaska state legislators, Governor's office, Alaska federal delegation, and the public about the DGGS geologic program and its significance.
- Focus the Division's geologic expertise on addressing Alaska's highest priority needs for geologic information.

ENERGY RESOURCES

The Statewide Energy Resource Assessment program produces new geologic information about the state's oil, gas, and coal resources. With the current and projected reduction in oil-generated revenue to the state's economy resulting from declining oil production, despite significantly increased oil prices, new significant hydrocarbon discoveries are needed to maintain or increase major revenue payments to the state. There is a continual need for acquisition of fundamental geologic data using modern concepts and techniques to enable industry to better focus its exploration in prospective areas beyond the core production areas. Recent DGGS work in the central and western North Slope is stimulating industry interest in the west-central Brooks Range foothills. DGGS studies include acquiring new geologic data that assist exploration for new gas supplies for the proposed natural gas pipeline. Therefore, in FY06 this program continues to focus significant effort on frontier state lands in the central North Slope and on prospective state lands east of the Trans-Alaska Pipeline. In late FY06, DGGS will initiate a geologic mapping project in the Kavik River area of the eastern Brooks Range foothills, partially funded by the federal STATEMAP program, in the interest of providing basic geologic data to support oil and gas exploration in the region.

DGGS is also participating in a state and Federal government project to assess the recoverable resource potential of onshore natural gas hydrate and associated free-gas accumulations on State, Federal, and Native lands on the North Slope of Alaska. These gas hydrates have the potential to be an additional source of natural gas that can be produced by conventional methods and will add to the total gas resources available for the proposed natural gas pipeline.

The Statewide Energy Resource Assessment program is evaluating potential oil and gas reservoirs in the Bristol Bay Basin and Alaska Peninsula region to better assess the hydrocarbon potential of this frontier area. This 3-year project is generating new geologic information that will assist oil and gas exploration on state-owned on-

shore and three-mile-limit waters of Bristol Bay Basin and Alaska Peninsula that are the focus of state lease sales.

The Statewide Energy Resource Assessment program also is pursuing a solution for village and commercial enterprise energy needs in rural Alaska by evaluating the potential for shallow gas resources near Alaska communities. The program is working to implement a comprehensive statewide coal resource data file and provide the energy component of an integrated DGGS geologic data management system.

The numerous elements of the Statewide Energy Resource Assessment program are financed from a mixture of funding sources: General Fund, Industry Receipts, Federal Receipts, and Capital Improvement Project funding.

OBJECTIVES

1. Encourage active private-sector oil and gas exploration on the North Slope beyond the Prudhoe Bay–Kuparuk field areas.
2. Generate new geologic data that support oil and gas industry exploration in the Bristol Bay Basin and Alaska Peninsula region.
3. Identify potential sources of energy in rural Alaska for the local generation of heat and power.
4. Provide DNR, other state agencies, and the public with authoritative information relating to the energy resources of the state so that rational policy and investment decisions are made.

FY06 ENERGY RESOURCES PROJECTS

Detailed project summaries for the following energy resources projects appear in the section *Project Summaries—FY06*:

In addition to the above projects, the Energy Resources section performs the following tasks:

1. Upon request, provide written evaluations of mineable coal potential for lease areas in response to requests from Division of Mining, Land and Water Management.
2. Respond to verbal requests from other State agencies, Federal agencies, industry, local government, and the public for information on energy-related geologic framework and oil, gas, and coal resource data.

MINERAL RESOURCES

The inevitable decline of Alaska's oil reserves base suggests that Alaska must move decisively to strengthen a broader subsurface resource economic base. To achieve this goal, Alaska needs private-sector commitment of capital and talent in non oil-related as well as oil-related industries. The mineral industry, however, has historically shown a reluctance to commit significant company resources until there is a dramatic advancement in our understanding of the geologic environments of the most prospective Alaska lands open to mineral and other geologic resource development.

Alaska has an accessible state land endowment of more than 100 million acres, much of it chosen from a 350-million-acre land pool because of perceived potential to host mineral wealth. Currently the overwhelming majority of these lands are not geologically or geophysically surveyed at a sufficiently detailed level, nor with the focus needed to optimize mineral discovery and development. Recently, a DNR/DGGS program of integrated geological and geophysical mapping has been effective in attracting new private-sector mineral investment capital to Alaska. The purpose of the FY06 Statewide Mineral Resource Appraisal Project is to produce, on a prioritized schedule, the critical new geological surveys needed to sustain Alaska's mineral industry investments and provide management agencies with information needed to formulate rational management policy.

The Statewide Mineral Resource Appraisal project shares responsibilities with the Geologic Communications Section in the Division-wide task of implementing a publicly accessible, comprehensive, on-line computerized Alaska geologic information database.

The numerous elements of the Statewide Mineral Resource Appraisal Project are financed from a mixture of funding sources: General Fund base budget, Capital Improvement Project funding, Federal Receipts, and Program Receipts.

OBJECTIVES

1. Catalyze increased mineral resource exploration in Alaska's mining districts.
2. Provide DNR, other state agencies, and the public with unbiased, authoritative information on the mineral resources of the state so that rational land policy and investment decisions can be made.
3. Provide an accurate current statistical and descriptive summary of the status of Alaska's mineral industry for calendar year 2005.

FY06 MINERAL RESOURCES PROJECTS

Detailed project summaries for the following Mineral Resources projects appear in the section *Project Summaries—FY06*:

Airborne geophysical/geological mineral inventory program: Airborne geophysical survey of selected mining districts – p. 29
Southern NPRA Airborne Geophysical Project – p. 30
Airborne geophysical survey of the proposed gas pipeline corridor – p. 31
Geologic ground-truth inventory of Liberty Bell geophysical survey tract, Interior Alaska – p. 32
Airborne geophysical/geological mineral inventory program: Geologic mapping in the Council geophysical survey tract – p. 33
*Compilation of Alaska bedrock, surficial, and geophysical map index project – p. 34
*Geochronologic database for Alaska – p. 35
*Compilation of Alaska state agency lithochemical data – p. 36
*Compilation of existing resource assessment geochemical datasets – p. 37
*Archiving and indexing DGGS project files and field notes (DGGS legacy files project) – p. 38
*Geologic maps of the Haines and Nome areas – p. 39
Annual Alaska mineral industry report – p. 40
BLM 2009 project (land selection project) – p. 41
* MDIRA-supported project (see p. 13)

In addition to the above projects, the Mineral Resources section performs the following tasks:

1. DGGS Mineral Resource geologists provide timely responses to verbal and written requests for mineral information from other State agencies, local government, industry, and the general public.
2. Provide authoritative briefings about the status of Alaska's mineral industry, State support for mineral ventures, and recently acquired geophysical and geological data at professional mineral industry conventions and trade shows, and in professional journals.

ENGINEERING GEOLOGY

The Engineering Geology program addresses major engineering-geology and geologic-hazard issues that affect public safety and economic well-being in developing areas of Alaska. DGGS conducts engineering-geologic mapping to determine the distribution and character of surficial deposits, their suitability for foundations, susceptibility to erosion, earthquakes and landslides, and other geologic hazards. Geologic evaluations of areas subject to major hazards like floods, earthquakes, volcanic eruptions, tsunamis, and landslides help to forecast the likelihood of future major events and the severity of hazards associated with them. In addition to General Funds, several elements of the Statewide Engineering Geology Program are partially, or largely financed through Federal Receipts.

Alaska's communities at high risk from major geologic hazards comprise the majority of Alaska's citizens and a large majority of the state's corporate headquarters. In many urban areas, the state lacks the fundamental geologic data needed to guide the proper implementation of building codes, land-use zoning, right-of-way siting,

property insurance regulation, and contingency planning for adverse natural hazard events. Loss of life and damage to infrastructure and buildings can be reduced through informed construction practices, land-use planning, building-code application, and emergency preparedness. However, economics and practicality dictate that mitigation measures be implemented first where risk is highest. Because hazards are not uniformly distributed, engineering-geologic and hazard maps become the first source of information about where damage is likely to be greatest and, therefore, where mitigation efforts need to be concentrated. These maps are critical for emergency planning and the allocation of emergency-response resources prior to an adverse event.

The type of surficial-geologic mapping conducted for purposes of identifying geologic hazards and locating sources of construction materials is also of benefit for locating placer-mineral deposits. For this reason, engineering-geology personnel often participate in teams with DGGS's mineral-resources geologists to map areas of interest for minerals exploration.

A major component of the Engineering Geology program is the Alaska Volcano Observatory, in which DGGS participates with the U.S. Geological Survey and University of Alaska Fairbanks to monitor Alaska's active volcanoes, map and describe their geology and hazards, and predict and record eruptive activity. DGGS's support for AVO activities comes from the U.S. Geological Survey, which in turns comes partly from the Federal Aviation Administration to support volcanic-ash warnings to aircraft. DGGS provides helicopter logistics for field operations, assists in geologic and volcanic hazards studies, maintains the AVO Web site, and is developing a database of geologic information on Alaska's volcanoes. These roles are described in detail in five project summaries.

OBJECTIVES

1. Help protect public safety and health by providing information on geologic hazards as they affect human activity.
2. Provide geologic information to help lower the costs of construction design and improve planning to mitigate consequences arising from hazardous natural geologic events and conditions.
3. Provide reliable engineering-geologic data for informed land-use decisions by the government and private sector.
4. Identify sources of sand, gravel, rip-rap, stone, and other geologic construction materials required to create the infrastructure, roads, and other land-based transportation corridor improvements necessary to support expanded development of natural resources and other local economic activities in Alaska.
5. Identify potential sources of placer minerals in participation with minerals resources mapping teams.

FY06 ENGINEERING GEOLOGY PROJECTS

Detailed project summaries for the following Engineering Geology projects appear in the section *Project Summaries—FY06*:

In addition to the above projects, the Engineering Geology section performs the following tasks:

- Produce written evaluations of potential hazards in areas of oil exploration leases, land disposals, permit applications, etc., and respond to verbal requests for information from other State agencies, local government, and the general public.
- As part of the Alaska Coastal Management Program, conduct reviews of district coastal management plans, Coastal Policy Questionnaires, and consistency applications to determine compliance with the program's natural hazards standards (11 AAC 112.210).
- Conduct post-event hazard evaluations in response to unexpected major geologic events (e.g., earthquakes, volcanic eruptions, and landslides), providing timely information dispersal to the public via electronic as well as traditional methods, and providing event and continuing hazard information to appropriate emergency management agencies.

GEOLOGIC COMMUNICATIONS

The Geologic Communications Section staff edits, designs, publishes, and disseminates technical and summary reports and maps generated by the Division's technical projects about Alaska's geologic resources. The maps and reports released through this section are the state's primary avenue for widely disseminating detailed information and data relating to its subsurface mineral and energy wealth, its geologic construction materials, and its geologic hazards. These printed and/or digital-format documents focus attention on Alaska's most geologically prospective and useful lands and are the authoritative geologic basis for many of the state's resource-related land-policy decisions. They also encourage geologic exploration investment leading to resource discoveries and subsequent major capital investments. Timely availability of geologic information from DGGS is a significant factor in stimulating Alaska's economy and mitigating the adverse effects of geologic hazards.

The geologic information desk staff provides information to the public on a wide range of topics including mineral and energy resources, prospecting, earthquakes, volcanoes, and permafrost, and assists customers in understanding geological and geophysical maps and data. Staff also manages sales of geologic reports, maps, and data and prepares displays and represents the division at geologic conferences and events.

The section produces an annual report summarizing division activities and accomplishments; publishes newsletters to communicate division progress and advertise recent publications; designs, edits, and produces technical and educational geologic maps and reports in printed and digital formats; manages the DGGS library so that reports (by DGGS and other related agencies) are available and locatable; and participates in outreach activities such as classroom presentations, science fair judging, or helping teachers plan earth science units.

The division's Digital Geologic Database project was initiated by the federally funded Minerals Data & Information Rescue in Alaska (MDIRA) program and has three primary objectives: (1) to establish a spatially referenced geologic database system in a centralized data and information architecture with networked data access for new DGGS geologic data; (2) to create a functional on-line system that allows the public to find and identify the type and geographic locations of geologic data available from DGGS and then view or download the selected data; and (3) to cooperatively integrate DGGS minerals-related data with data from other agencies through a MDIRA-sponsored Web site <http://akgeology.info>. This project is led by a geologist from the Minerals Resources Section but is largely implemented by the Geologic Communications section.

The section provides primary computer and GIS service and support to DGGS staff and streamlines information delivery to the public. The section established a Web site and began extensive use of the Internet in FY98 to increase the availability of the Division's information and to provide state and worldwide access to the Division's geologic information base. These efforts have developed into a major project to establish a state–federal multi-agency Internet-accessible Alaska geologic database management system. Federal funding was obtained to scan, convert to digital format, and post the entire DGGS suite of publications on our Web site. The U.S. Geological Survey provided additional funds to do the same for all USGS Bulletins and Professional Papers in the DGGS library and make them available via the World Wide Web.

The Geologic Communications Section is financed through the General Fund, Federal Receipts, and Program Receipts.

OBJECTIVES

1. Disseminate new, accurate, unbiased, Division-generated data on the geology of Alaska, as well as selected data from other sources, to the public at large, to DNR policy and regulatory groups, and to all other interested parties within one year of its acquisition.
2. Preserve and manage the data and knowledge generated by the Division's special and ongoing projects in an organized, readily retrievable, and reproducible form consistent with pertinent professional standards.
3. Focus public awareness on Alaska's most prospective mineral and energy lands.

FY06 GEOLOGIC COMMUNICATIONS PROJECTS

Detailed project summaries for the following Geologic Communications projects appear in the section *Project Summaries—FY06*:

GEOLOGIC MATERIALS CENTER

The Geologic Materials Center (GMC) archives and provides public access to non-proprietary oil, gas, and coal drill cores and drill-cutting samples, rock cores from mineral properties, and processed ore, oil, gas, coal, and source-rock samples. These samples are used by government and private-sector geoscientists to improve the odds of finding new oil, gas, and mineral deposits that will maintain the flow of state revenues and provide in-state employment. The Geologic Materials Center Project is financed from the General Fund budget and in-kind contributions directly from industry. The private sector contributes the cost of delivering all new samples, sample preparation and analyses, sample logs, and data logs.

The holdings of the GMC are a continually growing asset that is compounding in value over time at little cost to the state. The GMC facility is staffed by two Division geologists and numerous private-sector volunteers. The GMC has formal cooperative agreements with the U.S. Geological Survey, the U.S. Minerals Management Service, and U.S. Bureau of Land Management to house and control their Alaska geologic materials. A voluntary 14-member board advises the GMC project leader and DGGS on matters pertaining to the GMC.

OBJECTIVES

1. Enhance responsible resource development and in-state employment opportunities by making information concerning oil, gas, and mineral exploration more accessible.
2. Advance the knowledge of the geology and resources in Alaska's low-lying structural basins favorable for oil or gas discovery.
3. Advance the knowledge of Alaska's mineral potential by making available representative samples of ores and drill cores from mineral deposits throughout the state.

A detailed project description for the Geologic Materials Center appears in the section *Project Summaries–FY06* (p. 60).

ADMINISTRATIVE SERVICES

The Administrative Services group provides financial control and administrative support for all other projects in the Geological Development component including: securing lowest costs for goods and services; maintaining, and when necessary, procuring vehicles for field work; coordinating travel arrangements and appropriate paperwork to minimize travel expenses and field party subsistence costs; administering and monitoring grants and contracts; tracking and reporting project expenditures to ensure cost containment within budget for all projects; mail/courier services; assistance in personnel matters; petty cash; and any other support necessary to further increased efficiency or savings in acquiring knowledge of the geology of Alaska.

OBJECTIVE

1. Facilitate the efficient execution of DGGS programs and projects.

TASKS

- Monitor grants and contracts (Federal, Interagency, and Program Receipts) to ensure deliverables are produced on schedule and within budget; ensure expenses are properly billed against grants and contracts and receipts are collected promptly.
- Provide accurate, timely reporting of project expenditures and current balances; encourage prudent money management.
- Minimize the cost of transportation to the field by coordinating personnel travel and supply shipments
- Coordinate Division vehicle use to minimize requests for reimbursement for personal vehicle mileage.
- Make travel arrangements and complete travel authorizations to ensure use of the lowest-cost travel options.
- Assist staff with personnel matters; inform staff about changes in personnel rules or benefits and ensure that all personnel paperwork complies with applicable rules and regulations. Estimate future personnel salaries and benefits to assist management in making human resource decisions necessary to efficiently accomplish the division's mission.

PROJECT SUMMARIES—FY06

Alaska faces the challenge of growing a healthy economy from its natural resources while protecting an environmental legacy that is the envy of many. The Department of Natural Resources' Division of Geological & Geophysical Surveys is an integral partner in the team of state agencies that strive to meet this challenge. The output from our projects provides the fundamental earth-science information required to guide critical policy decisions, encourage exploration investment, mitigate the effects of geologic hazards, and improve the quality of life for all Alaskans.

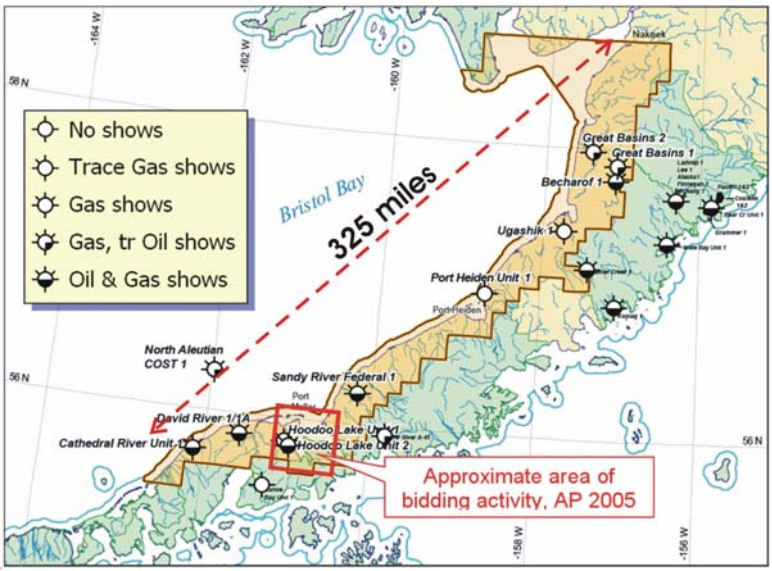
The overviews of the following 39 projects that are being pursued by DGGS in FY06 span the scope of our legislative mission statement. Each of these projects is making a positive difference for Alaska. Many are implemented through various cooperative agreements with other state and federal agencies, universities, in-house project teams, and contracts. We leverage state General Funds through these arrangements so that the Division's work provides the greatest possible benefit from the public's investment.

CONTENTS

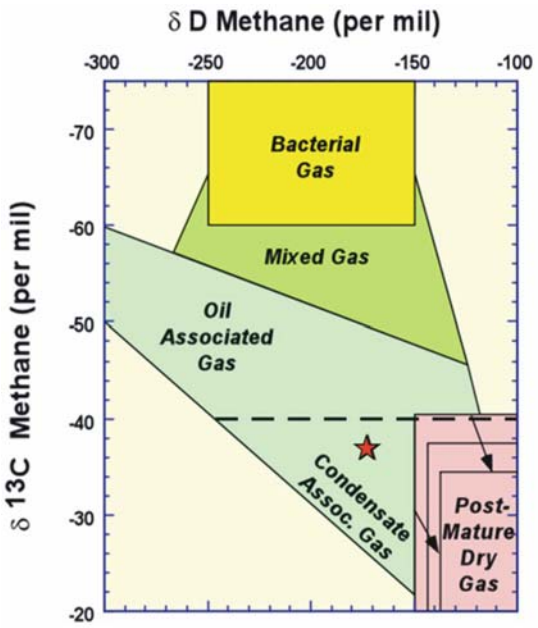
*MDIRA-supported project (see p.13)

BRISTOL BAY, FRONTIER BASIN, ALASKA PENINSULA: HYDROCARBON RESOURCES, PETROLEUM RESERVOIR CHARACTERIZATION, AND SOURCE POTENTIAL

This 3-year program is funded by the U.S. Department of Energy's Alaska Energy Technology Development Laboratory, DGGS, Alaska Division of Oil and Gas, and Bristol Bay Native Corporation. The 2005 field season was the second supported by this grant. Project work is in collaboration with geologists from Purdue University and the University of Alaska Fairbanks. New field data provide the fundamental reservoir characteristics of potential basin targets, place the reservoir data in a stratigraphic and sequence stratigraphic framework, and summarize the structure, organic geochemistry, and hydrocarbon potential of this frontier basin. Data collected thus far have been published in peer-reviewed DGGS reports that are accessible on the DGGS website. Project data, DGGS reports, and national meeting presentations catalyzed interest in the October 2005 area-wide lease sale ($1.3 million in bids over 37 tracts). Bids by Shell Offshore and Hewitt Mineral Company in the 2005 lease sale were all near Port Moller townsite (cannery) and Herendeen Bay. The area includes extensive outcrop, and hosts a prolific seep of dry natural gas, the thermogenic origin of which was recently revealed in published DNR research. Petroleum system plays are in both the Mesozoic and Tertiary sections. At the conclusion of this program (Spring 2007) all final reports and data will be published by DGGS; all rock samples along with reports will be archived at the Geologic Materials Center in Eagle River.



More than 20 wells have been drilled on the Alaska Peninsula; most reported oil and gas shows, but none has produced. Federal offshore resource estimates are 230 million barrels of oil and natural gas liquids, and 6.8 TCF gas (mean estimates: U.S. Minerals Management Service report).



Oil seeps are present in the Jurassic Shelikof Formation south of Puale Bay, on the northeast side of the peninsula. Triassic shallow-water limestone of the Kamishak Formation yields total organic carbon as much as 2.4 percent, hydrogen index of 598 and 474, and oxygen index of 21 and 22, which are encouraging values for potential hydrocarbon sources.

The Miocene Bear Lake Formation, considered an important reservoir play, is at least 3,700 feet (~1,200 meters) thick, and is a deepening-upward succession in the Port Moller area. Porosity and permeability values range from 1 to 35 percent and 0.001 to 1,000 millidarcies. The sand/organic siltstone ratio is estimated at 80/1. Siliceous coal and carbonaceous siltstone occur throughout the entire formation. Thin, siliceous coal deposits also occur in the underlying Upper Cretaceous rocks. These thin but common coal deposits create the possibility for biogenic methane production.

New isotopic gas analyses for the methane gas seep at the Herendeen Bay hot springs indicate a thermogenic source for the gas, which suggests that thermally mature Mesozoic strata may lie at depth.

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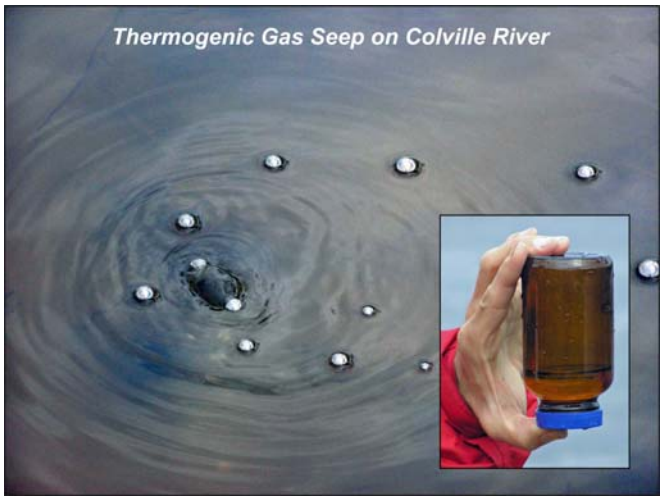
BROOKS RANGE FOOTHILLS PROGRAM

Alaska's North Slope remains one of the most promising onshore oil and gas provinces in all of North America. The Division of Geological & Geophysical Surveys (DGGS) continues its leadership role in furthering the geologic understanding of this petroleum system, primarily through investigations of rocks exposed in the foothills of the northern Brooks Range (see map). This program was developed in response to the need for high quality, publicly available geologic data to stimulate exploration for hydrocarbons in northern Alaska. The cost of this program is shared by major and independent oil and gas companies. While directed by DGGS, this research effort is a multi-agency collaboration that includes the Alaska Division of Oil & Gas (ADOG), the United States Geological Survey (USGS), the University of Alaska, and others.

During the 2005 field season, the program continued to focus on stratigraphic studies of key reservoir and source rock intervals in the foothills of the central Brooks Range. These detailed studies are providing new constraints on the depositional history and correlation of Early Cretaceous units, leading to an improved understanding of how the gas-prone Colville basin evolved. During reconnaissance work in Cretaceous rocks of southern NPRA (see map), we were able to confirm an active gas seep, first discovered by a U.S. Navy geological field party in 1945. In addition to having been active for at least 60 years, the seep is located along the faulted crest of a large anticline. Preliminary carbon and deuterium isotope analyses have established that the hydrocarbon is thermogenic in origin, confirming the presence of a viable petroleum system.



In addition to stratigraphic studies, the program also continued to evaluate the structural geology of the Brooks Range foothills, documenting the geometry and style of deformation. Ongoing apatite fission track thermochronology is also allowing for the recognition of discrete phases of uplift and erosion that influenced hydrocarbon maturation and migration. Finally, in an effort to constrain subsurface relationships in the southern Colville Basin, DGGS collaborated with the ADOG and USGS to conduct a high-resolution gravity survey. Ongoing geophysical modeling of the gravity data along this transect will place critical constraints on the structural configuration of the region, including evaluating the presence of specific play elements at depth (see Siksikpuk River Gravity Survey project description).

Notable upcoming DGGS publications from this program include: (1) a synthesis of nearly a decade of organic geochemical studies conducted by DGGS, (2) the final report on sequence stratigraphy and reservoir architecture of the Nanushuk and Torok Formations, and (3) a basin analysis of the Fortress Mountain Formation (all anticipated late FY06 and early FY07). Additional products will include reports summarizing measured stratigraphic sections, structural cross sections, paleontologic data, provenance studies, and reservoir quality analyses (released during spring FY06).

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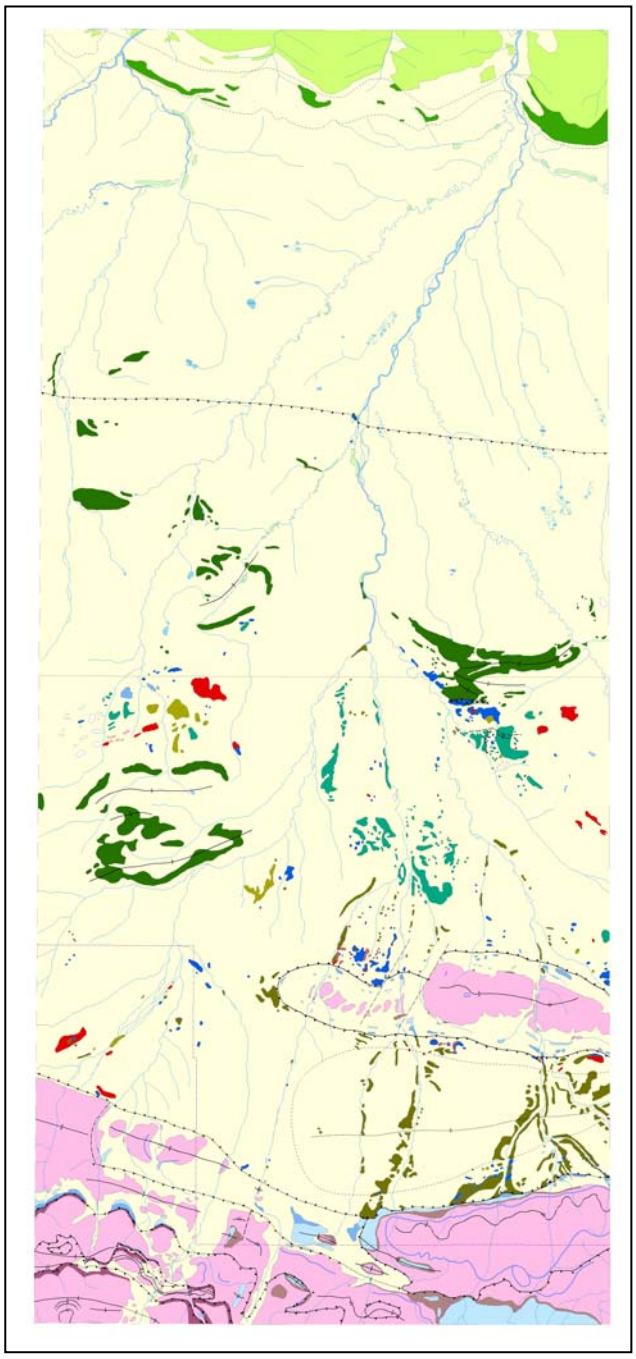
SIKSIKPUK RIVER STATEMAP PROJECT



DGGS proposed a geologic mapping project in the Siksikpuk River area of the Chandler Lake Quadrangle as part of the FY04 and FY05 STATEMAP program. This program is part of the United States Geological Survey National Cooperative Geologic Mapping Program, which provides matching funds to state geologic surveys to prioritize and perform geologic mapping. DGGS is collaborating with University of Alaska Fairbanks and Alaska Division of Oil and Gas geologists on stratigraphic and structural studies associated with the mapping. The area lies along the southern margin of Alaska's remote North Slope, long known for its petroleum potential. This portion of the northern Brooks Range foothills is thought to be strategic for natural gas in particular, and is currently under lease to both major and smaller independent petroleum exploration companies. New mapping in this area provides an opportunity to study, in outcrop, the stratigraphy and structural styles of the source and reservoir rocks that enrich the Colville basin to the north. This new map extends structural and stratigraphic models developed during previous mapping along the foothills to the west, and provides new baseline geologic data to the private and public entities that identify, develop, and manage resources that area.

DGGS is augmenting this STATEMAP mapping project with detailed stratigraphic, sedimentologic, and structural studies. Our stratigraphic analyses include detailed observations of key formations from which we develop representative geologic models. Sedimentologic investigations include both hydrocarbon source and reservoir potential studies. Sampling and analyses include geochemistry to identify source rock potential and to differentiate between similar lithologies. Paleontologic analyses are being performed to define and correlate units and to identify source potential. Isotopic age determinations may be used to date minerals where appropriate to model uplift histories. Thin section samples have also been collected for petrographic determination of lithology and microfacies to differentiate units, characterize porosity and permeability, and determine sediment transport pathways. Porosity and permeability testing of samples are also helping to define their reservoir potential. All of the above studies contribute to interpretations of structural relationships and resource implications.

DGGS mapping and associated research in the map area support not only new foothills exploration by industry currently active on the North Slope, but encourage smaller companies to enter the region as well. Products of this two-year project include a published GIS-based comprehensive geologic map and reports of analytical results. The analytical data, geologic map, and interpretations will be published in final form in December 2006.

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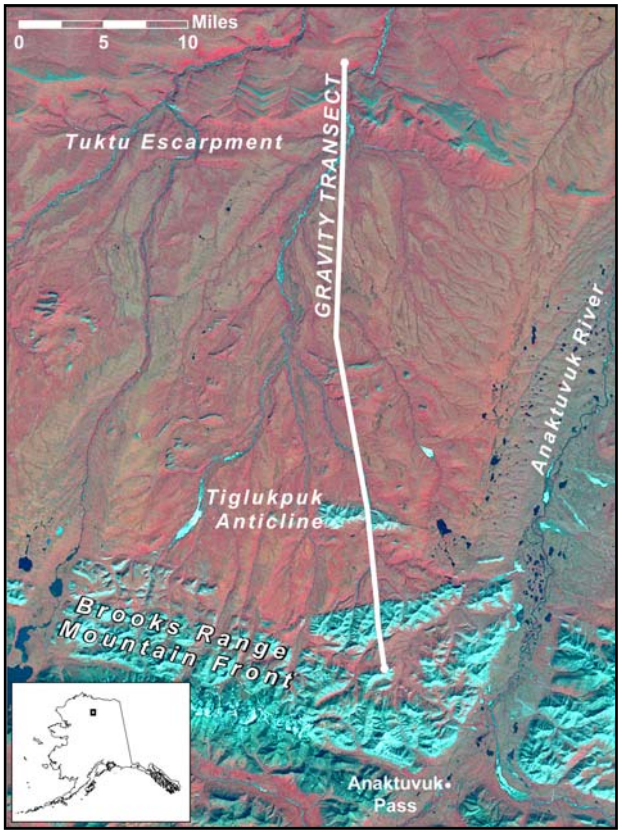
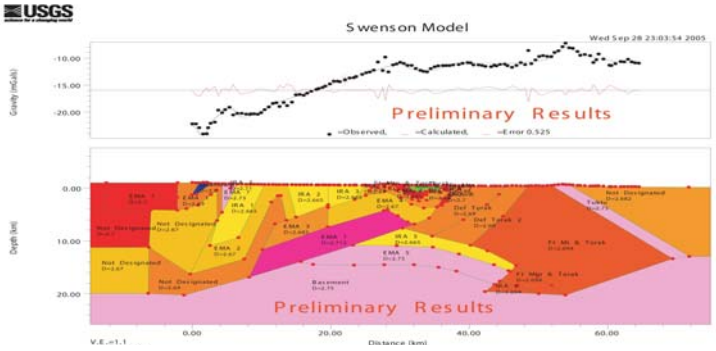
SIKSIKPUK RIVER GRAVITY SURVEY

The northern foothills of the Brooks Range have long been recognized as highly prospective for natural gas. However, despite this resource potential, the province remains underexplored with very few well penetrations. Understanding this complexly deformed zone is critical to hydrocarbon assessment in the state-owned and state-interest lands south of Prudhoe Bay.

Recent DGGS geologic mapping projects in the Brooks Range foothills have advanced in a westward direction across the mountain front and have sought to expand and refine structural and stratigraphic models. While mapping has been helpful to characterize the geology of the area (see Siksikpuk River STATEMAP project description), it is limited by discontinuous exposures. In addition, the structural complexity and associated steeply dipping strata in the foothills belt were not well imaged by existing conventional seismic data in this region. To provide additional subsurface control, ground station gravity data were collected to allow more accurate interpretation of geologic structures. The USGS Crustal Imaging and Characterization team provided personnel and instrumentation to complete the gravity survey within the Siksikpuk map area in collaboration with DGGS and the Alaska Division of Oil and Gas. These new measurements represent nearly an order of magnitude improvement in both the amount and precision of data relative to existing gravity data. The data were collected along a transect between the mountain front and Tuktu Escarpment, paralleling the line where DGGS is currently investigating and modeling a structural transect perpendicular to strike.



The gravity survey crosses Tiglukpuk anticline, a major structural culmination exposing the northernmost strata that can be definitively tied to the Endicott Mountains Allochthon (EMA). The distribution of this structural unit has significant implications regarding the oil and gas potential of the foothills belt. The EMA contains an excellent Triassic source rock and thick Mississippian carbonate package with locally excellent reservoir quality. The broad gravity high in the central portion of the profile is consistent with the possible presence of the higher-density, carbonate-bearing EMA rocks further north in the subsurface than previously mapped. Additional gravity modeling will further refine our interpretations.



Location of gravity transect (map, upper left) and preliminary gravity model based on structural interpretation (above)

Preliminary results of the gravity modeling were presented in December 2005 at the annual meeting of the American Geophysical Union. Final gravity survey results will be published as a DGGS Report of Investigations in December 2006 with an updated structural model in conjunction with the Siksikpuk River STATEMAP project geologic map.

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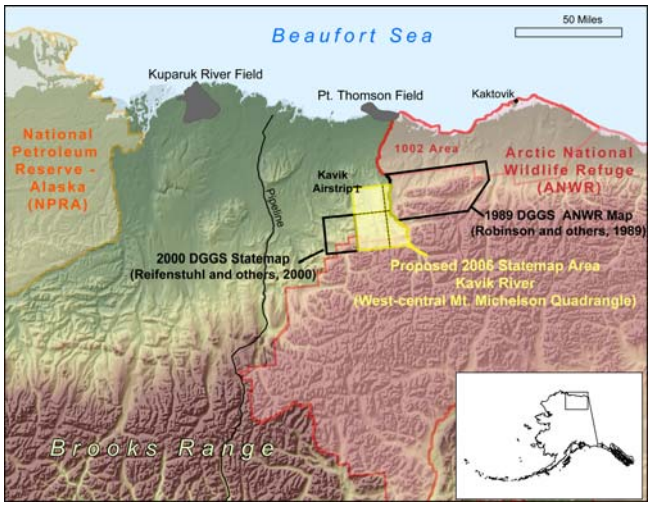
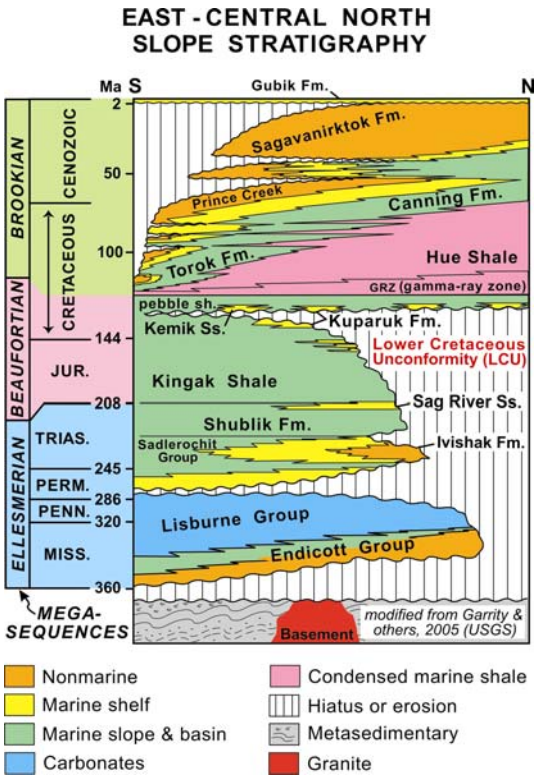
PROPOSED GEOLOGIC MAPPING IN THE KAVIK RIVER AREA, WEST-CENTRAL MT. MICHELSON QUADRANGLE

Despite declining reserves at giant oil fields like Prudhoe Bay, northern Alaska remains a world class petroleum province and continues to attract exploration by both major and independent oil and gas companies. For more than a decade, the Alaska Division of Geological & Geophysical Surveys (DGGS) has sought to entice new exploration and assist ongoing efforts, by conducting geologic mapping along the northern foothills of the Brooks Range (for example, see Siksikpuk River STATEMAP project description). Many of the geologic relationships delimited by our surface mapping along the mountain front can be projected northward into the subsurface, where the geology is obscured by tundra cover. It is a long-range objective at DGGS to eventually produce a contiguous series of detailed geologic maps along the entire foothills belt, thereby establishing a regional geologic framework necessary to understand the evolution of the petroleum system.





During the summer of 2006, DGGS plans to conduct 1:63,360-scale geologic mapping of more than 500 square miles of the eastern North Slope (see map). The proposed Kavik River map area borders the western boundary of the Arctic National Wildlife Refuge (ANWR), one of the most prospective onshore oil and gas provinces remaining in North America. In addition, geologic mapping in this area will fill a gap between two previous 1:63,360-scale maps published by DGGS (Reifenstuhl and others, 2000; Robinson and others, 1989). Support for this mapping is pending through the federally funded STATEMAP program. If approved, the final map product will be released as a DGGS Report of Investigation during the summer of 2007.

Detailed geologic mapping in the Kavik River area will allow for the investigation of numerous important questions related to the geologic evolution of northern Alaska. It is one of a few areas where all three major depositional sequences can be mapped in close association (Ellesmerian, Beaufortian, and Brookian; see figure at left). The unique exposures of the Beaufortian Megasequence are particularly noteworthy and are not present in our recent mapping areas in the central Brooks Range foothills. This Jurassic to Early Cretaceous rift-related succession is associated with the opening of the Arctic Ocean Basin and includes a prominent Lower Cretaceous unconformity (see figure at left) that is the critical trapping mechanism for many successful oil and gas fields along the northern margin of Alaska (for example, Kuparuk River, Pt. Thomson, and many other discoveries).

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Robinson, M.S., Decker, John, Clough, J.G., Reifenstuhl, R.R., Bakke, Arne, Dillon, J.T., Combellick, R.A., and Rawlinson, S.E., 1989, Geology of the Sadlerochit and Shublik Mountains, Arctic National Wildlife Refuge, northeastern Alaska: Alaska Division of Geological & Geophysical Surveys Professional Report 100, 1 sheet, scale 1:63,360.

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COALBED METHANE FOR RURAL ALASKA ENERGY

Coalbed gas is a low-cost clean-burning fuel that is comparable in heating value (~1,000 Btu/scf) to conventional natural gas. Coal seams underlie many rural Alaska villages that currently depend on expensive diesel fuel for heating and electrical power generation. A cooperative effort between the Division of Geological & Geophysical Surveys (DGGS), U.S. Department of Energy–Arctic Energy Office (USDOE), U.S. Geological Survey (USGS), U.S. Bureau of Land Management–Alaska (BLM), and the University of Alaska Fairbanks (UAF) evaluated the potential for a local source of economically producible coalbed methane in Fort Yukon, a remote community in Interior Alaska. The presence and quantity of producible coalbed gas in these basins remains unknown and untested until test drilling can assess the quantity and quality of this resource. Coalbed methane that is locally produced and consumed economically using shallow well fields and short pipelines in remote villages like Fort Yukon, isolated from the urban power grids, could lower energy costs and reduce the potential for catastrophic spills associated with the transportation and storage of large volumes of diesel fuel typically used to meet rural energy needs.

Under the cooperative effort, shallow drilling operations were conducted to evaluate the gas content and hydrology of coal seams beneath Fort Yukon in late summer 2004. This project was intended to demonstrate the use of a light weight drill rig for exploration and development of natural gas from coal, and to assess the economic feasibility of extracting natural gas from coal in remote Alaska villages using this technology. An additional side benefit of this project has been the use of the drilling mud, predominantly bentonite, as a sealant for an old landfill in the community. This opportunity provides for proper disposal of this product and protects the water table and river from possible contaminants from the landfill. Drilling began August 21, 2004; coring of the first coal began on August 26 at a depth of approximately 1,280 feet. Coal cores were collected for analysis of gas content and composition; water from the coal seam was sampled for chemical analysis. A second coal seam was successfully cored on September 1 at a depth of approximately 1,905 feet with the final hole depth of 2,287 feet reached on September 3. Core samples were analyzed for methane content, formation transmissivity, and water quality. Preliminary results of the gas content analyses suggest that the gas saturation levels of the coals are in the 20 to 30 percent range on average, with a maximum of about 50 percent in one canister. Based on these preliminary test results, the low gas saturation levels would require pumping excessively large volumes of water from the coal seams to produce gas. Therefore, coalbed gas development at Fort Yukon is not likely to be economic. Preliminary water quality analyses indicate that the subsurface water is potable.

A final project report will be completed and submitted to USDOE in December 2005. This report will be written by DGGS, UAF, USGS, and BLM and will include chapters on the Fort Yukon fuel gas requirements, coal seam gas content, coal seam water quality, drill core geology, recommendations for future exploration in Fort Yukon, and the application and feasibility of small-diameter drill hole CBM exploration-to-production technology in rural Alaska. Individual peer-reviewed reports on these chapters will be submitted for journal publication in third quarter FY06.

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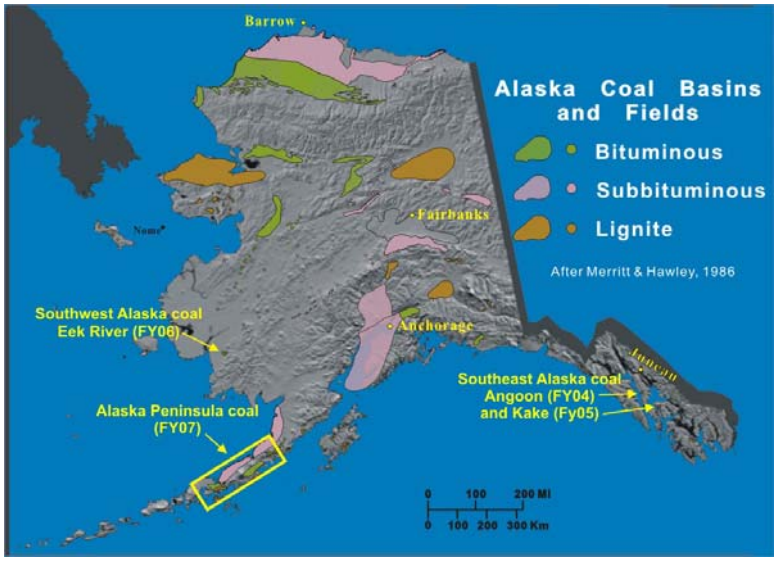
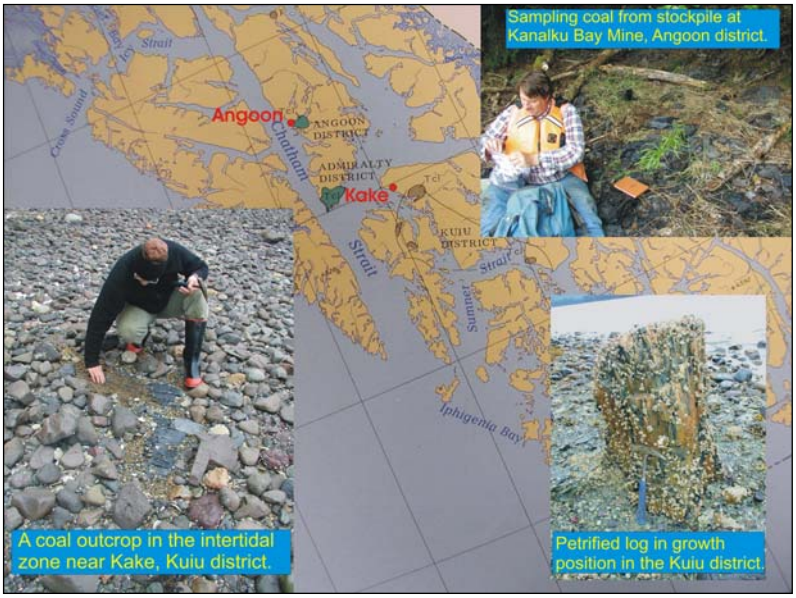
ALASKA COAL DATABASE
NATIONAL COAL RESOURCE DATABASE SYSTEM

The long-term goal of the Alaska Division of Geological & Geophysical Surveys' (DGGS) participation in the U.S. Geological Survey's (USGS) National Coal Resource Database System (NCRDS) cooperative program is to record all known coal occurrences in Alaska and archive the information in a single, readily accessible database available at the USGS Web site: http://energy.er.usgs.gov/products/databases/USCoal/. The NCRDS program is funded through a multi-year proposal process with final reporting at the end of each funding period. Alaska's coal resources make up about half of the United States' coal-resource base and approximately one-sixth of the total world-resource base. Total identified Alaska coal resources (all ranks) amount to only about 160 billion short tons, yet hypothetical and speculative resources are as high as 5.5 trillion short tons. This wide disparity in the estimates of coal resources is due to both a considerable lack of subsurface data obtained through drilling and the lack of modern coal seam descriptions and geographically located data. During the course of gathering information to expand the NCRDS database for Alaska, the need was recognized to collect new coal samples and current stratigraphic data. Some locations of coal occurrences, as described in older literature, are inadequate or incorrect, and the description is insufficient for a proper resource assessment. The most frequent problems we have encountered are unverified coal seams and coal sample locations, suspect coal quality analyses, and insufficient stratigraphic control. The current NCRDS project was initiated to accurately locate the poorly known coal fields in Southeast and Southwest Alaska and provide new coal-quality data and accurate stratigraphic information for meaningful coal resource assessments.



During the 2003, 2004, and 2005 summer field seasons, DGGS and BLM personnel conducted field examinations of coal outcrops in the Kake (Kuiu coal district) and Angoon (Angoon coal district) areas of Southeast Alaska (figure at right). A paleontologic study of Tertiary flora was conducted to determine age and paleo-environment of coal deposits. In 2005, coal deposits near the Eek River in Southwest Alaska were evaluated and sampled. Coal samples collected from all three areas were submitted for proximate, ultimate, and trace-element analyses. During FY06–FY07, coals on the Alaska Peninsula will be sampled as part of the next funding cycle of NCRDS proposed projects. The Alaska Peninsula is an area of renewed oil and gas exploration and this new information will benefit the exploration of energy resources in the region. Final products include a final written report that provides sample localities, coal seam characteristics, coal quality, measured stratigraphic sections (where deemed necessary), and point-source data to be placed into the Alaska coal resource portion of the NCRDS. The Angoon, Kake, and Eek River coal report will be released in May 2006. The Alaska Peninsula report will be released in May 2007.



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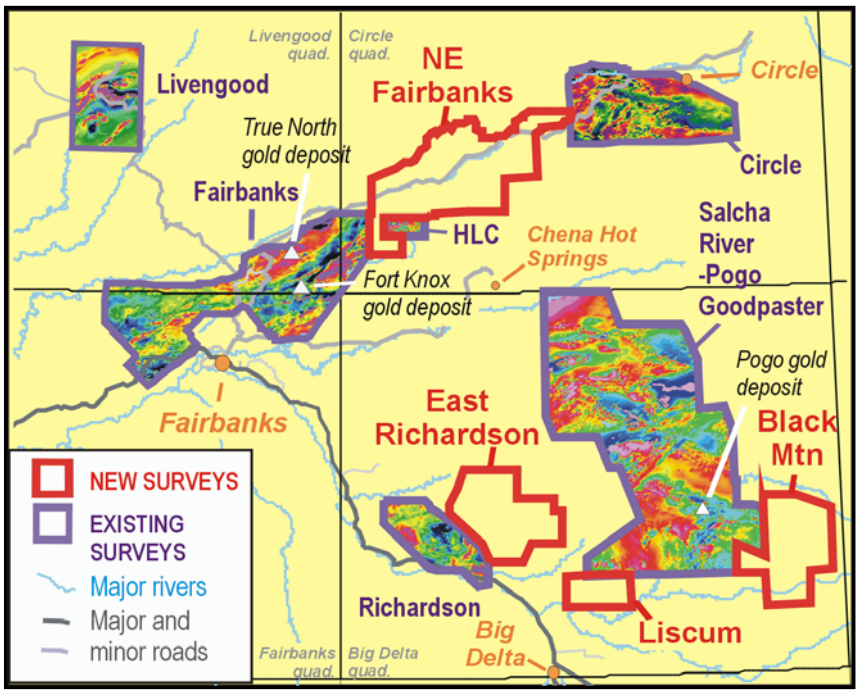
AIRBORNE GEOPHYSICAL/GEOLOGICAL MINERAL INVENTORY: AIRBORNE GEOPHYSICAL SURVEY OF SELECTED MINING DISTRICTS

The Airborne Geophysical/Geological Mineral Inventory (AGGMI) project is a special multi-year investment to expand the knowledge base of Alaska's mineral resources and catalyze private-sector mineral development. The project seeks to delineate mineral zones on Alaska state lands that: (1) have major economic value; (2) can be developed in the short term to provide high-quality jobs for Alaska; and (3) will provide economic diversification to help offset the loss of Prudhoe Bay oil revenue. Candidate lands for this project are identified on the basis of existing geologic knowledge, land ownership, and responses to solicitations for nominations from Alaska's geologic community. Products resulting from these surveys generally include (1) 1:63,360-scale aeromagnetic and airborne-electromagnetic maps; (2) 1:63,360-scale bedrock and surficial geologic maps; (3) 1:63,360-scale mineral occurrence maps; and (4) and various other geological, geochemical, and geophysical data compilations. As a result of this program, millions of dollars of venture capital have been spent in the local economies of the surveyed mining districts and adjacent areas in direct response to the new geologic knowledge provided by the surveys.

DGGS is currently acquiring airborne-geophysical data for the AGGMI program in four interior survey tracts (shown in red). These tracts cover more than 500,000 acres of prospective mineral terranes of State, State-selected and Native lands. The geology and potential for mineral lode deposits in the survey tracts is poorly known because of extensive vegetative cover and lack of detailed mapping. Airborne geophysical surveys and follow-up detailed geologic mapping will provide a way to map various lithologic units, especially distinguishing between granitic rocks and the various metamorphic units, and to delineate regional structures. By completing an integrated geophysical-geological mineral inventory study, new zones of gold mineralization may be identified.



Geophysical data acquisition for these survey tracts was completed by Stevens Exploration Management Corp. and their subcontractor, Fugro Airborne Surveys, in November 2005. Maps and digital data will be released as DGGS Geophysical Reports in early 2006. Other geophysical publications to be released in FY06 through the AGGMI project include updated maps and digital data formats for the Rampart–Manley, Chulitna, and Petersville geophysical surveys flown in 1996 and 1997. The new publications for these areas include plot files and good quality topographic data combined with full-color image data through a map process that was not technologically feasible when the data were originally released.

DGGS believes that geophysical data leading to a better understanding of the geologic framework hosting identified and potential ore deposits in these districts will stimulate increased mineral exploration investment within these belts of rocks and the surrounding areas. The geophysical and geological data that are produced from these studies will be used for decades.

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SOUTHERN NPRA AIRBORNE GEOPHYSICAL PROJECT

The U.S. Bureau of Land Management (BLM) and the Alaska Division of Geological & Geophysical Surveys (DGGS) conducted an airborne geophysical survey for about 1,450 square miles of the southern part of the National Petroleum Reserve–Alaska (NPRA). The survey was funded by the BLM through a cooperative agreement with DGGS in support of DGGS's statewide airborne geophysical survey program. The objective of the NPRA survey is to expand the geophysical database available to government agencies and the public with respect to the mineral potential of the southern NPRA. This survey will contribute significant data on mineral-resource potential for BLM's upcoming land-use plan. These data will provide timely information to policy makers, the resource industry, and the public regarding hardrock minerals in the area.

The NPRA contains 22 known mineral occurrences. These occurrences are concentrated near the southern portion of the reserve and contain such commodities as lead, zinc, silver, barite, and phosphate. Of greatest significance is a series of zinc–lead–silver occurrences that lie along a 70-mile-long belt near the southern boundary of the reserve. Drenchwater Creek appears to be a stratiform or blanket-like concentration of sphalerite and galena (zinc and lead ore). High potential exists for a large zinc–lead deposit at Drenchwater. Drilling and trenching would be required to determine conclusively whether this mineral occurrence is comparable to the world-class Red Dog deposit, which lies approximately 110 miles to the west–southwest. An alternative to drilling is airborne geophysics, which, while not as conclusive as drilling, can delineate subsurface geologic features over a broad area. The benefits of airborne geophysics are many: Quick acquisition, large coverage area, and no impact on the ground.

The reserve also contains a series of bedded barite (barium ore) occurrences. The most significant are located in the Cutaway Basin area and consist of massive beds of barite. Initial estimates indicate that this area contains an inferred resource of 50 million tons. These deposits have the potential to provide a source of drilling mud for North Slope oil operations. The reserve contains extensive deposits of bituminous and subbituminous coal with resources on the order of 300 million tons. This region may contain up to 40 percent of the total coal-resource potential of the United States. With the increased interest in coalbed natural gas, the coal resources may play a critical role in providing rural Alaska communities with more economical sources of energy.

This project is the seventh cooperative BLM–DGGS airborne geophysical project since 1995. The BLM geophysical projects are similar to the geophysical portion of the Alaska Airborne Geophysical/Geological Mineral Inventory program funded by the State of Alaska, but tend to concentrate on Federal and Native lands instead of State and Native lands. The role of DGGS in these BLM-funded projects is to contract and monitor geophysical data acquisition and processing, and to release the geophysical data to the public. These airborne surveys are an essential element of the State of Alaska's and U.S. Bureau of Land Management's ongoing programs to encourage exploration in promising mineral districts within Alaska and to make mineral information available to the public.

Acquisition of aeromagnetic and electromagnetic data for the southern NPRA survey tract was accomplished in July and August 2005 by Stevens Exploration Management Corp. who subcontracted Fugro Airborne Surveys. The maps and digital data will be released to the public in early 2006.

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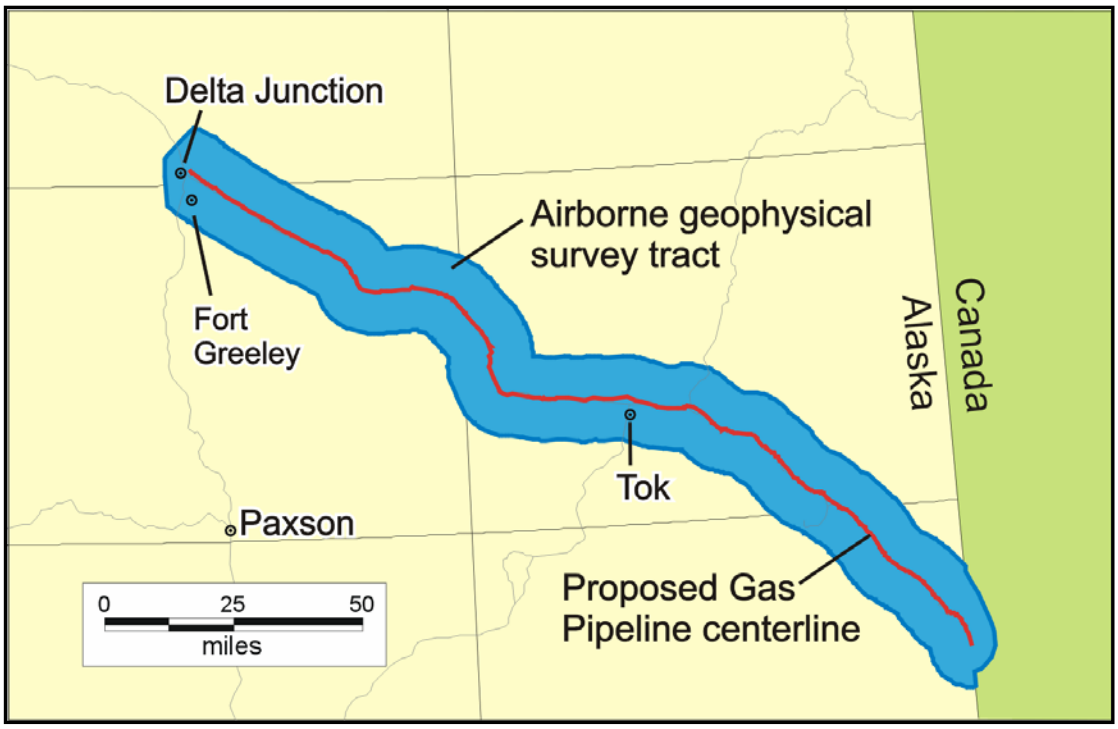
AIRBORNE GEOPHYSICAL SURVEY OF THE PROPOSED GAS PIPELINE CORRIDOR, INTERIOR ALASKA: FIRST PHASE OF GEOLOGIC HAZARDS AND RESOURCES EVALUATION

With FY05 supplemental funding, DGGS is conducting the first year of a proposed multi-year project to assess the geologic hazards and construction materials resources along the proposed natural gas pipeline corridor from Delta Junction to the Canadian border. The information will aid in design and construction of the pipeline and will be useful for future developments such as the proposed Alaska Railroad extension and other public and private development that will occur as a result of improved access in this corridor. Products from this first year will be detailed airborne geophysical surveys of a 15-mile-wide corridor; future geologic mapping will concentrate on a 10-mile-wide corridor. Some areas in and near Fort Greely will not be surveyed for either geophysical or geologic data because of Department of Defense access restrictions.



Basic geologic information is critical when planning a major engineering project. Airborne geophysical data (aeromagnetic and electromagnetic) is the fastest and least costly way to cover large areas and initiate acquiring the needed data for such a project; the information acquired through this method can direct geologists toward determining type of bedrock, depth and type of overburden, and location of geologic hazards, such as fracture zones. The electromagnetic system being used (Fugro Airborne Surveys' RESOLVE system) acquires more information from the near-surface material than the electromagnetic systems typically used for mining district investigations. The RESOLVE system was designed to provide information for engineering and environmental concerns. The contractor will provide geophysical modeling of selected portions of the survey tract; where appropriate, the modeling will provide further information on probable location of aggregates, depth of overburden, stability, and permafrost.

The geophysical data will be released by DGGS in spring 2006 in the form of digital data and aeromagnetic and apparent resistivity maps. The contractor's report and modeling results should be released in early summer 2006. DGGS plans to initiate geologic mapping of the proposed gas pipeline corridor in summer 2006.

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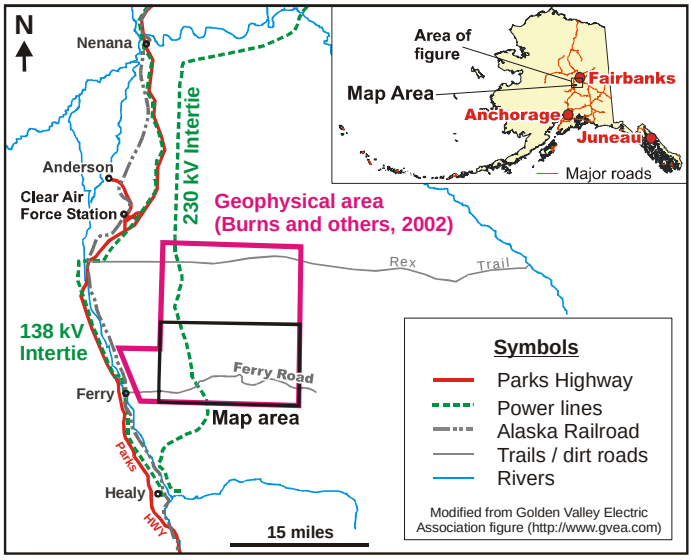
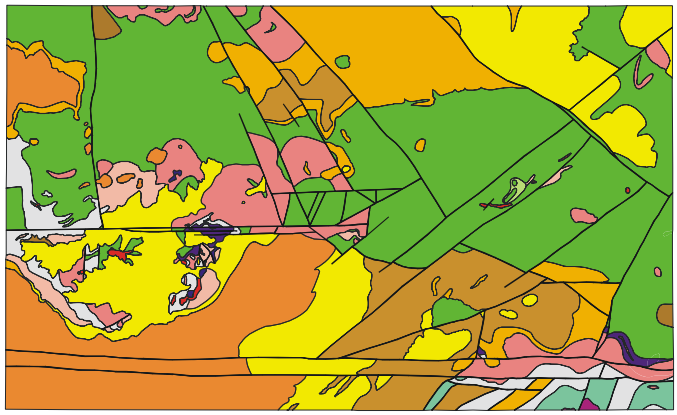
GEOLOGIC GROUND-TRUTH INVENTORY OF LIBERTY BELL, WESTERN BONNIFIELD MINING DISTRICT GEOPHYSICAL SURVEY TRACT

DGGS released airborne magnetic and electromagnetic geophysical maps for 276 square miles near Liberty Bell, western Bonnifield mining district in March 2002. During the summer of 2005, DGGS conducted fieldwork for 21 days, covering 131 square miles of the geophysical survey tract. The Liberty Bell project is part of DGGS's airborne geophysical/geological mineral inventory project, a special multi-year investment by the State of Alaska to expand Alaska's geologic and mineral resources knowledge base, catalyze future private-sector mineral exploration and development, and guide state planning. Other funding sources include the federal STATEMAP program and the State's General Fund.



The Bonnifield district is located about 80 miles south of Fairbanks and extends across the north flank of the Alaska Range for approximately 40 miles. The western part of the district is highly accessible. The existing transportation corridor and nearby electricity would facilitate mineral development of this area. Approximately 85,000 ounces of placer gold have been mined from the region since 1903 (Szumigala and Hughes, 2005), with most production from the western part of the district. Eleven placer gold mines (three active) and eight metallic lode occurrences occur in the proposed map area (Alaska Resource Data Files [ARDF]). The Liberty Bell gold mine is the major lode occurrence known in the mining district. The Liberty Bell property has an announced potential of 250,000 ounces of gold, with inferred resources of 1,240,000 tons at an average grade of 0.1 ounces of gold per ton at the Mine Zone (ARDF). The Liberty Bell mineralization has the same general age and character seen in Tintina gold belt plutonic-related gold systems.



1:50,000-scale draft geologic map of the Liberty Bell area (this study).

Bedrock at the Liberty Bell mine is dominated by weakly metamorphosed volcaniclastic, felsic igneous, and sedimentary rocks of the California Creek Member of the Totatlanika Schist (Late Devonian–Early Mississippian age) (Yesilyurt, 1996; Dusel-Bacon and others, 2004). Late Cretaceous felsic porphyry dikes and plugs, and metamorphosed mid-Paleozoic rocks occur throughout the map area. Tertiary continental clastic rocks of the coal-bearing Usibelli Group and Nenana Gravel discontinuously overlie these older rocks in angular unconformity. A complex system of dormant and recently active faults displaces this geologic section.

DGGS believes that new geologic mapping with interpretation of geophysical data will lead to: (1) a better understanding of the tectonic framework of the northern Alaska Range foothills, which is demonstrated by recent earthquakes to be a hazard to important Alaskan infrastructure and (2) increased mineral exploration investment within this belt of rocks in the western Bonnifield district. This project's products will be a series of geologic maps at 1:50,000 scale, and reports containing geological, geochemical, and geophysical data compilations. Geologic maps will be completed by June 2006.

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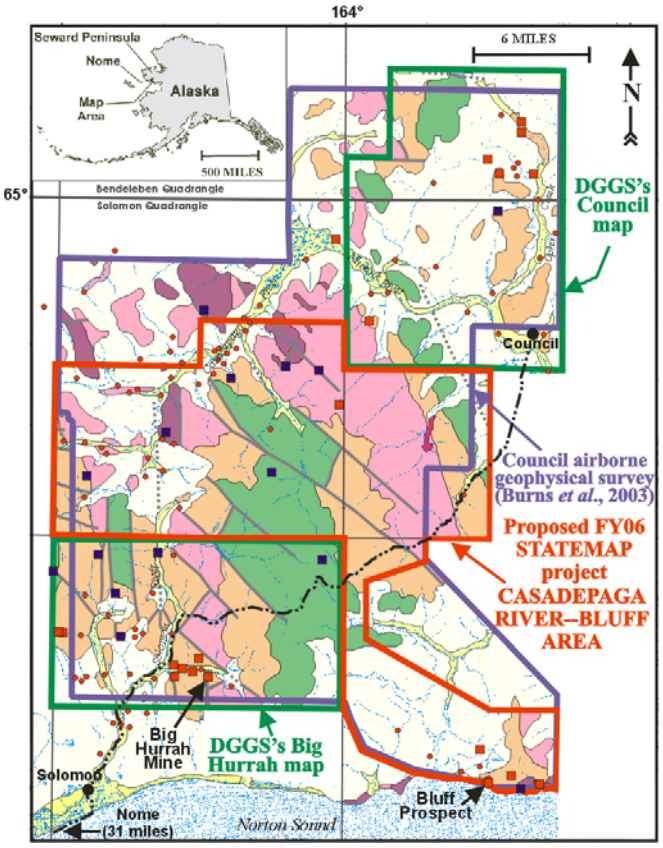
AIRBORNE GEOPHYSICAL/GEOLOGICAL MINERAL INVENTORY PROGRAM: GEOLOGIC MAPPING IN THE COUNCIL GEOPHYSICAL SURVEY TRACT

More than 1 million ounces of placer gold have been extracted from the Solomon–Council area of the Seward Peninsula of Alaska since the turn of the century. To encourage industry exploration for lode gold and base-metal deposits in this region, in 2003 the Alaska Division of Geological & Geophysical Surveys (DGGS) released an airborne-geophysical survey for the area outlined in purple as part of the State-funded Airborne Geophysical/Geological Mineral Inventory (AGGMI) program (see figure; Burns *et al.*, 2003). In 2004, DGGS conducted 1:50,000-scale geologic mapping in the Big Hurrah and Council areas (outlined in green). This mapping was primarily funded by the AGGMI program, with partial support from the federal STATEMAP program. In 2006, pending additional STATEMAP support, we plan to extend this mapping into the Casadepaga River–Bluff area (outlined in red), and produce a combined map of the three regions by June 2007. The purpose of DGGS's mapping is to provide geologic context for known lode gold and base-metal deposits and occurrences, and evaluate the area's mineral resource potential. The Casadepaga River–Bluff map area contains the Bluff lode gold prospect, and covers the headwaters of the Casadepaga River, known for its rich placer gold deposits. The lode sources of this placer gold have not yet been identified.



The Casadepaga River–Bluff region is underlain by Proterozoic to Lower Paleozoic metasedimentary and metaigneous rocks of the Nome Group. In the map area, the Nome Group has been broadly subdivided into the Solomon Schist, Mixed Unit, Casadepaga Schist, and Marble (Till *et al.*, 1986). DGGS's 2004 geologic mapping documented the internal metamorphic stratigraphy of these units, but their ages and relative stratigraphic positions are still poorly known. Efforts to determine protolith ages were initiated in 2004; several analyses are pending, and additional work is planned for 2006. Stratigraphic and protolith-age information is essential for evaluating the depositional environment and economic potential of the base-metal sulfide deposits hosted by the Nome Group.

Detailed geologic mapping and sampling will also be undertaken by DGGS in the Casadepaga River–Bluff area to document the location, geochemistry, age, distribution, orientation, and regional structural controls on the area's gold-bearing quartz vein systems. In order to model where additional veins may be located, it is important to determine the timing of gold-vein formation relative to structural features, metamorphic events, and igneous intrusions. Our preliminary work indicates that Nome Group rocks underwent high-pressure blueschist-facies metamorphism at ~200 Ma, and were later partially overprinted by a greenschist-facies mineral assemblage. Rare, volumetrically minor, extension-related alkalic dikes of Early Cretaceous to Quaternary(?) age are scattered throughout the Big Hurrah and Council map areas, but are not spatially associated with gold-bearing quartz veins. Gold-bearing quartz + white mica ± plagioclase ± carbonate veins (so far) yield $^{40}Ar/^{39}Ar$ white mica ages of 107 to 119 Ma. Ongoing Rb/Sr, $^{40}Ar/^{39}Ar$, petrographic, microprobe, conodont, and other studies by DGGS and University of Alaska personnel will soon provide additional insights into the region's geologic, metamorphic, and structural history, and its lode-gold and base-metal mineral potential.

References cited

Burns, L.E., Fugro Airborne Surveys, and Stevens Exploration Management, 2003, Plot files of the airborne geophysical survey data of the Council area, Seward Peninsula, Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report GPR 2003-1, 1 CD-ROM.

Till, A.B., Dumoulin, J.A., Gamble, B.M., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data, Solomon, Bendeleben, and southern Kotzebue quadrangles, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 86-276, 71 p., 3 plates, scale 1:250,000.

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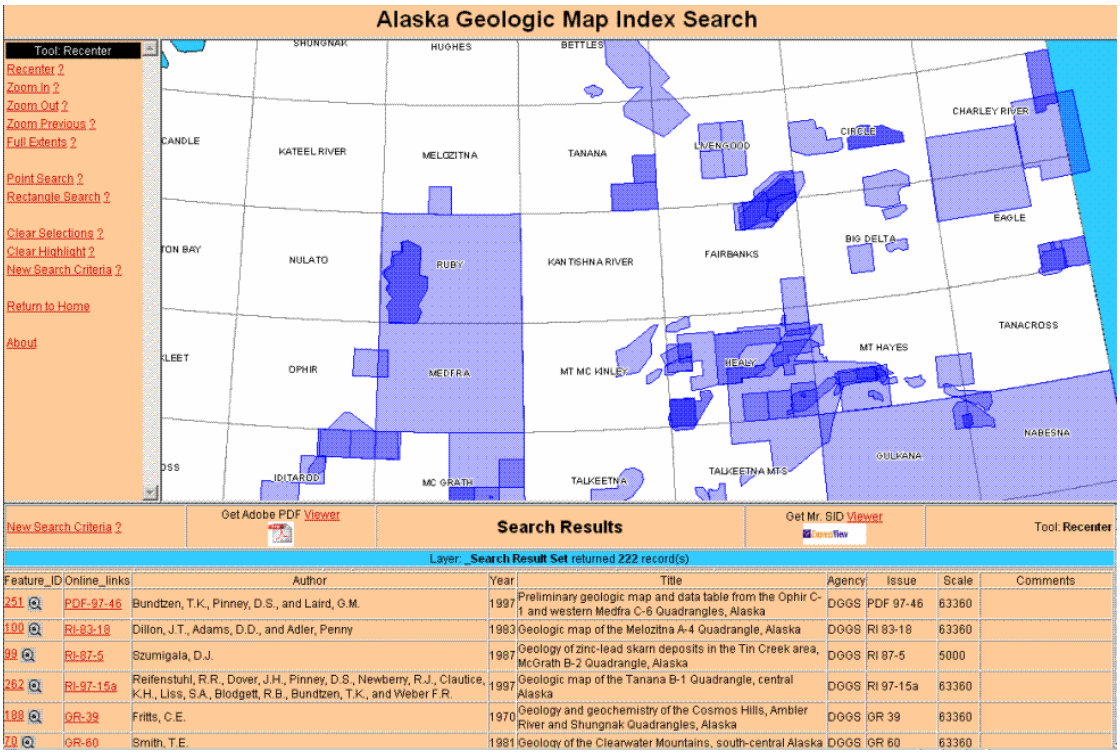
COMPILATION OF ALASKA BEDROCK, SURFICIAL, AND GEOPHYSICAL MAP INDEX PROJECT

The Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS) and Land Records Information Section (LRIS) released the first version of an application that portrays the locations of geologic maps from all government agencies in a single, interactive, Internet-accessible location. The "Alaska Geology Map Index" site <http://maps.akgeology.info/> was made accessible to the public in early November 2003 and currently contains about 300 citations and outlines for DGGS-authored geologic maps. Outlines for geologic maps made by other government agencies, mainly the U.S. Geological Survey, and geophysical surveys published by DGGS and other government agencies will be added by DGGS during FY06 and FY07.



Feature_ID	Online_links	Author	Year	Title	Agency	Issue	Scale	Comments
251	PDF-97-46	Bundtzen, T.K., Pinney, D.S., and Laird, G.M.	1997	Preliminary geologic map and data table from the Ophir C-1 and western Medfra C-6 Quadrangles, Alaska	DGGS	PDF 97-46	63360	
100	RI-83-18	Dillon, J.T., Adams, D.D., and Adler, Penny	1983	Geologic map of the Melozitna A-4 Quadrangle, Alaska	DGGS	RI 83-18	63360	
99	RI-87-5	Szumigala, D.J.	1987	Geology of zinc-lead skarn deposits in the Tin Creek area, McGrath B-2 Quadrangle, Alaska	DGGS	RI 87-5	5000	
262	RI-97-15a	Reifenstuhl, R.R., Dover, J.H., Pinney, D.S., Newberry, R.J., Clautice, K.H., Liss, S.A., Blodgett, R.B., Bundtzen, T.K., and Weber F.R.	1997	Geologic map of the Tanana B-1 Quadrangle, central Alaska	DGGS	RI 97-15a	63360	
188	GR-39	Fritts, C.E.	1970	Geology and geochemistry of the Cosmos Hills, Ambler River and Shungnak Quadrangles, Alaska	DGGS	GR 39	63360	
70	GR-60	Smith, T.E.	1981	Geology of the Clearwater Mountains, south-central Alaska	DGGS	GR 60	63360	

The purposes of the Alaska Map Index Project are to (1) allow users to search for and quickly retrieve geological and geophysical maps through a map-based, graphic search interface and (2) make information about the current status of bedrock and surficial geologic mapping of Alaska widely accessible to the mineral industry, federal and state agencies, and others. Currently, an up-to-date, geographically based index of DGGS, USGS, U.S. Bureau of Land Management (BLM), and U.S. Bureau of Mines (BOM) Alaska geologic maps does not exist. This information will make it easier for the public and government agencies to easily find the geologic maps they need to make informed decisions. The program is part of the federal Minerals Data and Information Rescue in Alaska (MDIRA) program. The primary objective of the MDIRA program is to ensure that all Alaska mineral data are preserved in a safe and readily accessible format for all potential users.

Improvements to the first version of the Web interface will be made by LRIS during FY06 and FY07. Currently, besides allowing searching by rectangle or by point, the interface shown above provides links to scanned reports and maps for each DGGS citation. Links to scanned USGS publications will be provided when available on our Web site. Subsets of map outlines based on map categories, such as "bedrock geology," "surficial geology," "resources-metals, lode", and "hazards, permafrost" may also be produced by the user through another associated Web page.

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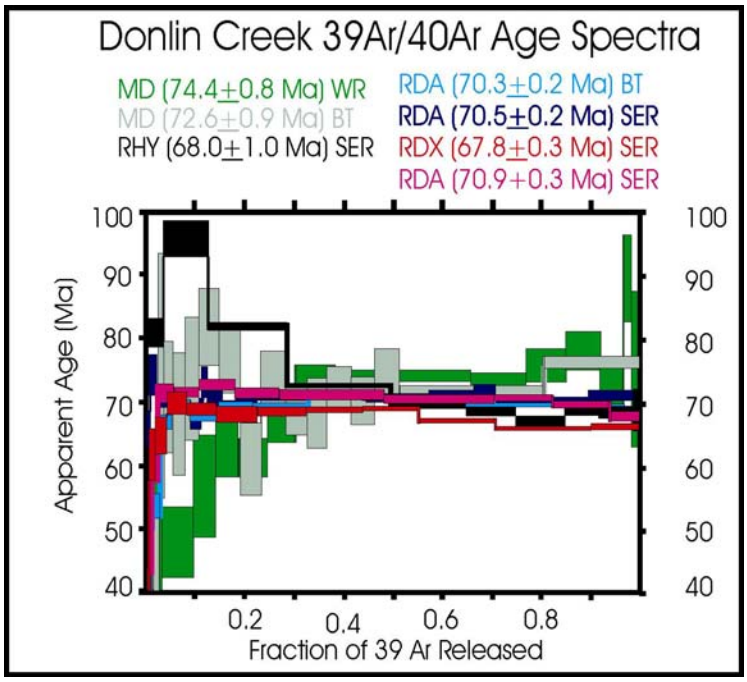
GEOCHRONOLOGIC DATABASE FOR ALASKA



In Spring 2005 the Alaska Division of Geological & Geophysical Surveys (DGGS) began to develop a geochronologic database for Alaska. The geochronologic database will contain age data and associated information for all available radiometric dates for rocks and minerals in Alaska. The objective of this project is to expand the most-current existing compilations of radiometric data and to make this age information widely accessible to private industry, academia, and government. This project is part of the federally funded Minerals Data and Information Rescue in Alaska (MDIRA) program. The primary objective of the MDIRA program is to ensure that all Alaska mineral data are preserved in a safe and readily accessible format for all potential users. Information on mineral resources is important for management policy decisions in both the public and private sectors. Higher quality data should lead to better economic, legislative, and environmental decisions.

DGGS's existing Oracle-based relational database structure is being used as a starting point for the structure of the geochronologic database. Additional fields will be added after consulting laboratory analysts and other geologists with a vested interested in using the database. The database will include dates for all available U-Pb, K-Ar, $^{40}Ar/^{39}Ar$, and Rb-Sr data for Alaska. The initial source of age data will be the previous compilations by Wilson and others (1990; 1999). Additional radiometric dates will be compiled from both published and unpublished sources, starting in August 2005. In addition to updating the existing compilations, this database project will add essential basic supporting information that is currently not easily accessible. This information includes items such as raw analytical data, standards, constants used in calculations, analytical laboratory, analyst, sample preparation and processing steps, sampling agency and geologist, and sample context and descriptions where the data are available. Much of the supporting data are present in the original publications for the age data, including unpublished student theses, or are archived in laboratory or industry files. Where data are not available in published form, letters requesting more information will be sent to appropriate geologists, requesting that they provide the data if they have it or, more likely, that they will give permission for the laboratory to provide the information. GeoRef and a dataset currently under construction at DGGS, the *Bedrock and Surficial Geologic Map Index*, will be used to search for additional sources of data.

This geochronologic database will provide a centralized, up-to-date, digital source of radiometric ages. Addition of the basic supporting data, where possible, will allow the geoscience community to critically evaluate the validity of these ages and to make their own interpretations. The final stage of the geochronology project will be to make this database accessible via DGGS's web site and through a link on the Interagency Minerals Coordinating Group website. Bibliographic citations for DGGS and U.S. Geological Survey publications will be linked to digital or PDF files of the appropriate publication. The geochronologic database project is scheduled to be completed by June 2007. The completed database will reside in DGGS's Oracle database, which will serve as a repository for future radiometric data.

Wilson, F.H., Shew, Nora, and Dubois, G.D., 1990, Map and table showing isotopic age data in Alaska, *in* Plafker, G. and Berg, H.C., eds., Geology of North America, The Geology of Alaska, v. G-1, Plate 8.

Wilson, F.H., Shew, Nora, Dubois, G.D., and Dadisman, Shawn, 1999, Alaska Radiometric Ages: U.S. Geological Survey, http://minerals.usgs.gov/sddp/mrdata/sddpftp.shtml.

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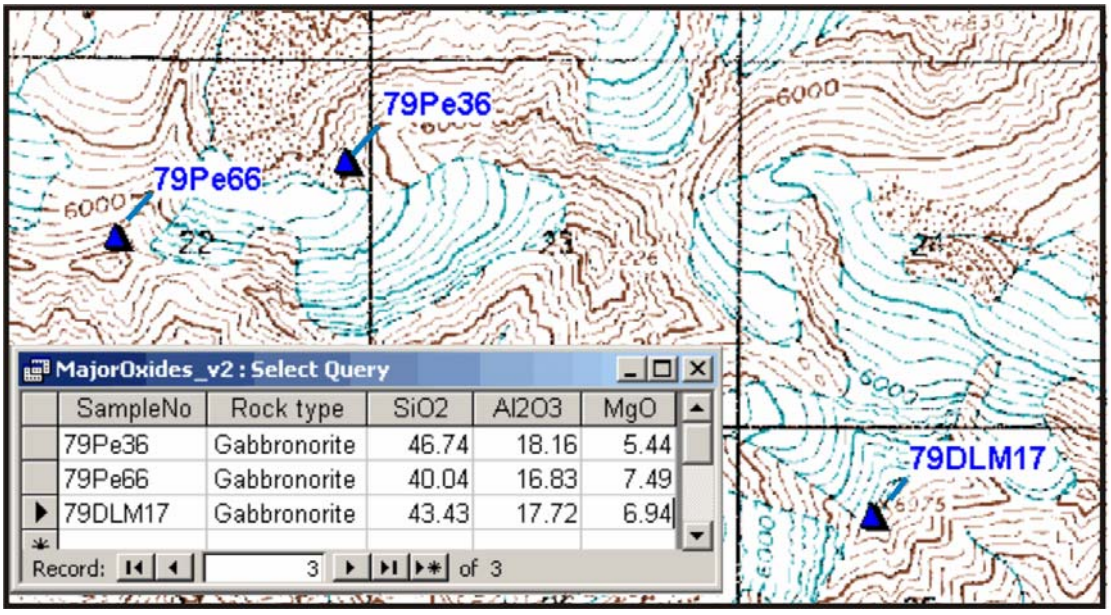
COMPILATION OF ALASKA STATE AGENCY LITHOCHEMICAL DATA

As part of the Federally funded Minerals Data and Information Rescue in Alaska (MDIRA) program, all minerals-related Alaska geochemical datasets will be incorporated in a comprehensive interagency digital geochemical database system. The Minerals Section of the Alaska Division of Geological & Geophysical Surveys (DGGS) is conducting two components of the geochemical program—the Alaska State Agency Lithochemical Data Project (described here) and the Compilation of Existing Resource Assessment Geochemical Datasets Project (described in a separate briefing paper).

The objective of the Alaska State Agency Lithochemical Data Project is to make DGGS lithochemical data accessible via the MDIRA program's Web site <AKgeology.info>. The data will then be incorporated into the DGGS division-wide database. As part of the MDIRA project, during the past 5 years Federal agencies have made a concerted effort to systematically organize their electronic geochemical-data files. That effort is nearly complete for much of the Federal quantitative geochemical data. DGGS possesses a significant amount of Alaska mineral-related geochemical data that has not yet been gathered into organized datasets. Some of the data have not been published; other sets are not in digital format and are in danger of being lost. The vast majority of the data have not been digitally linked with geographic locations.



DGGS is assembling the various at-risk lithochemical data that have been generated by DGGS or, in some cases, by the University of Alaska, organizing these data into rational datasets and linking them with georeferenced locations. The DGGS system will be designed and implemented in a manner compatible with U.S. Geological Survey PLUTO and RASS datasets and will provide the data for the MDIRA database and Web site. This project works in cooperation with USGS counterparts and the DGGS MDIRA database project. Geochemical data and latitude and longitude sample locations are being compiled in a Microsoft Access database.

We estimate this project will recover 1,200 sets (one sample equals one set) of major oxide analyses, 500 sets of minor element analyses, 3,000 rock trace-element datasets, and 500 to 600 mineral compositions datasets. An additional 1,000 major oxide or trace-element datasets from unpublished Master's of Science thesis research done at UAF also will be included. Data will be included for the areas of Haines, Lime Peak, Chugach, Fairbanks, Talkeetna Mountains, Interior Alaska, Valdez Creek mining district, and southwestern Alaska, as well as others. The project is scheduled for completion and posting on the AKgeology.info Web site by December 31, 2006.

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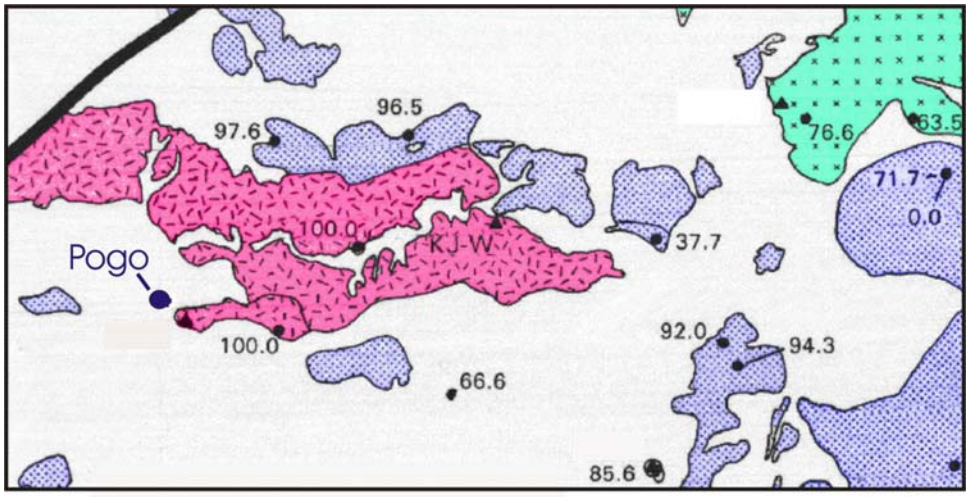
COMPILATION OF EXISTING RESOURCE ASSESSMENT GEOCHEMICAL DATASETS

The objective of the Compilation of Existing Resource Assessment Geochemical Datasets project is to provide three reference datasets to the public that were compiled by the Alaska Division of Geological & Geophysical Surveys (DGGS) for use in resource assessments. The datasets were designed during investigations of tin granites, plutonic gold ("non-porphyry") systems, and mafic and ultramafic plutonic rocks. These datasets contain about 3,400 major oxide and trace element analyses and mineral compositions from mineralized and non-mineralized systems around the world. A small percentage of the rocks in these datasets come from Alaska. Though many of the analyses included in these datasets have been released to the public, they are scattered in hundreds of articles around the world. The data have not been released to the public as a cohesive dataset with a mineral-related purpose. Federal funding, through the Minerals Data and Information Rescue in Alaska (MDIRA) project, will allow DGGS to migrate the data from older computer software to current database standards, document the sources of the data, provide georeferencing for samples where appropriate, and make these refined datasets available to the public.

The datasets can be used to compare compositions between Alaska rocks and those related or non-related to particular ore deposits worldwide. The data for the tin-granite and plutonic gold systems were edited so that characteristic compositions of particular types of mineralized and non-mineralized systems could be more accurately identified. These two datasets, consisting of about 1,700 analyses, were used successfully for comparison during evaluation of areas containing potential tin granites and plutonic gold systems (non-porphyry type) in Alaska during the late 1980s. For example, we calculated "discriminant scores" by using multivariate discriminant analysis on the plutonic gold dataset (see figure; modified from Burns and others, 1991). At the time the study was done, this area in Interior Alaska was thought to be barren of gold deposits. The scores indicate degree of similarity of the rock analyzed to other plutonic rocks associated with systems that produced gold deposits. Scores in the diagram range from about 63 (considered to indicate very low similarity) to 100 (considered indistinguishable from plutons associated with gold systems). The discriminant scores of '100' near the later-discovered Pogo deposit were an indication that gold-related plutonic systems may well be present in the area. The particular plutonic rock associated with deposition of gold at Pogo is not exposed at the surface. The predictions DGGS made based on the plutonic gold dataset were thought to be a major catalyst of much mineral exploration in this part of the interior in the early 1990s.



The third dataset includes about 1,750 rock and mineral analyses from mafic and ultramafic bodies and shows potentially significant similarities between the different types of ultramafic and mafic rocks. This dataset may also eventually be used as an aid for locating platinum-group-element (PGE) mineralization.

The datasets will be released via the DGGS and MDIRA Web sites (<www.dggs.dnr.state.ak.us> and <www.akgeology.info>, respectively). The project is expected to be completed by December 31, 2006.

Burns, L.E., Newberry, R.J., and Solie, D.N., 1991, Quartz normative plutonic rocks of interior Alaska and their favorability for association with gold: Alaska Division of Geological & Geophysical Surveys Report of Investigation 91-3, 71 p., scale 1:412,500; 2 sheets.

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ARCHIVING AND INDEXING DGGS PROJECT FILES AND FIELD NOTES (DGGS LEGACY FILES PROJECT)

A project to provide an index of DGGS legacy projects and field data is being funded through the federal Minerals Data and Information Rescue in Alaska (MDIRA) project. DGGS has maps, files, and unpublished reports from about 40 years of fieldwork and office projects to be properly archived by this project. The indexing project is a joint effort between DGGS and the Department of Mining and Geological Engineering at the University of Alaska Fairbanks. Through a Reimbursable Services Agreement (RSA), both organizations have principal investigators who manage different aspects of the project. Two UAF undergraduate engineering students have been employed by UAF over the past year for this project. Methodology of the project is similar to that used for the successful MDIRA-sponsored Alaska Mineral Information Data Index (AKMIDI) Project, which inventoried the Anaconda Minerals Co. and other data collections.

DGGS has boxes and file cabinets full of project maps, files, field notes, and associated data accumulated by staff geologists during the last 40 years. Lack of time and funding for DGGS has precluded addressing this problem. This current indexing project will enable DGGS to organize, inventory, and store legacy documents to make them accessible to DGGS scientists and the public.

Like the AKMIDI Project, the DGGS file project will sort, bar code, and index historic project and field data. Digital images will be linked to or stored in the relational database so that the public can obtain some insight about the content of a potentially useful intermediate map, figure, or photograph without having to retrieve the physical materials from the DGGS archive. The bar code and digital photograph index will use a variation of the AKMIDI relational database and will ultimately be uploaded into the DGGS Oracle database. The database will be amenable to routine maintenance and query and will provide DGGS with an opportunity to make an organized index of its archived project file materials available to the public through the Internet.

To date, file cabinets of project files and manuscripts have been sorted and inventoried; maps, field notes, and other products from several projects are compiled. A spreadsheet of more than 8,800 historic thin sections has also been completed. All DGGS maps are now compiled and await sorting and filing prior to coding. Some partially archived rock samples have been moved from cold storage into the DGGS warehouse for cataloging, boxing, and shipping to the Geologic Materials Center.

Indexed project and working file data and materials will stored in an organized manner so that they are accessible and archived for the future. The inventoried documents will be stored in DGGS offices and where appropriate, the Geologic Material Center in Eagle River.

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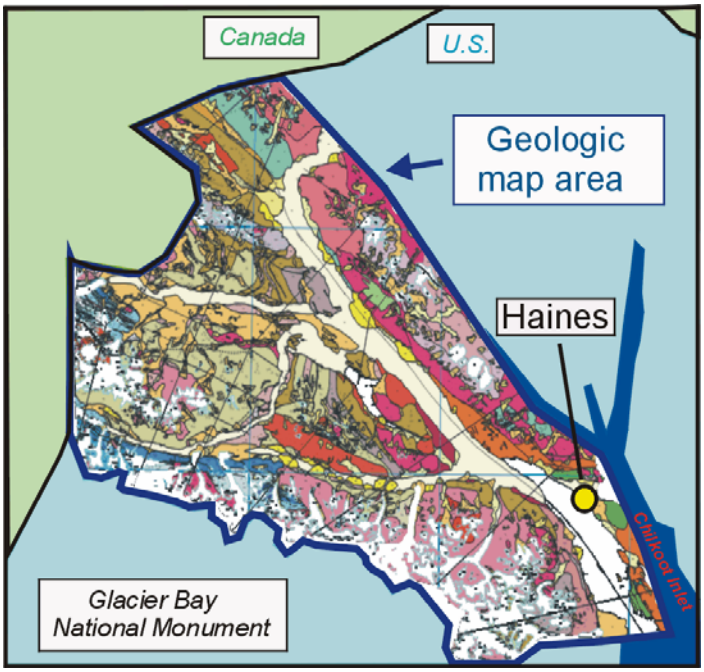
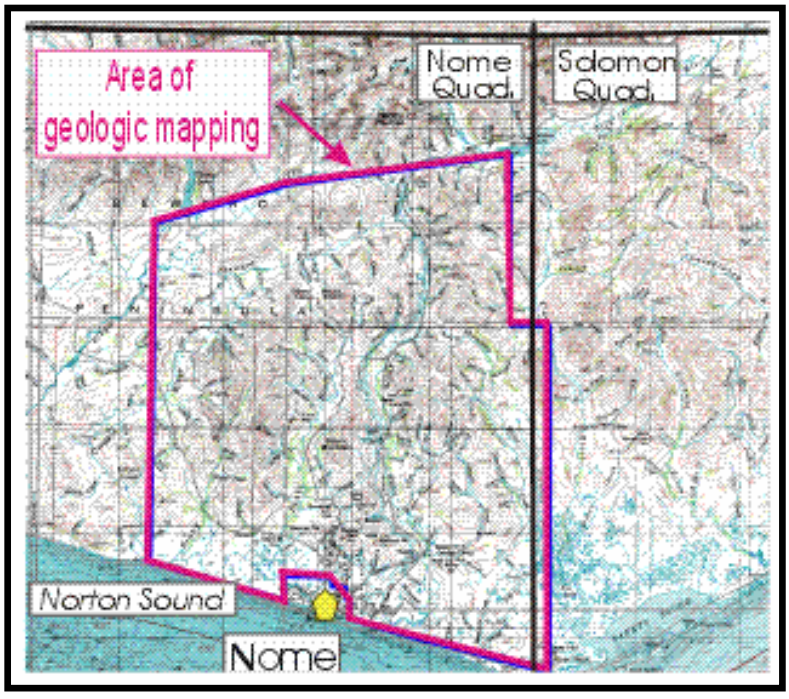
GEOLOGIC MAPS OF THE HAINES AND NOME AREAS



As part of the federally funded Minerals Data and Information Rescue in Alaska (MDIRA) project, as many minerals-related Alaska geologic maps as possible will be incorporated in a comprehensive DGGS geologic database system. This 'Geologic maps of the Haines and Nome areas' project will publish two bedrock geologic maps, for which DGGS has completed field work and draft maps but which have not been published, and incorporate them in the division-wide database. The maps include a 900-square-mile geologic map of the Haines area and a 250-square-mile geologic map of a highly prospective mineralized tract near Nome on the Seward Peninsula (see figures). The maps will be published in hardcopy format and posted on the DGGS Web site.

The Haines map covers the entire Porcupine mining district. This bedrock and surficial geologic map has been reviewed and edited as a Professional Report. The map unifies five geologic maps previously published in reconnaissance form for a 900-square-mile area. The authors of the five geologic maps used different nomenclature and mapping styles. The map to be published contains the synthesis of terminology and map units that were worked out by the original authors. The second sheet of the Haines map contains sample locations, radiometric ages, and geochemical data. This area is a major section of southeastern Alaska that has no existing coherent geologic map. This project will complete the digitizing of the geologic map and cross-sections and publish the map both in hardcopy form and on the DGGS Web site. The Haines map project is scheduled to be finished by the end of December 2006.



The Nome map covers a portion of the Nome mining district. An initial year's worth of geologic mapping was released for part of the area, but compiling the mapping of a second summer of geologic work was delayed due to other State priorities. During 2005, the first author of the original map, now a private consulting geologist, submitted a draft geologic map for DGGS publication, and is currently revising the map based on reviewers' comments. The Nome map project is scheduled to be finished by the end of December 2006.

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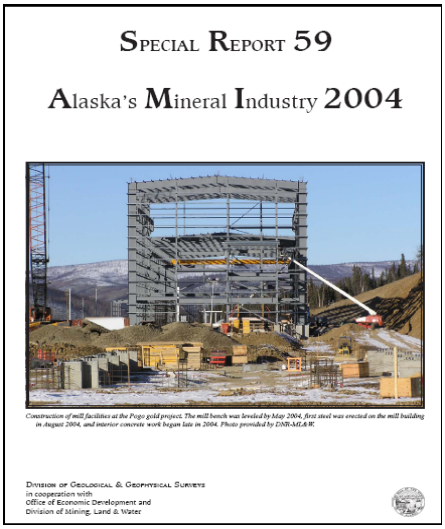
ANNUAL ALASKA MINERAL INDUSTRY REPORT



Alaska Statute 41.08 charges the Division of Geological & Geophysical Surveys *"to determine the potential of Alaska land for production of metals, minerals, fuels, and geothermal resources; the location and supplies of groundwater and construction materials; the potential geologic hazards to buildings, roads, bridges, and other installations and structures; and shall conduct such other surveys and investigations as will advance knowledge of the geology of Alaska."* To meet part of this goal, we gather, verify, collate, and supply statistics and summary observations about Alaska's mineral industry in a timely manner and release this information to the public in the format of an annual mineral industry report, an interim summary, and public presentations. This project assists the mineral industry, provides valuable information to the State in terms of the health of the State's mineral industry, and fosters a better understanding of the significance of the mineral industry to Alaska's private sector and government.

The annual Alaska mineral industry report is a key source of information about exploration, development, and production of Alaska's mineral resources. Statewide and international circulation of the annual mineral industry report and its findings at professional mineral industry conventions and trade shows, and in professional journals informs the general public, local and international mineral industry, and local, state, federal, and international government agencies about current activities within the Alaska mineral industry. The report serves as a barometer for the mineral industry's status in any given year and provides unbiased, authoritative information compiled in a consistent format from year to year. Government personnel formulating public policy affecting resource and land management rely on the report as an essential asset.

The 2004 Alaska mineral industry report released in November 2005 summarized information provided through replies to questionnaires mailed by DGGS, phone interviews, press releases, and other information sources. The 2004 cumulative value of Alaska's mineral industry is $1.618 billion, a new record value; this is the ninth straight year that Alaska's mineral industry topped $1 billion. Exploration expenditures for 2004 were $70.8 million; development expenditures amounted to $209.1 million, the third highest since records were kept in 1981; and the value of mineral production was $1,338.7 million, also a new record.

The annual report has been published for 24 consecutive years as a cooperative venture between the Department of Natural Resources' Division of Geological & Geophysical Surveys and the Office of Economic Development in the Department of Commerce, Community & Economic Development, with help from the Division of Mining, Land & Water in DNR. A summary of the 2005 Alaska mineral industry activities will be released by February 2006. The 2005 Alaska mineral industry report will be released by early November 2006.

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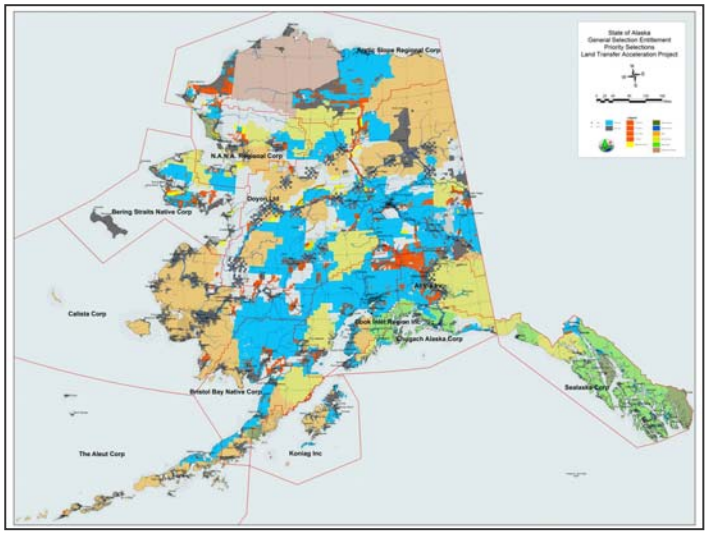
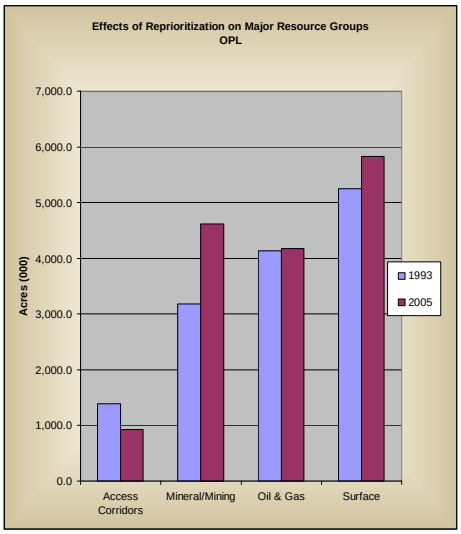
BLM 2009 PROJECT (LAND SELECTION PROJECT)





The Alaska Statehood Act (PL 85-508) guaranteed the State of Alaska a land entitlement of 104.6 million acres. The State prioritized remaining selectable lands (Ownership Priority List—OPL) by 1994. About 90 million acres have been conveyed from the U.S. Bureau of Land Management (BLM). At the current rate of conveyance, transfer of remaining lands would take 25 to 80 years. DNR began the BLM 2009 Project after passage of the Alaska Land Transfer Acceleration Act (S.1466), co-sponsored by U.S. Senators Murkowski and Stevens. The Act aims to speed State and Native land conveyances, with a goal of completing conveyance of the remaining 89 million acres of state and Native land conveyances by 2009, the 50th anniversary of Alaska's Statehood. The Resource Assessment & Development Section (RADS) in Division of Mining, Land & Water (DML&W) is the lead DNR coordinating group for the BLM 2009 Project; all DGGS recommendations for land conveyance priorities are submitted to RADS.

The State has about 14.5 million acres of General Grant entitlement remaining as of November 2005 and about 34 million acres of selected lands. DNR agencies have identified about 20 million acres of land as moderate–high to high potential for minerals, oil and gas, surface resources, or access corridors. About 6 million acres are dual selected by both State agencies and Native corporations; these dual selections introduce uncertainty of final ownership for these lands.

DGGS reviewed selection priorities and reprioritized lands based on new geologic information, new mineral deposit models, and other information. The reprioritization process was multiphase and iterative. DGGS and DML&W completed Phase 1 in November 2004 and submitted 135 areas totaling 5.2 million acres for further study. DGGS was asked to study 26 areas in detail during Phase 2. For these areas, DGGS reviewed existing geologic and mineral deposit information using MapInfo GIS software. Locations of 7,000 mineral occurrence sites categorized by mineral deposit model (Alaska Resource Deposit Files; http://ardf.wr.usgs.gov/) geochemical samples (e.g., DGGS web geochemistry, http://www.dggs.dnr.state.ak.us/webgeochem/index.jsp), State and Native selected lands, and current federal and state mining claims, as well as results from DGGS probabilistic modeling created for the 1992 mineral endowment estimation for selected areas, geophysical data, and selected geologic and topographic maps. DGGS prioritized 2,717 square miles (1.74 million acres) and submitted a list in April 2005 to RADS of each section's priority following RADS guidelines. A final review and list of comments was sent to RADS in May 2005.

On September 28, 2005, a final State OPL of 18 million acres was submitted to BLM by DNR, after review by the DNR Commissioner's Office. Future work will include prioritizing remaining State land selections as needed to complete State land entitlement.

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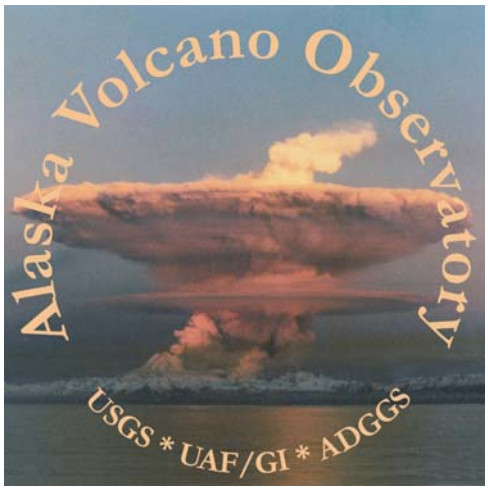
ALASKA VOLCANO OBSERVATORY: PROGRAM MANAGEMENT



The Alaska Volcano Observatory (AVO) is a multi-agency program that uses state, federal, and university resources to monitor and study Alaska's hazardous volcanoes, predict and record eruptive activity, and implement public safety measures. AVO is a cooperative program of the Alaska Division of Geological & Geophysical Surveys, the U.S. Geological Survey, and the University of Alaska Fairbanks Geophysical Institute. DGGS participates in AVO in many ways. All funds for DGGS participation in AVO are generated through written proposals for external funding. We build and maintain the AVO Web site (www.avo.alaska.edu) and the database from which it is derived (both discussed in separate briefing papers). We lead some geologic field programs and serve as team members on others (also discussed separately). In addition, we serve specific program roles not connected to individual geologic projects. These are discussed below.

Volcano Monitoring. AVO continues to excel in integrated monitoring of volcanoes using short-period seismometers, broadband seismometers, continuous telemetered GPS, satellite imagery, gas measurements, Web cameras, and local observer reports. AVO maintains seismic networks on 28 volcanoes (up from four a decade ago), and monitors more than 100 volcanoes twice daily by satellite. We use these data streams to recognize unrest and impending eruptive activity, and we issue formal updates, status reports, and warnings to a wide range of civil authorities, agencies, and concerned businesses and individuals.

GIS Expertise. DGGS provides advanced GIS expertise to all component agencies in AVO. This includes producing base maps by combining diverse data derived from satellite and airborne sensors in areas where 1:63,360-scale maps do not exist, retrieving and georegistering maps from discontinued map series, and producing a variety of other georegistered data products. DGGS also provides expertise in finalizing and troubleshooting GIS-based map reports using standard GIS techniques for numerous specific projects in all AVO component agencies.

Helicopter and Ship Logistics. DGGS manages helicopter procurement for all major AVO projects. In addition, DGGS manages ship charter for those projects far enough from population centers to require ship-based helicopters. Total expenses during the 2005 field season were $957,000. Having all the helicopters contracted by a single agency results in significant budgetary and logistic efficiencies. As part of managing the helicopter budget DGGS also coordinates all AVO field project schedules so that the appropriate helicopters are available throughout the field season to meet the needs of each field party.

Geochemical Data Procurement and Archiving. DGGS coordinates the procurement of whole-rock geochemical analyses related to Alaska's volcanoes and maintains the archive of those data. In the 17 years AVO has existed, mapping activities have resulted in more than a doubling of available data compared to all other combined work since the late 1940s. These data share rigid inter-project quality controls, making the combined dataset a major resource for researchers and adding substantially to the value of the data from individual geologic mapping projects.

CUSVO/NVEWS. DGGS is one of the charter members of CUSVO (Consortium of U.S. Volcano Observatories). CUSVO provides coordination among the five volcano observatories in the United States. NVEWS (National Volcano Early Warning System) is a major emerging initiative of CUSVO, and DGGS sits on the NVEWS steering committee. NVEWS aims to standardize monitoring among the nation's volcanoes and to improve monitoring at inadequately monitored volcanoes in Alaska, the lower 48 states, Hawaii, and the Commonwealth of the Northern Mariana Islands.

With DGGS input, AVO issues hundreds of daily, weekly, and periodic volcano status reports every year. DGGS also contributes to whitepapers and committee reports such as the NVEWS implementation plan, which is scheduled for release in early 2006.

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ALASKA VOLCANO OBSERVATORY: GeoDIVA DATABASE

GeoDIVA: AVO/DGGS staff design, populate, and distribute the Geologic Database of Information on Volcanoes in Alaska (GeoDIVA). The mission of GeoDIVA is to maintain complete, flexible, timely, and accurate geologic and geographic information on Pleistocene and younger Alaska volcanoes for scientific investigation, crisis response, and public information in a dynamic, digital format. This information system will be the most comprehensive, accurate, and up-to-date source of information on Alaska volcanoes available anywhere, online or in printed form. GeoDIVA is being developed in modules (figure 1). Each module is released as it is finished in order to streamline the delivery of information to the public. The AVO Web site at www.avo.alaska.edu is also a DGGS effort, and is the primary means of information dissemination (see separate briefing paper). The GeoDIVA back-end to our public Web site replaces thousands of individual html pages and is continuously updated.

Module	Status	Notes
Bibliography	Complete through 2004	Will be updated yearly to include new publications—fully searchable
Basic volcano information	Complete	128 major and 167 minor volcanic features in Alaska
Eruption history information	Complete through mid-2005	Information, actual text, and references for more than 400 historic eruptions.
Images	Structure complete—data loading in progress	Currently contains more than 4,300 pictures, figures, and maps—growing daily.
Sample information	Structure complete—data loading in progress	Currently contains information for more than 1,500 samples—growing daily.
Geochemistry	Structure complete—data loading in progress	Test data inserted. Refining process for inserting large amounts of data.
Petrology	Planned for FY06	Arc-wide thin section images and descriptions
Geochronology	Planned for FY06	Arc-wide age dates and references
GIS data	Planned for FY06–07	Researching needs, software, and hardware

Figure 1. GeoDIVA modules and status.

Currently GeoDIVA uses MySQL as a database management system, with third-party software, Microsoft Access, and AVO-generated front-ends to input and access the data. These software solutions are robust and cost-effective. Web interfaces to GeoDIVA are being constructed concurrent with database development and data uploading so that there is minimal lag between database creation and user accessibility.

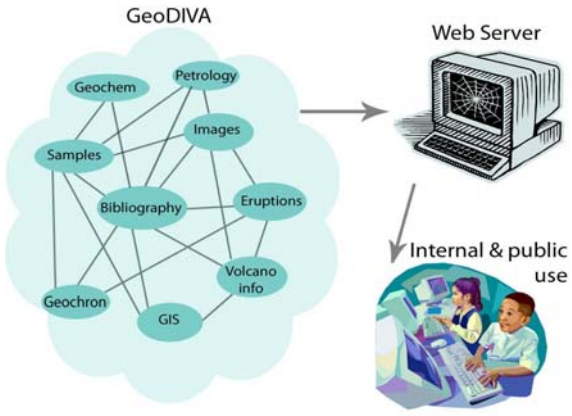

Figure 2. GeoDIVA's interconnected modules are referenced via the bibliography in order to enhance usefulness to multiple user groups.

GeoDIVA is being carefully constructed to serve two distinct user groups: Internal geoscientists and the general public. For the information in GeoDIVA to be useful to both groups of users, users must be able to determine the source of the information. This requires that every piece of information that goes into the database be properly referenced. Figure 2 shows the interconnected nature of GeoDIVA's many modules, and their dependency on the bibliography.

GeoDIVA grows by continual addition of new data to existing modules and episodic surges of growth as new modules come on line. Completed, in progress, and planned modules of GeoDIVA are shown in figure 1.

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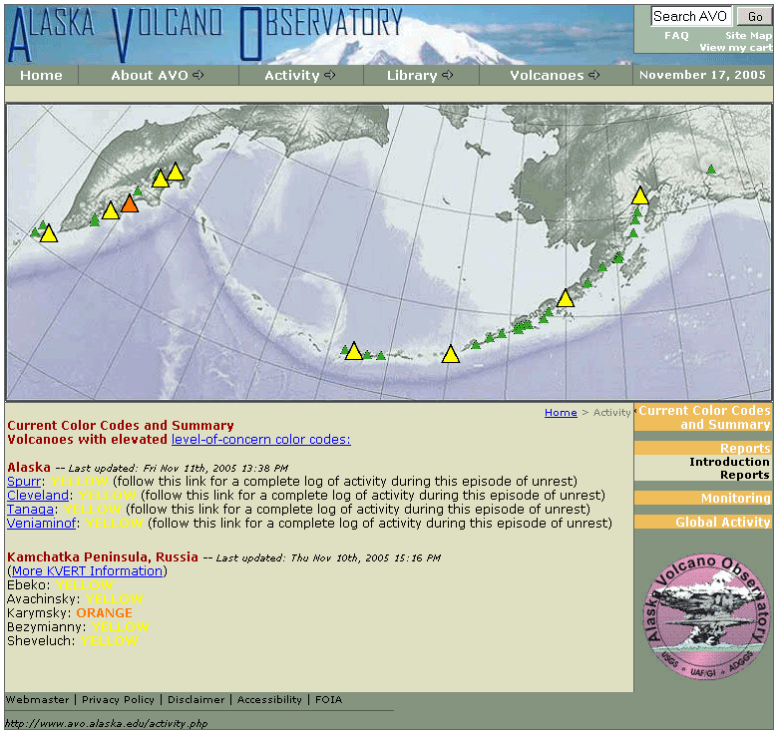
ALASKA VOLCANO OBSERVATORY: WEB SITE

The AVO public Web site serves about 500,000 pages and approximately 45 gigabytes of data to an average of 29,000 unique visitors per month, and is among the top ten USGS and USGS-affiliated Web sites in the country. DGGS was the original creator of the AVO Web site more than a decade ago, and continues to be the site manager. DGGS has the primary responsibility for producing and maintaining the site (http://www.avo.alaska.edu), including all the coding, graphics manipulation, and most of the design. During FY05, AVO's fifth version of the Web site came online. This new site brings AVO up-to-date with current Web technologies—serving Web pages from a MySQL database using PHP and other programming tools. The database (GeoDIVA, which is also a DGGS effort, described separately) allows AVO to easily update and maintain the site, delivering information online much faster than any previous version of the site.



AVO's database-driven map shows current volcanic activity in Alaska and Kamchatka. Triangles marking individual volcanoes are dynamically linked to additional information at the click of a mouse, including real time displays of geophysical data. Colors of triangles correspond to the level-of-concern color code, and are automatically updated during the release of warning information.

Besides serving as the primary source for detailed information on all volcanoes in Alaska, the site also facilitates distribution of status reports and information updates to aviation personnel and interested citizens. AVO is a participant in DMIS (Disaster Management Interoperability Services), and sends daily CAP (Common Alerting Protocol) information to the DMIS backbone through a Web interface created by DGGS. The DMIS and CAP combination allows AVO to seamlessly share information between emergency response organizations. CAP is the first RSS/XML feed. We will make increasing use of this emerging technology.

The site also serves as the digital distribution center for richly formatted AVO print publications such as volcano hazard reports, digital photographs, maps, and fact sheets.

The AVO internal Web site delivers complex near-real-time seismological and satellite data over the Web for project participants, making distributed monitoring possible (rather than monitoring only from within the centralized lab). The internal Web site is also becoming a central location for managing images, sample and geochemical data, and other organization-wide information. This information is stored in the database where it is easily searched and exported in a variety of useful formats.

AVO is on the leading edge of Web development for volcano observatories, and is actively sharing its expertise with other observatories in the U.S. DGGS is keeping abreast of new and emerging technologies that will allow us to further enhance AVO's Web presence and data dissemination abilities.

In the coming year DGGS will focus on continual incremental improvements to the site, and serving new GeoDIVA database modules as they become available.

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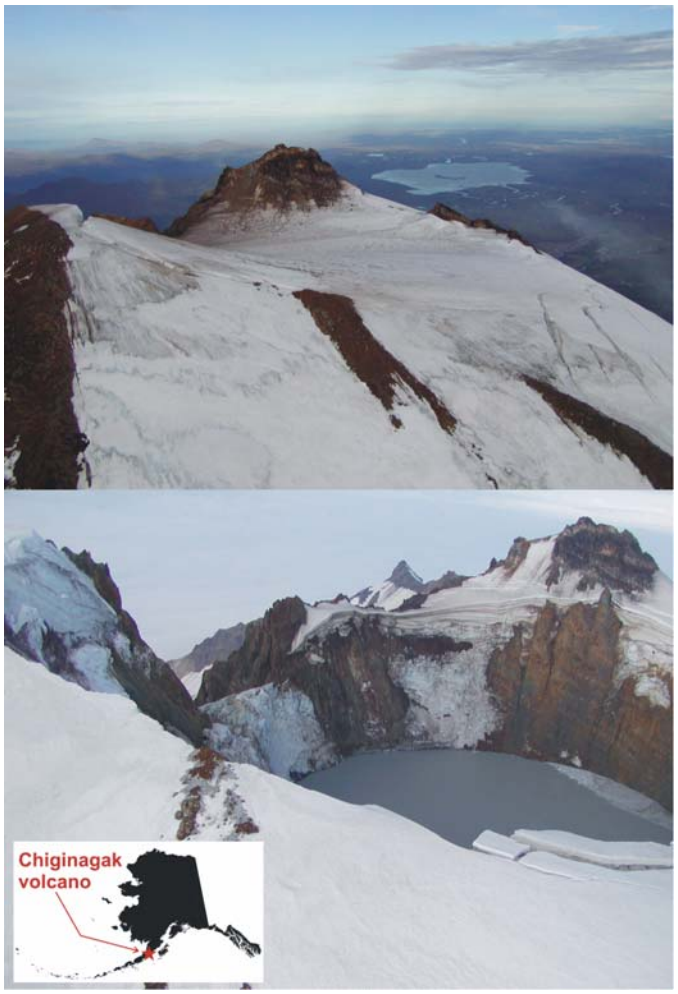
ALASKA VOLCANO OBSERVATORY: CHIGINAGAK VOLCANO VOLCANIC EVENT RESPONSE, GEOLOGIC MAPPING, AND HAZARD ASSESSMENT

2005 Crater Lake Formation, Lahar, Acidic Flood, and Caustic Gas Emission. Mount Chiginagak is a hydrothermally active volcano on the Alaska Peninsula, approximately 170 kilometers (100 miles) south-southwest of King Salmon. Sometime between August 2004 and early summer 2005, a 400-meter-wide, 100-meter-deep lake developed in the formerly snow-and-ice-filled crater of the volcano. In early summer 2005 an estimated 3 million cubic meters of sulfurous, clay-rich debris and acidic water exited the crater through tunnels in the base of a glacier that breaches the south crater rim. More than 27 kilometers downstream, the acidic waters of the flood reached approximately 1.3 meters above current water levels and inundated an important salmon spawning drainage, acidifying Mother Goose Lake (pH of 2.9 to 3.06) and preventing the annual salmon run in the King Salmon River. A release of caustic gas from the crater accompanied the mud-flow and flood, causing widespread vegetation damage along the flow path. A DGGS field crew investigated the event in August and September 2005. A temporary seismic station was installed, water samples were collected for chemistry and pH, and the extents of the vegetation and flood damage were mapped. Over the winter, AVO/DGGS will monitor activity at the volcano with satellite imagery and photographs provided by local pilots. DGGS is working with the U.S. Fish and Wildlife Service and the Alaska State Department of Fish and Game to better understand the recovery of Mother Goose Lake and the King Salmon River.



In August 2004 (top photo) the summit crater at Chiginagak volcano was filled with snow and ice. Mother Goose Lake can be seen in the background. By August 2005 (bottom photo), increased heat flow at the summit had melted the snow and ice. Earlier that summer, 3 million cubic meters of sulfurous, clay-rich debris and acidic water drained from the summit crater lake and inundated Mother Goose Lake and the King Salmon River drainage, acidifying the lake and preventing the annual salmon run. Photos by Janet Schaefer.

Geologic Mapping and Volcano Hazard Assessment. Geologic studies at Chiginagak were initiated as part of AVO's core program of describing the history of restless volcanoes. The DGGS-led geologic mapping and hazard assessment work that began in 2004 will continue into the 2006 field season. Geologic mapping at the volcano has uncovered evidence of previous lahar events at the volcano much like the one that occurred in 2005. Investigations have revealed a long history of hydrothermal activity, debris avalanches, and lava flows at the volcano.

DGGS staff presented initial results and observations of the acid flood at the American Geophysical Union conference in December 2005. Additional publications in peer-reviewed scientific journals will follow, with timing of publication dependent on the outcome of pending analytical results and 2006 field investigations. A geologic map and volcano hazard assessment are scheduled to be published by DGGS in 2007.

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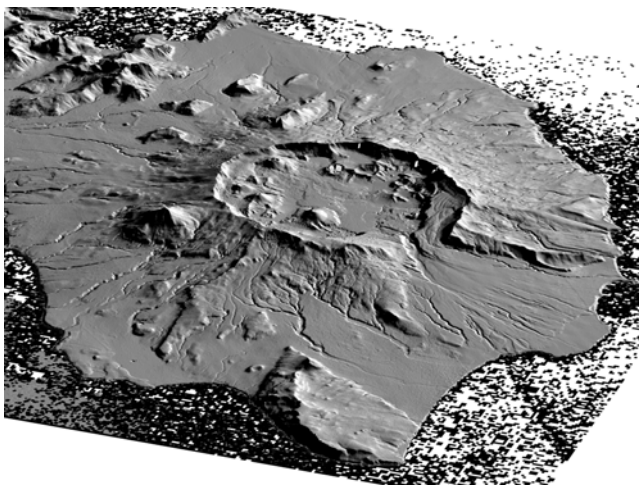
ALASKA VOLCANO OBSERVATORY: HAZARDS REPORTS AND GEOLOGIC MAPS

According to AVO guidelines, core products for volcanoes that are "well monitored" are volcano-specific hazard evaluations (geared for a general audience), updated or new geologic maps (geared for volcanologists), and networks of real-time geophysical monitoring instruments. Interagency AVO teams work to produce these products over time spans of two or more years, depending on the complexity of the volcanic center. DGGS volcanologists serve on projects as team members, with roles varying from project chief to technical or scientific support. Currently active projects with DGGS involvement include:



Shaded-relief image of Okmok volcano derived from a high-resolution DEM produced for this project by DGGS. Data for the DEM are from NASA's shuttle radar topography mission (SRTM) and the aircraft-mounted synthetic aperture radar (AirSAR) mission. In addition, coastal features were defined with the use of Landsat7 imagery The DEM was used to produce a new topographic map with 10 m contour interval which will be the base for 1:25,000 and 1:63,360-scale geologic maps. At the start of the Okmok project the best available topographic map was 1:250,000-scale and insufficient for geologic mapping.

Okmok: Okmok volcano, 110 kilometers (75 miles) west of Unalaska/Dutch Harbor, is the most frequently eruptive caldera in North America and is the site of long-term geologic studies by AVO. Preparation of the geologic map and hazards report is led by UAF scientists. DGGS provides the lead for GIS, database, caldera wall mapping, and precaldera geochemistry efforts.

Products: A hazards report was released by DGGS in the spring of 2005. Geologic maps of the caldera floor and of the entire volcano will be released by DGGS in spring 2006.

Spurr: Spurr volcano, 120 kilometers (75 miles) west of Anchorage is the volcano closest to a major population center. There were large eruptions in 1953 and 1992 from the Crater Peak vent, and increased thermal flux at the summit has produced a small crater lake for the first time in recorded history. DGGS has conducted geologic studies at Spurr starting in 1985, and has led the geologic mapping efforts.

Products: A USGS-led hazards report was released in 2002. A DGGS-led geologic map will be published in spring 2006.

Chiginagak: Ongoing geologic studies at Chiginagak volcano are led by DGGS, and described in a separate briefing paper.

Veniaminof: Veniaminof volcano, near Port Moller, is the largest volcano in the Aleutian arc. Exceptionally detailed mapping, dating, and geochemical projects led by the USGS are providing high-resolution data for describing changes in the magmatic system over the past few hundred thousand years. Geologic field work started in 2001 and will end in 2006. DGGS provides the lead in database management, and assistance with geologic mapping.

Products: The hazards report and geologic map will be led by the USGS, and have not been firmly scheduled. Publication dates of 2006 or 2007 are anticipated.

Emmons: Emmons volcano, just east of Cold Bay, is the largest caldera in the Aleutian volcanic arc. It is geologically complex, with several large caldera-forming eruptions in the past 200,000 years. There are numerous Holocene vents, including the better-known active volcanoes Pavlof and Hague. Emmons has been the locus of USGS-led geologic studies for the past few decades. AVO seeks to compile much of that information in a new geologic map. DGGS participation, largely through providing geochemical expertise, has recently been added to the project. The geologic map is nearing completion.

Products: The hazards report and geologic map will be USGS led, and have not been firmly scheduled. Publication dates of 2006 or 2007 are anticipated.

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SURFICIAL GEOLOGY OF LIBERTY BELL, WESTERN BONNIFIELD MINING DISTRICT GEOPHYSICAL SURVEY TRACT

The Liberty Bell project is part of DGGS's airborne geophysical/geological mineral inventory project, a special multi-year investment by the State of Alaska to expand Alaska's geologic and mineral resources knowledge base, catalyze future private-sector mineral exploration and development, and guide state planning. Other funding sources include the federal STATEMAP program and the State's General Fund. The purpose of the bedrock mapping project (described separately) is to provide ground truth for airborne geophysical surveys released by DGGS in 2002 for 276 square miles in the western Bonnifield mining district (fig. 1). During the summer of 2005, DGGS conducted field work in 131 square miles of the geophysical survey tract near the Liberty Bell gold mine.

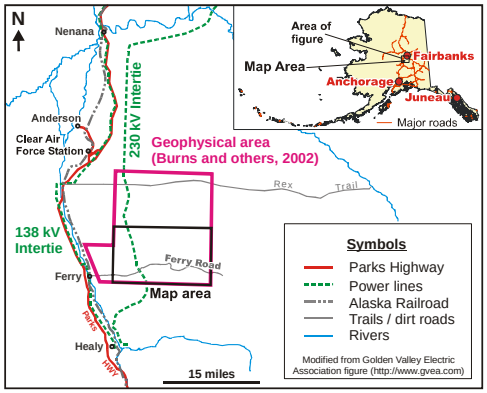

Figure1. Location map of Liberty Bell project area.

The Engineering Geology section of DGGS carried out 4 days of helicopter-supported mapping of the surficial deposits of the area to understand the genesis of the landscape in which the placer gold deposits have accumulated, delineate potential construction-materials resources, and identify possible geologic hazards that could pose a danger to human life and property should there be increased development in the district. Quaternary deposits in the map area are primarily alluvial and glacial in origin, and the great age of the deposits combined with recent tectonic activity, local thick cover, and slope movement has made mapping a challenge. Remnant gravel-covered planar surfaces are preserved more than 200 m above modern stream levels, and extents of former glaciers are primarily recognized by the presence of scattered erratic boulders on ridge tops (fig. 2). Landslides very commonly develop in the extensive Tertiary sediments and would pose a significant potential hazard to future development and infrastructure (fig. 3). The locations of 20 landslides were documented in the Liberty Bell map area during the 2005 field season.

Figure 2. Large granite erratic on ridge crest. Note dog for scale. View is toward Nenana River.

The anticipated products of this project are geologic-framework maps at 1:50,000 scale, one of which will describe the surficial geology of the area. The maps are scheduled to be completed and released in spring 2006 in fulfillment of DGGS contracts with the federally supported STATEMAP program. We are using the DGGS Geographic Information System (GIS) to generate these maps, and all data for the project will ultimately be stored and made available in a geographically referenced relational database. We will serve this data on the World Wide Web upon completion of the project. Past experience has shown that a thorough understanding of the geologic framework of an area acts as a catalyst for resource development and paves the way for future exploration. We anticipate a similar result in the Liberty Bell area.

Figure 3. Three of the 20 landslides mapped in the study area. Landslide in center photo has dammed a small lake.

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SURFICIAL-GEOLOGIC MAPPING IN THE COUNCIL GEOPHYSICAL SURVEY TRACT

More than 1 million ounces of placer gold have been extracted from the Solomon–Council area of the Seward Peninsula of Alaska since the turn of the last century. In 2004, with federal STATEMAP support, the Alaska Division of Geological & Geophysical Surveys (DGGS) conducted 1:50,000-scale geologic mapping in the Big Hurrah and Council areas. In 2006, we are proposing to extend this mapping into the Casadepaga River–Bluff area, and to produce a combined map of the three regions (fig. 1). The purpose of the bedrock mapping (described separately) is to provide ground truth for airborne geophysical surveys flown in the district in 2003 and thus develop a geologic context for known placers and lode gold and base-metal deposits and occurrences, and to evaluate the area's mineral resource potential. In order to explore new opportunities for development in the Council geophysical tract, it is critical that the State have an up-to-date inventory of the geologic resources of the area to guide planning activities and identify key features of potential interest.

The Engineering Geology section of DGGS is mapping the surficial deposits of the area to understand the genesis of the landscape in which the placer gold deposits have accumulated. Previous surficial-geologic mapping in the area has been at a very coarse scale, and we will be able to significantly refine the detail during our mapping efforts (fig. 2). Quaternary deposits in the map areas are primarily colluvial and glacial in origin. Glacial deposits are of great age and have been extensively reworked and modified by significant slope movement resulting from periglacial conditions.

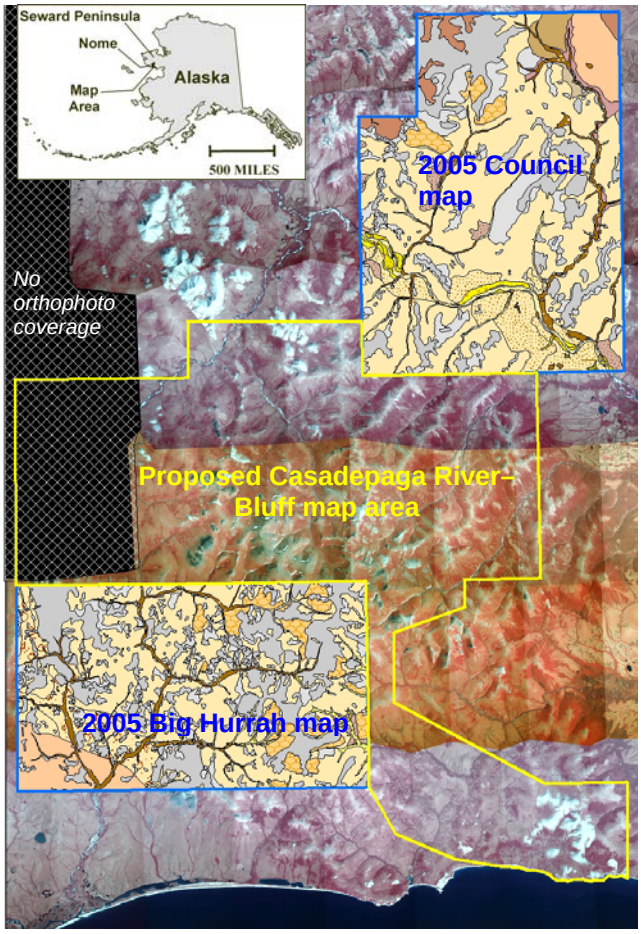

Figure 1 (above). Proposed Casadepaga River-Bluff map area on color-infrared orthophoto base map. The proposed mapping will link the 2005 Council and Big Hurrah maps. Orthophoto coverage will be expanded to encompass full map area.

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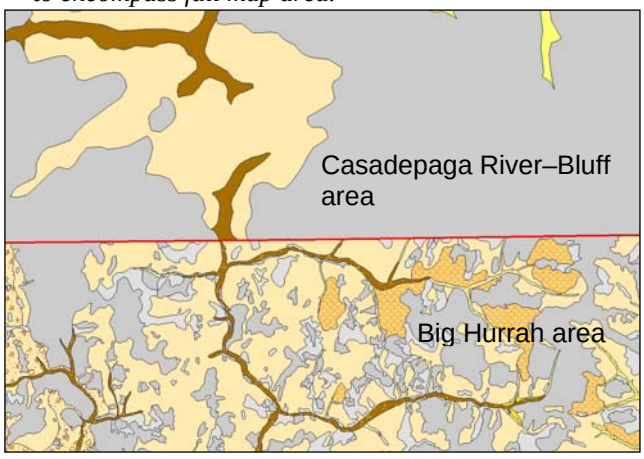

Figure 2 (right). Comparison of detail of existing surficial-geologic mapping in the Casadepaga River-Bluff area with adjoining 2005 DGGS mapping in the Big Hurrah area.

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LEGACY STATEMAP PROJECTS: SURFICIAL- AND ENGINEERING-GEOLOGIC MAPPING

The DGGS Engineering Geology Section is continuing work on five projects supported in part by the U.S. Geological Survey (USGS) STATEMAP program (figure 1). These include mapping of the Livengood, Salcha River–Pogo and Eagle A-1 areas for projects led by the DGGS Minerals Section; and mapping of the Dalton Highway and Kanayut River areas for projects led by the DGGS Energy Section. The surficial- and engineering-geologic map suites for each project describe properties and extent of surficial deposits, geologic materials, and potential geologic hazards.

In addition to 1:63,360-scale surficial, engineering, bedrock and comprehensive maps, anticipated products of the Livengood project include a color infrared orthophoto mosaic of the area that may be published at a later date. The Livengood surficial- and engineering-geologic maps will be published by the end of FY2006.

The 1:63,360-scale surficial, engineering, bedrock and comprehensive maps for the Salcha River–Pogo area encompass the Big Delta C-3, SW 1/4 of the Big Delta C-2, NE 1/4 of the Big Delta B-3, and most of the NW 1/4 of the Big Delta B-2 quadrangles. The Salcha River–Pogo surficial- and engineering-geologic maps will be published in late 2006.

The Eagle A-1 surficial- and engineering-geologic maps are complete. Final publication is delayed pending completion of metadata for associated digital GIS data layers, but is expected by the end of FY06. A 1:63,360-scale map of engineering geology in a corridor 8 miles (13 km) wide along the Dalton Highway near Galbraith Lake is also currently delayed, pending final review, editing, and metadata.

The Kanayut River surficial-geologic map refines earlier 1:250,000-scale mapping by Tom Hamilton (USGS). The map describes deposits related to four major glaciations as well as three distinct phases of the youngest, Itkillik, glaciation. An engineering-geologic map will be derived from the completed 1:63,360-scale surficial- and bedrock-geologic maps. Publication of the surficial- and engineering-geologic maps are currently delayed pending editing and outside peer review.

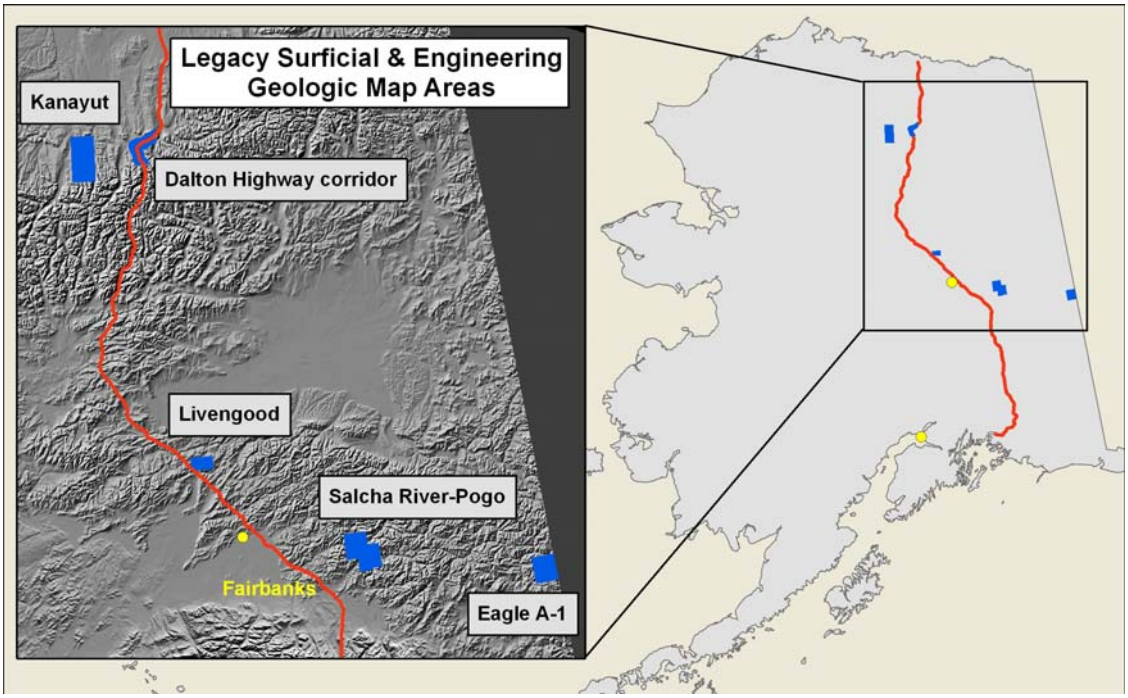

Figure 1. Location map of STATEMAP project areas for which surficial- and engineering-geologic maps are in various stages of completion.

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MapTEACH: FIELD-GEOSCIENCE OUTREACH AND EDUCATION IN RURAL ALASKA

With the support of ten partner organizations (including private-sector, non-profit, and educational institutions), DGGS is working on MapTEACH (Mapping Technology Experiences with Alaska's Cultural Heritage), a 3-year NSF-funded collaborative project with the University of Wisconsin Environmental Remote Sensing Center (ERSC) and the University of Alaska Fairbanks Geography Department to develop a field-geoscience outreach program for middle- and high-school students in rural Alaska. This program emphasizes hands-on experience with spatial technology (GPS, GIS, and remote sensing imagery in a local landscape–landform context) in conjunction with traditional activities, and will be piloted in the Minto–Nenana, Nome, and Fairbanks areas (fig. 1). Since participants will work directly with DGGS geologists, they will be presented with a chance to authentically emulate scientific activities at a novice level, using real data in a real-world setting. Concurrently, DGGS is learning to incorporate education and outreach into its geological practices when working in rural Alaska communities.

Figure 1. DGGS geologist Patty Burns (left) works with ANSEP (Alaska Native Science and Engineering Program) intern Kim Streeter and ERSC project assistant Bil Aldrich during MapTEACH summer data collection efforts near Nome.

The program will be implemented in two separate but content-equivalent formats to meet the unique requirements of accessing students in rural Alaska. Students serviced by centralized school districts will take part in a 9-week (standard school quarter) classroom-based curriculum that will culminate in a 7-day summer Capstone Field Experience during which students and teachers will interact in a field camp setting with Native Elders, traditions-based community leaders, and professional geologists from DGGS. Other, more geographically dispersed students will be brought together in Intensive Studies Institutes at established living–learning facilities for two weeks of full-time classroom instruction, followed by a 7-day Capstone Field Experience.

DGGS's primary MapTEACH responsibilities are to: Compile and publish area-specific field guides that will allow students to locate examples of important geological features in their local area; acquire and process satellite and aerial imagery and GIS data; assemble classroom, technology, and field-geology kits; function-test IT (Information Technology) equipment and software in a field setting; collaborate on curriculum development; serve as the primary liaison with members of the pilot communities, including local and tribal governments, schools, and Native groups; participate in Intensive Studies Institutes at the Nenana Student Living Center and the Northwestern Alaska Career and Technical Center (NACTEC); and act as guide and logistics lead for Capstone Field Experiences in all venues. DGGS is now also responsible for overall project management. The first pilot will take place at NACTEC in Nome during late spring 2007.

MapTEACH
...new ways to tell old stories

www.mapteach.org

Introducing students to geoscience and geospatial technology in culturally responsive and stimulating classroom and field settings will enhance community understanding of landscape processes, resources, and natural hazards in rural Alaska. It will also foster appreciation of state-of-the-art technology tools and data sets that can be applied to informed community planning and decision making.

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DENALI FAULT EARTHQUAKE RESPONSE

DGGS responded to the November 3, 2002, M7.9 Denali fault earthquake on many levels, including field research, public and professional outreach, and cooperation with various emergency and regulatory agencies. DGGS deployed a field geologist to evaluate the fault rupture within 24 hours of the event. Reconnaissance efforts revealed that the earthquake caused a total of 340 km of surface rupture affecting three separate faults in central Alaska: the Denali, Totschunda, and the newly discovered Susitna Glacier fault (fig. 1).

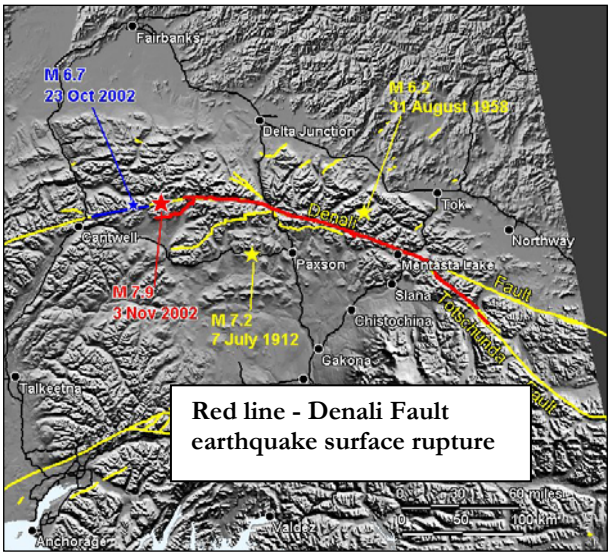

Figure 1. Faults and large-magnitude earthquakes in the area of the 2002 rupture.

With funding from the U.S. Geological Survey, DGGS participated in studies directed toward understanding the paleoseismic history of and hazards related to faults that ruptured during the M7.9 Denali fault earthquake as well as the paleoseismic history of the Denali fault near Cantwell, where it did not rupture in 2002 (fig. 2). Goals of current research on the fault include: (a) understanding the behavior of the Denali Fault—how often and where the fault has ruptured the earth's surface, the potential size of earthquakes on the fault, and how the November 3, 2002, event affected stress on the unruptured ends of the fault; and (b) understanding the relationship between the Denali fault and other potentially active faults in the Alaska Range. DGGS staff coauthored several non-DGGS publications resulting from this work, including papers in a special volume of the Bulletin of the Seismological Society dedicated to the Denali fault earthquake. DGGS concluded its involvement in Denali fault research during the 2005 field season.

Figure 2. Hand-dug paleoseismic trench across the Denali fault scarp near Cantwell in 2005. The right-lateral sense of motion of the fault is shown by red arrows.

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ALASKA COASTAL MANAGEMENT PROGRAM: NATURAL HAZARDS

Through a Reimbursable Services Agreement (RSA) with the Alaska Coastal Management Program (ACMP), DGGS provides support to program personnel and coastal district planners regarding natural hazard issues. DGGS responsibilities include: Reviewing natural hazard aspects of coastal policy questionnaires during the consistency review process when requested; providing support to coastal district planners revising coastal management plans; participation in district teleconferences; and periodically reviewing regulatory and planning documents regarding natural hazards issues.

At an ACMP workshop in Anchorage during FY05, DGGS presented information to district planners and project reviewers on the use of geologic maps to assess potential natural hazards.

DGGS staff are reviewing DGGS publications for natural hazard information in order to develop an online, annotated natural hazards bibliographic database with links to scanned documents and maps. The document review process was prioritized by quadrangle and completed for quadrangles outlined in red below (fig. 1). When complete, the natural hazards database will access dynamically linked data served from DGGS's publications database. The database interface will be developed by the ACMP and made available in Spring 2006 through the ACMP Web site at www.alaskacoast.state.ak.us.

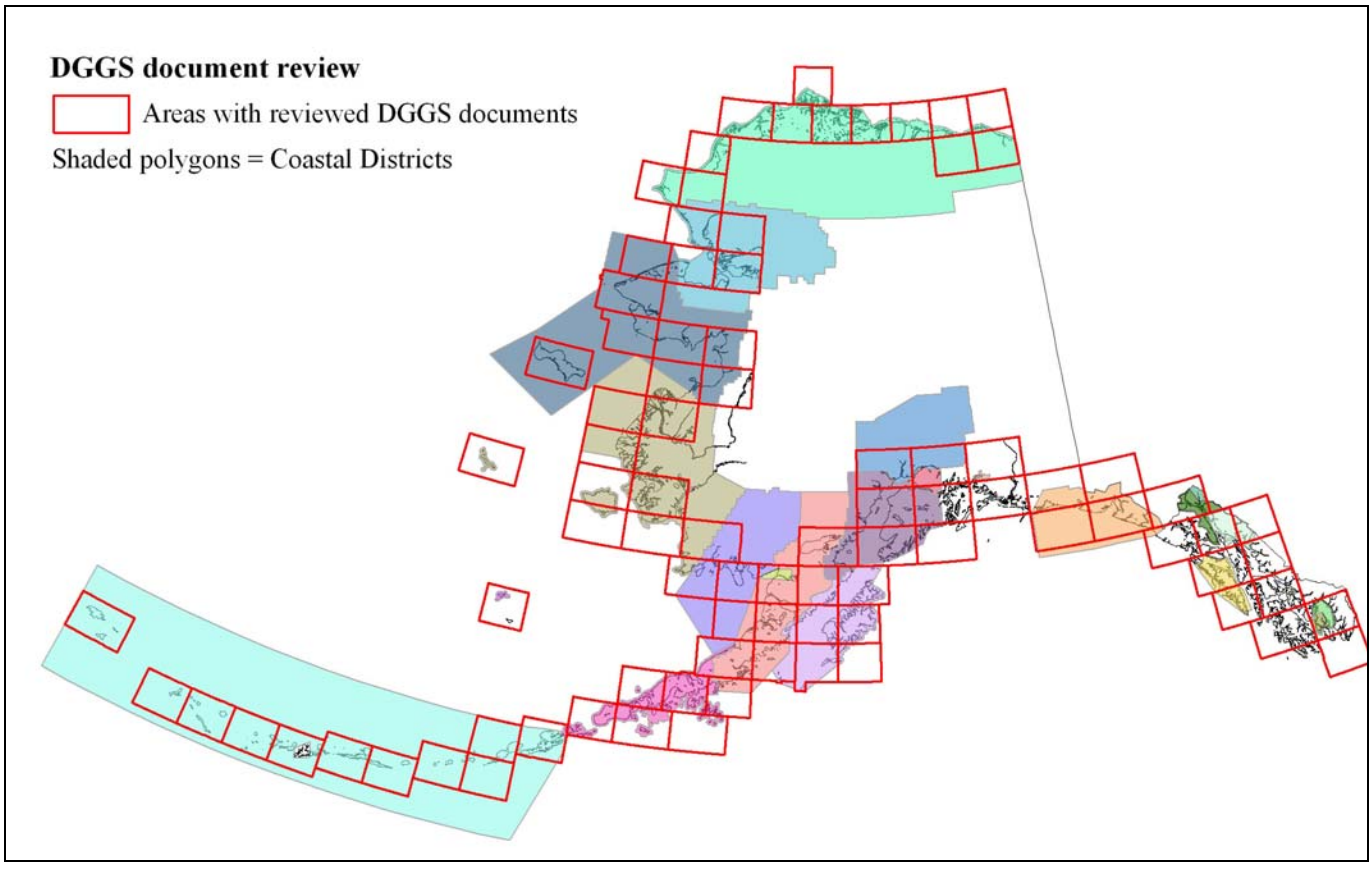

Figure 1. Areas where DGGS documents were reviewed for the ACMP Natural Hazards Bibliographic Database

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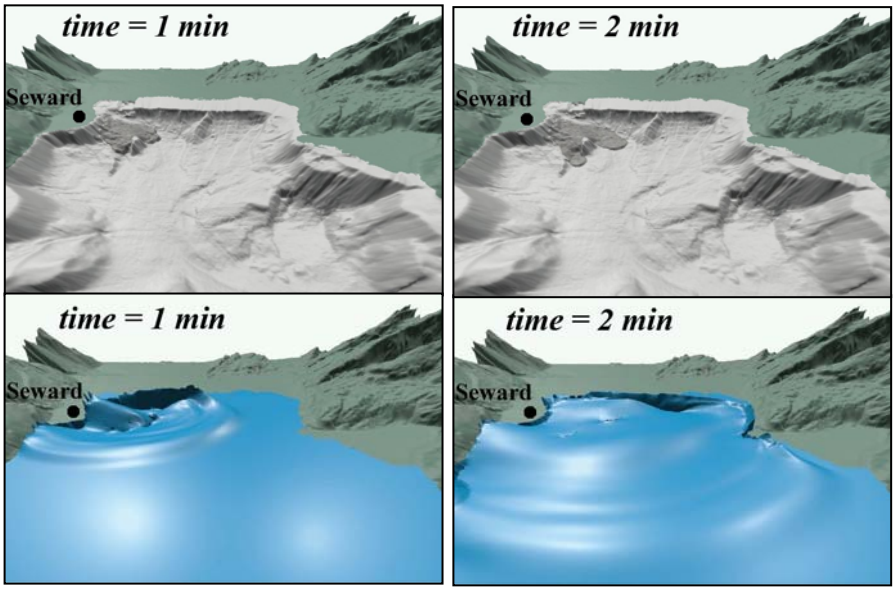
TSUNAMI INUNDATION MAPPING FOR ALASKA COASTAL COMMUNITIES

With funding from Congress, the National Oceanic & Atmospheric Administration (NOAA) initiated the National Tsunami Hazard Mitigation Program in 1997 to assist Pacific states in reducing losses and casualties from tsunamis. The program includes funding for five states (Alaska, Hawaii, Washington, Oregon, and California) to address four primary issues of concern: (1) quickly confirm potentially destructive tsunamis and reduce false alarms, (2) address local tsunami mitigation and the needs of coastal residents, (3) improve coordination and exchange of information to better utilize existing resources, and (4) sustain support at state and local level for long-term tsunami hazard mitigation.

As part of this program, DGGS is participating in a cooperative project with the Alaska Division of Homeland Security & Emergency Management (DHSEM) and the University of Alaska Geophysical Institute (UAGI) to prepare tsunami-inundation maps of selected coastal communities. Communities are chosen on the basis of tsunami risk, infrastructure, availability of bathymetric and topographic data, and willingness of a community to use results for emergency preparedness. For each community, we develop multiple hypothetical tsunami scenarios that are based on the parameters of potential underwater earthquakes and landslides. We have completed and published tsunami inundation maps for three communities in the Kodiak area as well as for Homer and Seldovia. For the next community, Seward, we have compiled and merged bathymetric and topographic data and are conducting numerical wave modeling for tsunamis generated both tectonically and by submarine landslides (see figure). Tsunami inundation maps and a report for Seward will be published by June 2006. Data compilation for the next community, Sitka, is underway.

To develop inundation maps, we use complex numerical modeling of tsunami waves as they move across the ocean and interact with the seafloor and shoreline configuration in shallower nearshore water. UAGI conducts the wave modeling using facilities at the Arctic Region Supercomputing Center. DGGS imports the results of this modeling into a Geographic Information System (GIS) database for use in projecting inundation limits on suitable base maps. DGGS, UAGI, and DHSEM meet with community leaders to communicate progress and results of the project, discuss format of resulting maps, and obtain community input regarding past tsunami effects and extent. DGGS publishes the final maps along with explanatory text, which are available in both hardcopy and digital formats. DGGS also makes the GIS files of inundation-limit lines available to the local communities for use in preparing their own tsunami-evacuation maps.



Graphic depiction of numerical modeling of submarine landslide and resulting tsunami that occurred at Seward following the 1964 great Alaska earthquake. Twelve people lost their lives as a result of waves generated either tectonically or by the submarine landslide.

During preparation of the Kodiak maps, comparison of the modeled 1964 inundation with the observed wave run-up in 1964 verified that the model produced comparable inundation. We have presented results of this project at international tsunami symposia in Istanbul, Turkey, and Seattle, Washington, in 2001, at the Tsunami Society symposium in Honolulu, Hawaii, in 2002, and at the American Geophysical Union meetings in 2003, 2004, and 2005. This project has been the subject of articles in *Geotimes* and *TsuInfo Alert Newsletter*.

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DIGITAL GEOLOGIC DATABASE PROJECT

In October 2000, the Division of Geological & Geophysical Surveys (DGGS) began creating a geologic database system that will provide consistent data input and organization in a centralized, secure storage architecture. The database system will also provide data identification and retrieval functions that will guide and encourage users to access appropriate data on-line. This project is part of the Federally funded Minerals Data and Information Rescue in Alaska (MDIRA) program.

The Digital Geologic Database Project has three primary objectives. The first is to establish a spatially referenced geologic database system in a centralized information architecture with networked data access for new and legacy DGGS geologic data. The second objective is to create a functional online system that allows the public to find and identify the type and geographic locations of geologic data available from DGGS and then view or download the selected data. The third objective is to cooperatively integrate DGGS minerals-related data with data from other agencies through a MDIRA Web page <http://akgeology.info>.

During the first five years, the project work group identified geologic data for inclusion in the database, created a secure and stable database structure, and started loading data into the database. DGGS Publications are now searchable and served to the public through the DGGS Web site <http://www.dggs.dnr.state.ak.us/pubs>, the MDIRA geologic map search engine <http://maps.akgeology.info/>, and Interagency Bibliography <http://maps.akgeology.info/>. DGGS Geochemical data can be searched and viewed through the DGGS WebGeochem search engine <http://www.dggs.dnr.state.ak.us/WebGeoChem>.

Currently, the project group is preparing to load geospatial data index information (metadata) into the database where it will be the basis for distributing DGGS spatial data on the Web. Other activities are in support of other DGGS MDIRA projects. Team members are also working to integrate DGGS data with other MDIRA datasets on the MDIRA Web Page <http://akgeology.info>. A map-based Web portal is in development by DNR that will incorporate DGGS and MDIRA data, making a true online "one stop shop" for Alaska Minerals data. These changes will be available, with a limited set of data, by June 30, 2006. The data set will increase in size in succeeding years.

The core of the project is the DGGS geologic database, which contains spatially referenced geologic and earth resources information. The information contained in the database, such as geochemical analyses, geologic map indices, bibliographic citations, and rock sample indices, are all tied to a geographic feature. Without this spatial reference the geologic information would have no context.

The database infrastructure that supports this project consists of a data server, spatially capable relational database management software, and utilities to interface with the DGGS Local Area Network (LAN) and Geographic Information System (GIS). The database is available to DGGS staff through the DGGS LAN using GIS software, database client software, and Web-based forms.

The public can access the information contained in the DGGS geologic database through the DGGS Web site <http://www.dggs.dnr.state.ak.us> and the AKGeology.info portal <http://akgeology.info> via searchable listings of publications and their associated data as well as through a variety of search engines allowing customized selection criteria.

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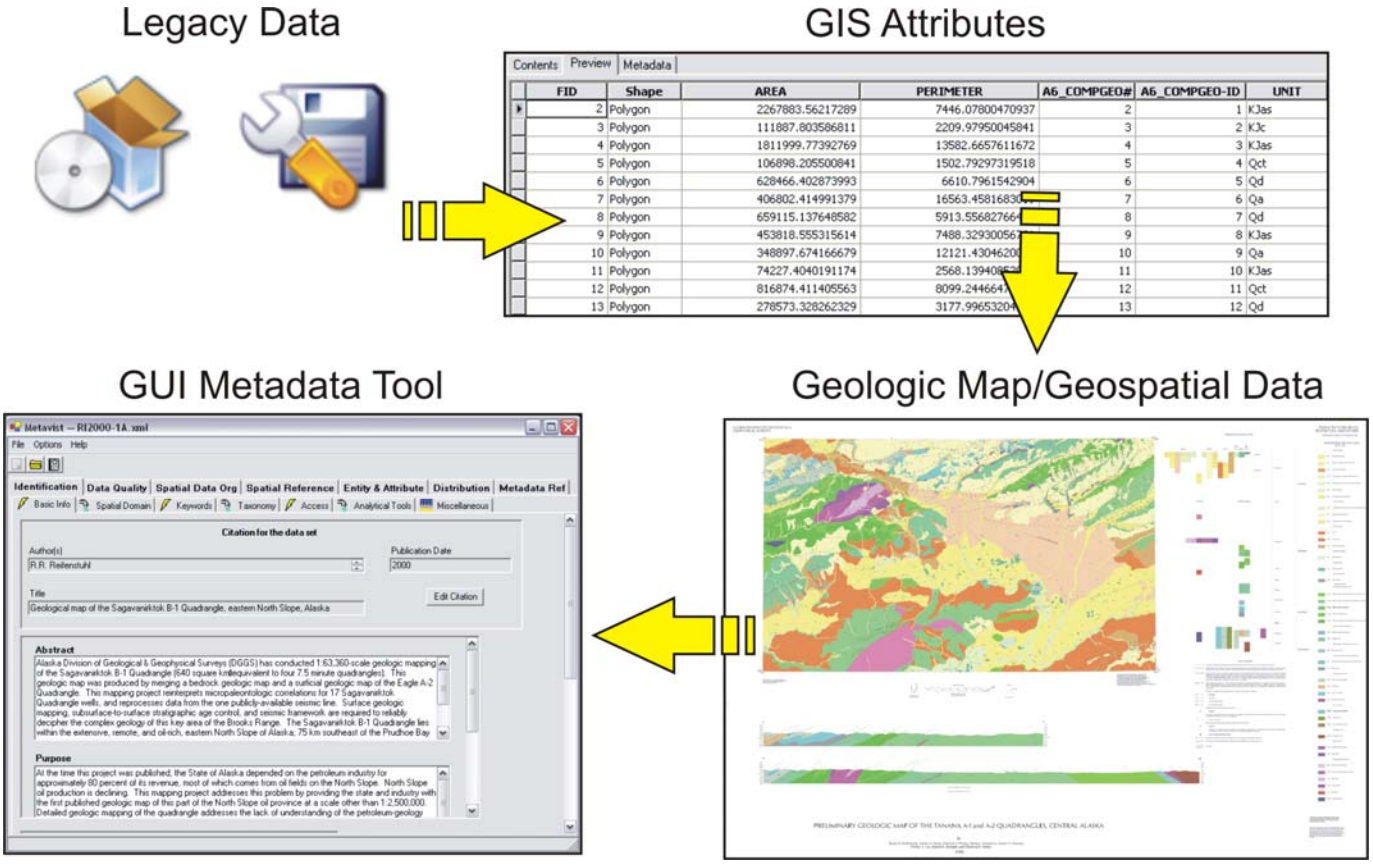
CONVERSION OF LEGACY DIGITAL GEOLOGIC MAP DATA TO MODERN FGDC STANDARDS

The Division of Geological & Geophysical Surveys (DGGS) has been generating geologic maps using GIS software since the early 1990s. Documentation of those geospatial datasets was inconsistent and did not meet modern metadata standards. This project is designed to recover legacy geospatial datasets developed prior to implementation of federal metadata standards in 2002 and to document and upgrade the existing data to modern GIS formats and documentation practices.

As part of the Minerals Data and Information Rescue in Alaska (MDIRA) project, DGGS is creating a database of geologic information that will ultimately be made available to the public via the Internet through a series of Web-based application interfaces. A significant portion of the "Data at Risk" to be preserved in this database are geographically referenced geologic mapping and minerals-related data created during the past 15 years using Geographic Information Systems (GIS) technology. Documentation of entity-attribute information and data-quality information for our legacy digital datasets is an essential step in making the legacy data meaningful and available to the public. The existing GIS data must be converted to modern geodatabase format with accompanying documentation, known as metadata, a superset of data that describes and documents the content of GIS data files.

The primary objective of this project is to produce Federal Geographic Data Committee (FGDC)-compliant metadata for our legacy GIS files in preparation for conversion to modern GIS data formats. This will require recovering much of the data from backup sources such as tapes and CD-ROMs, interviewing accessible geologists who produced the data, and gleaning as much information about the data as possible from available electronic and paper files. This project is in its eighth month of completion and, as of December, 2005, DGGS has recovered roughly 50 percent of legacy data files and has written the affiliated metadata. In January 2006, we will test and utilize a new, free, graphical user interface (GUI) to write the FGDC-compliant metadata. The GUI metadata writing tool will then be distributed to all DGGS staff for use on other projects. The ultimate goals are to make DGGS's GIS data more widely available and to facilitate loading and integration of GIS data into the MDIRA-funded interagency database system.



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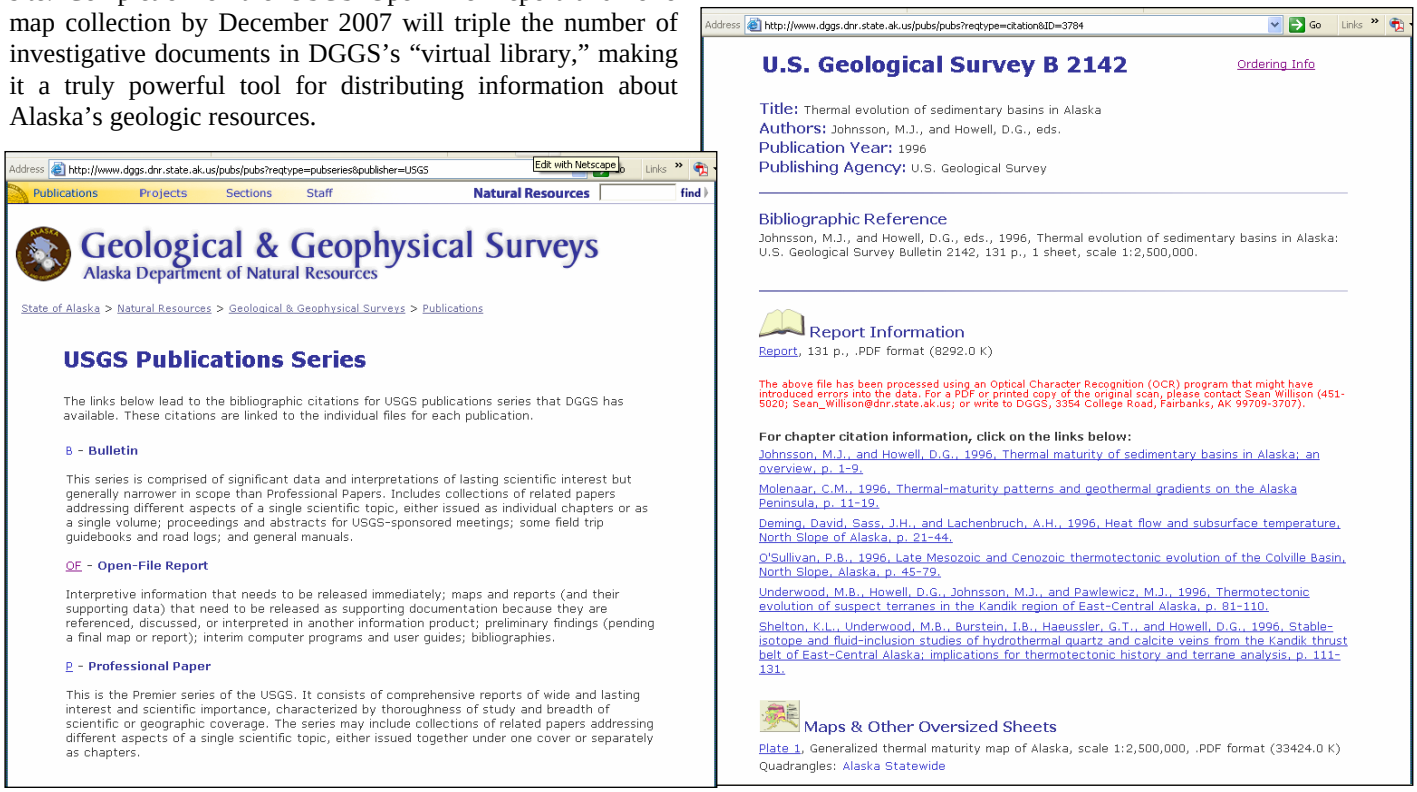
U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER AND BULLETIN SCANNING AND DOCUMENT CONVERSION PROJECT

Over the past century the United States Geological Survey (USGS) has published a wealth of geologic research and information about the geology, natural resources, and geologic hazards of Alaska. Alaska's difficult terrain and logistical challenges contribute to a very high cost per square mile for geologic mapping. Consequently, legacy reports published by the USGS for many of the remote areas in Alaska remain the primary sources of geologic information. The maps, reports, and informational publications produced by the USGS in Alaska are widely utilized by oil companies, mining companies, resource-based companies, consultants, universities, schools, government agencies, scientists, and private individuals. With the exception of maps and reports published digitally in the past few years, all of the USGS Alaska publications have existed solely on paper. A great majority of these documents are rare and out of print. Convenient access for Alaskans to complete collections of Alaska USGS reports is effectively restricted to patrons of the DGGS and USGS libraries, and research libraries in Fairbanks, Anchorage, and Juneau.

DGGS holds a nearly complete collection of Alaska-related USGS Publications. The collection includes about 5,000 reports and map consisting of almost 200,000 pages of text, photographs, data tables, and illustrations. Funded by a series of cooperative agreements with the USGS under the Minerals Data and Information Rescue in Alaska (MDIRA) Program, DGGS has been working to complete and catalog this collection, convert the documents to digital files, archive them in TIF format, and make them available to the public for downloading via the Web (PDF format).

The first phase of this project (Professional Papers and Bulletins) was completed in FY04. The second and final phase (USGS Open-File Reports, Miscellaneous Field Studies, Geologic Quadrangle Maps, Miscellaneous Investigations/Geologic Investigations, Mineral Investigations Resources Maps, and various other short series USGS publications) was begun in FY05. DGGS scanning project staff acquired and cataloged approximately 4,000 reports. Citation information for these reports was loaded into the DGGS Oracle database. Much work was done to locate and scan documents that were missing from our collection. Throughout FY06 the remaining documents will be scanned and made available to the public as they are completed.

Citation information and links to the reports that are currently available can be obtained via the MDIRA Interagency Bibliography Index <http://www.bib.akgeology.info/mbib/index.html> and through the DGGS publications pages. We are also investigating options for further enhancing users' ability to query these files and retrieve multiple documents from the Web site. Completion of the USGS Open-File Report and folio map collection by December 2007 will triple the number of investigative documents in DGGS's "virtual library," making it a truly powerful tool for distributing information about Alaska's geologic resources.



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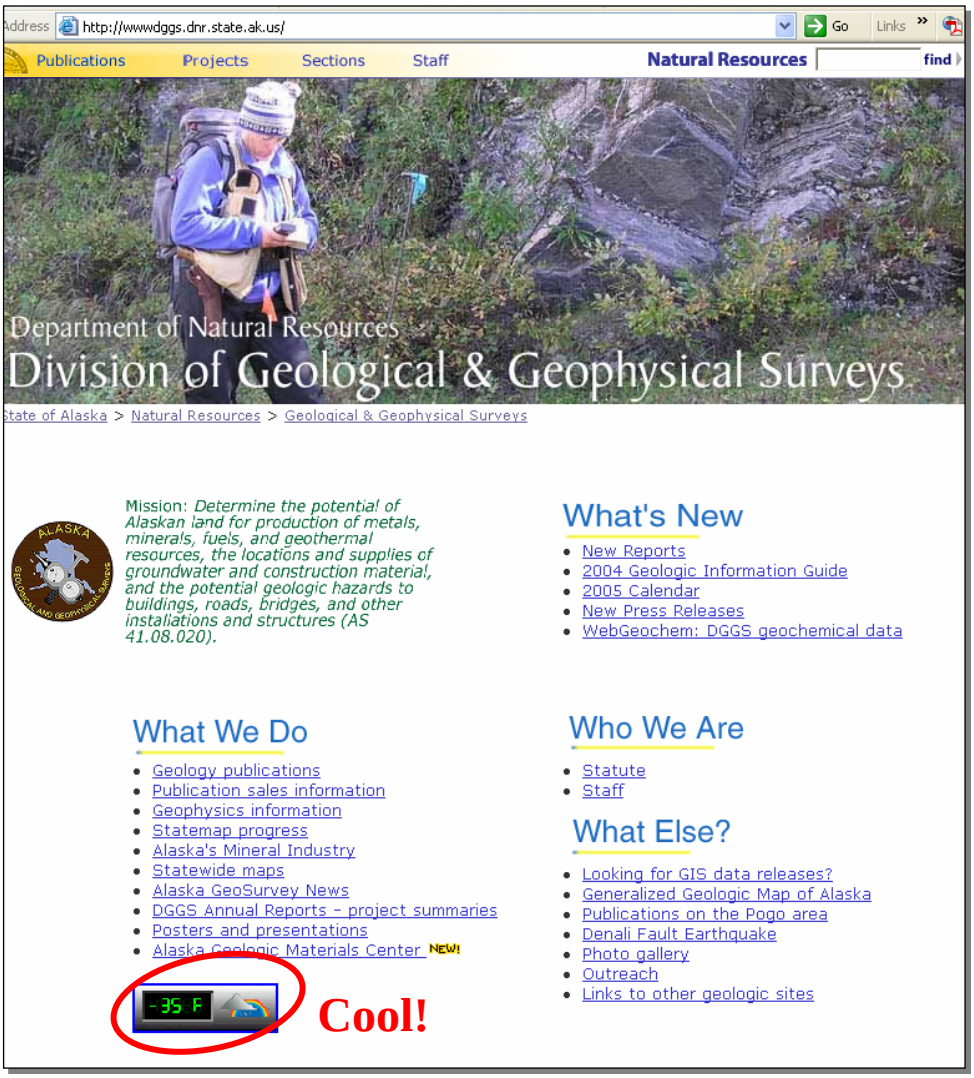
DGGS WEB PAGE

http://www.dggs.dnr.state.ak.us

During FY05 the DGGS Web site received 187,700 visits. The front page continues to be the most common entry point but is now closely followed by the "Publications" page. Beyond the front page the most popular pages, listed in consecutive order, are "Publications," "Statewide Maps," "Geologic Map of Alaska," "Photo Gallery," and the "DGGS Staff Directory" page.



Extensive changes were made during FY04 to improve the functionality, organization, appearance, and efficiency of the DGGS Web site and online file distribution infrastructure. FY05 user response to the revamped DGGS Web page look and feel, as well as to the improved functionality of live online access to our publications, has been overwhelmingly positive. In response to user feedback and requests for improved online information availability, we have continued to update, maintain, and improve the efficiency of existing pages. In addition to periodic content changes and updates, several changes have been implemented to improve internal workflow efficiency. For example, the "New Reports" page and the "Alaska's Mineral Industry" page are designed to enable quick access to publications in their respective topic areas; during FY05, these two pages were rebuilt to be populated directly from our Oracle database. These live, Java-coded pages ensure that they are continually up to date as information is added to the database without requiring manual recoding by DGGS staff.

The DGGS Geologic Communications team has also completed two multi-year projects involving online distribution of legacy geologic data. USGS Professional Papers and Bulletins containing Alaskan geologic information are now available through our "Publications" pages. We have also launched "WebGeochem: DGGS Geochemical Sample Analysis Search," an online tool for searching DGGS geochemical datasets. Work is underway to scan USGS Open-File Reports and folio maps and make them available through the DGGS Web site. Also in progress is development of a system for distributing digital data online, improving our Web traffic analysis workflow, rebuilding our internal Web page, redesigning and updating the photo gallery, and adding various pages containing content that would be of interest to our users.

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GIS–IT INFRASTRUCTURE PROJECT

The Geographic Information Systems–Information Technology (GIS–IT) team provides primary microcomputer and GIS service and support to DGGS staff, and streamlines information delivery to the public. The team is made up of a Microcomputer/Network Specialist, a Microcomputer/Network Technician, and a Cartographer/GIS Manager.

The DGGS IT staff initiate projects that will provide improved computer services to users. Several pieces of vital equipment were purchased this past year. A SunFire V440 server was purchased to replace a 13-year-old server, and a Sun StorEdge was obtained to provide disk space for files that presently reside on the old server and individual PCs. The new StorEdge 3300 will allow for expansion to more than 3 terabytes of data. These two pieces of equipment have been installed and are being transitioned into service. In the past year DGGS has begun using an Overland NEO for data backup. This tape unit will make it possible to back up data stored on the new disk array.

GIS users in the Division have benefited from the maintenance, upgrade, and support for ArcGIS licenses. The desktop GIS, Arc 9.1, implemented a year ago, has required new approaches to GIS that depart from the division's long-term Unix/ArcInfo background. To enable GIS project work, the GIS Manager maintains plotters and digitizers and advises and assists other users so they can complete maps for publication.

While providing DGGS staff with computers, network, and GIS, support is the primary function of the GIS–IT infrastructure project. Each year new projects provide better customer support and improve the stability of the network infrastructure or the efficiency of the support services provided to DGGS, and ultimately to the public. Projects for FY06 include completion of the transition to the new main server, initiating the new disk space for use, the full backup of files that exist on the new StorEdge, and the addition of Microsoft servers to the DGGS system.

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PUBLICATIONS AND OUTREACH PROJECT

The Publications Project team publishes and distributes the geologic data collected, analyzed, and assembled by staff in the Minerals, Energy, and Engineering Geology sections of DGGS. Team members are involved in many of the division's publication production and outreach activities. Some of the functions they perform are:

- Staff DGGS's information desk to provide information concerning Alaska's geologic resources and hazards.
- Manage sales of DGGS geologic reports, maps and data.
- Prepare displays and represent DGGS at geologic conferences and meetings by providing staff and assembling the booth display.
- Produce an annual report for the Legislature and public, required by statute and written by the geologic staff, summarizing DGGS activities and communicating plans for its future projects.
- Publish a twice-yearly newsletter that communicates DGGS progress and advertises the latest publications.
- Design, produce, and distribute an annual informative DGGS calendar.
- Perform design, layout, and editing, and oversee final production of technical and educational geologic maps and reports in both printed and digital formats.
- Review metadata for each project.
- Manage the DGGS library so that reports are available and locatable.
- Maintain a collection of Alaska-related publications of the U.S. Geological Survey, U.S. Bureau of Mines, and the U.S. Bureau of Land Management.
- Participate in school outreach activities such as helping prepare classroom presentations, judging science fair entries, or helping teachers by presenting earth science units.

The publications produced by this group record and preserve geologic data such as: Definitive statistics for Alaska's mineral industry; detailed (1:63,360-scale) bedrock, surficial, and engineering geologic maps for specific areas in the state; sources of Alaska's geologic information; annual information about DGGS's programs and accomplishments; airborne geophysical data for areas with promising mineralization; and educational brochures and pamphlets explaining Alaska's geology or natural-science features. Some of the most recent DGGS publications include *Alaska's Mineral Industry 2004; Geologic Map Suite of the Big Hurrah area, northern half of the Solomon C-5 Quadrangle; Geologic Map Suite of the Council area, Solomon D-4 and Bendeleben A-4 quadrangles, Seward Peninsula; Preliminary volcano-hazard assessment for Okmok Volcano, Umnak Island;* several reports on the geology of the Bristol Bay area, Alaska Peninsula; and replotted geophysical surveys for Nome and Goodpaster mining districts. Publications are available on paper (printed on demand and sold for the cost of printing) and as PDF documents and scanned compressed maps on the DGGS Web page (no charge).

Work will continue in FY2006 to increase the availability of digital datasets from which GIS maps are produced, so that customers can manipulate data in any way they choose, and publishing documents in digital format first, then using the digital publication to produce a paper copy when necessary. The availability of geological and geophysical data encourages exploration of Alaska's natural resources and mitigation of risks from the state's geologic hazards.

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GEOLOGIC MATERIALS CENTER

The Alaska Geologic Materials Center (GMC) in Eagle River holds nonproprietary rock core and cuttings that represent nearly 12 million feet of exploration and production drilling on Federal, State, and private lands of Alaska, including the Alaska outer continental shelf. Of this footage, 216,000 feet are diamond-drilled hard-rock mineral core. The GMC collection includes rock materials from more than 1,300 oil and gas exploratory or production wells, rock core from more than 1,000 exploratory hard-rock mineral holes, and numerous surface rock samples. The collection also includes extensive geochemical data, petrographic thin sections, and paleontological glass slides derived from this rock.

The GMC is operated by the Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys, with support from cooperating government agencies that include the U.S. Bureau of Land Management, U.S. Geological Survey, U.S. Minerals Management Service, and Alaska Oil and Gas Conservation Commission. The basic mission of the GMC is to archive all worthwhile rock samples collected in Alaska and on the Alaska outer continental shelf. The chief users of the GMC are the oil and gas industry, although use by the minerals industry, government, and academic institutions is increasing.

As of mid December, 2005, the GMC had 155 visitations with another 1,067 contacts (by phone, mail, or e-mail) during FY06. GMC has also received to date for FY06 2,054 processed oil/gas petrographic, microfossil, or geochemical glass slides and one technical data report.

In FY05, there were 450 total visitations with another 2,688 contacts with the facility. The GMC also received a total of 7,309 processed slides and five data reports.

For FY06, the GMC has successfully received, stored, and is in the process of inventorying one 40-foot trailer load of rock samples representing collections from U.S. Forest Service's Zarembo Island hard-rock mineral prospect, and "released" Alaska Oil and Gas Conservation Commission well samples. So far this fiscal year, samples for 12 oil and gas wells and five hard-rock mineral holes were received or donated.

Because the volume of samples has far exceeded its warehouse capacity, the GMC now has a total of 55 portable CONNEX containers, 48 of which are occupied with samples. For FY06, one CONNEX has been added, but no additional shelf space has been added. No large rock donations are presently anticipated for the rest of FY06.

Contact: John Reeder, Geologic Materials Center, 907-696-0079, john_reeder@dnr.state.ak.us

PUBLICATIONS RELEASED IN 2005

GEOPHYSICAL MAPS & REPORTS

GPR 2004_6. Line, gridded, and vector data, and selected plot files of the airborne geophysical survey data of the Nome mining district, Seward Peninsula, Alaska, by L.E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp., 2004, 1 CD-ROM. Line data in ASCII format; gridded data in Geosoft and ER Mapper format; vector files in Autocad 13 dxf files. Includes 6 maps listed below as GPR 2004_6_1a through 3b are included as plot files in both HPGL/2 format and postscript printer format. Software is needed with ability to plot HPGL2 files for an HP Design Jet 5000/5500 series plotter or postscript files designed for an HP Design Jet 5000/5500 using Postscript 3 printer driver v5.0. The postscript files should plot on all Hewlett Packard plotters that can interpret Postscript 3 files. *Supercedes PDF 94-15 and PDF 94-33.* $10.

GPR 2004_6_1a. Total magnetic field of the Nome mining district, Seward Peninsula, Alaska, 2004, 1 sheet, scale 1:63,360. Full color map; topography included. *Supercedes RI 94-10; see also GPR 2004_6_1b.* $13.

GPR 2004_6_1b. Total magnetic field of the Nome mining district, Seward Peninsula, Alaska, 2004, 1 sheet, scale 1:63,360. Full color map; magnetic contours and section lines included. *Supercedes RI 94-10; see also GPR 2004_6_1a.* $13.

GPR 2004_6_2a. 7200 Hz coplanar apparent resistivity of the Nome mining district, Seward Peninsula, Alaska, 2004, 1 sheet, scale 1:63,360. Full color map; topography included. *Supercedes RI 94-12; see also GPR 2004_6_2b.* $13.

GPR 2004_6_2b. 7200 Hz coplanar apparent resistivity of the Nome mining district, Seward Peninsula, Alaska, 2004, 1 sheet, scale 1:63,360. Full color map; resistivity contours and section lines included. *Supercedes RI 94-12; see also GPR 2004_6_2a.* $13.

GPR 2004_6_3a. 900 Hz coplanar apparent resistivity of the Nome mining district, Seward Peninsula, Alaska, 1 sheet, scale 1:63,360. Full color map; topography included. *Supercedes RI 94-13; see also GPR 2004_6_3b.* $13.

GPR 2004_6_3b. 900 Hz coplanar apparent resistivity of the Nome mining district, Seward Peninsula, Alaska, 1 sheet, scale 1:63,360. Full color map; Resistivity contours and section lines included. *Supercedes RI 94-13; see also GPR 2004_6_3a.* $13.

GPR 2005_1. Plotter format and Adobe Acrobat format files of the geophysical survey of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, by L.E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp. 1 CD-ROM. Includes 13 maps (aeromagnetic or resitivity) listed below as GPR2005_1_xy as plot files in both HPGL/2 format and postscript printer format, and as Adobe Acrobat format files. For the plotter files, software is needed with ability to plot HPGL2 files for an HP Design Jet 5000/5500 series plotter or postscript files designed for an HP Design Jet 5000/5500 using Postscript 3 printer driver v5.0. The postscript files should plot on all Hewlett Packard plotters that can interpret Postscript 3 files. $10.

GPR 2005_1_1a. Total magnetic field of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; topography included. $13.

GPR 2005_1_1b. Total magnetic field of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; magnetic contours and section lines included. $13.

GPR 2005_1_1c. Color shadow magnetic map of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; state section grids included. $13.

GPR 2005_1_1d. Total magnetic field and electromagnetic anomalies of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; topography, flight lines, and simplified electromagnetic anomalies included. $13.

GPR 2005_1_2a. 56,000 Hz coplanar resistivity of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; topography included. $13.

GPR 2005_1_2b. 56,000 Hz coplanar resistivity of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; resistivity contours and section lines included. $13.

GPR 2005_1_3a. 7200 Hz coplanar resistivity of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; topography included. $13.

GPR 2005_1_3b. 7200 Hz coplanar resistivity of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; resistivity contours and section lines included. $13.

GPR 2005_1_4a. 900 Hz coplanar resistivity of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; topography included. $13.

GPR 2005_1_4b. 900 Hz coplanar resistivity of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Full-color map; resistivity contours and section lines included. $13.

GPR 2005_1_5a. Total magnetic field and detailed electromagnetic anomalies of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, parts of Big Delta B-3 and B-4 quadrangles, 2005, 1 sheet, scale 1:31,680. Full-color map; topography, flight lines, and detailed electromagnetic anomalies included. $13.

GPR 2005_1_5b. Total magnetic field and detailed electromagnetic anomalies of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, parts of Big Delta B-2 and B-3 quadrangles, 2005, 1 sheet, scale 1:31,680. Full-color map; topography, flight lines, and detailed electromagnetic anomalies included. $13.

GPR 2005_1_6. Flight lines of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, 2005, 1 sheet, scale 1:63,360. Black and white map; topography and flight lines only included. $13.

GPR 2005_2. Line, gridded, and vector data of the geophysical survey of part of the Goodpaster River area, Goodpaster mining district, Interior Alaska, by L.E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp. 1 CD-ROM. Line data in ASCII format; gridded data in Geosoft and ER Mapper formats; vector files in Autocad version 13 dxf files. Most of the gridded and vector data (aeromagnetic and resistivity only) include the area for the Salcha River–Pogo (released by DGGS in 2000) and Southeast Extension of the Salcha River–Pogo survey (released by DGGS in 2002) as well as the new Goodpaster River area data. The line data only includes the new Goodpaster River survey. $10.

GPR 2006-1. Line, grid, and vector data and plot files for the airborne geophysical survey data of parts of the southern National Petroleum Reserve–Alaska, Northwest Alaska, by Laurel E. Burns, U.S. Bureau of Land Management, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp., 2006. 3 CD-ROMs. Line data in ASCII format; gridded data in Geosoft and ER Mapper formats; vector files in Autocad version 13 dxf files. Includes 19 maps (aeromagnetic or resitivity) listed below as GPR2006_1_xy as plot files in both HPGL/2 format and postscript printer format, and as Adobe Acrobat format files. For the plotter files, software is needed with ability to plot HPGL2 files for an HP Design Jet 5000/5500 series plotter or postscript files designed for an HP Design Jet 5000/5500 using Postscript 3 printer driver v5.0. The postscript files should plot on all Hewlett Packard plotters that can interpret Postscript 3 files. $30.

GPR 2006-1-1a. Total magnetic field of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, 4 sheets, scale 1:63,360. Full color; contains topography. $52.

GPR 2006-1-1b. Total magnetic field of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, 4 sheets, scale 1:63,360. Full color; contains magnetic contour lines. $52.

GPR 2006-1-2a. 7200 Hz coplanar resistivity of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, 4 sheets, scale 1:63,360. Full color; contains topography. $52.

GPR 2006-1-2b. 7200 Hz coplanar resistivity of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, 4 sheets, scale 1:63,360. Full color; contains resistivity contour lines. $52.

GPR 2006-1-3a. 900 Hz coplanar resistivity of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, 4 sheets, scale 1:63,360. Full color; contains topography. $52.

GPR 2006-1-3b. 900 Hz coplanar resistivity of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, 4 sheets, scale 1:63,360. Full color; contains resistivity contour lines. $52.

GPR 2006-1-4a. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Misheguk Mountain C-1, C-2, D-1, and D-2 quadrangles, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4b. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass C-5 and D-5 quadrangles, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4c. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass C-4 Quadrangle, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4d. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass C-3 Quadrangle, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4e. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass C-2 Quadrangle, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4f. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass C-1 Quadrangle, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4g. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass B-5 and C-5 quadrangles, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4h. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass B-4 Quadrangle, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4i. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass B-3 Quadrangle, 1 sheet, scale 1:31,680. Full color;

contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4j. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass B-2 Quadrangle, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-4k. Total magnetic field and detailed electromagnetic anomalies of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, parts of Howard Pass B-1 Quadrangle, 1 sheet, scale 1:31,680. Full color; contains topography and detailed electromagnetic anomalies. $13.

GPR 2006-1-5a. 56,000 Hz coplanar resistivity of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, 4 sheets, scale 1:63,360. Full color; contains topography. $52.

GPR 2006-1-5b. 56,000 Hz coplanar resistivity of parts of southern National Petroleum Reserve–Alaska, Northwest Alaska, 4 sheets, scale 1:63,360. Full color; contains resistivity contour lines. $52.

GPR 2006-3. Line, grid, and vector data and plot files for the airborne geophysical survey data of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, by Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp., 2006, 1 CD-ROM. Line data in ASCII format; gridded data in Geosoft and ER Mapper formats; vector files in Autocad version 13 dxf files. Includes 13 maps (aeromagnetic or resistivity) listed below as GPR2006_3_xy as plot files in both HPGL/2 format and postscript printer format, and as Adobe Acrobat format files. For the plotter files, software is needed with ability to plot HPGL2 files for an HP Design Jet 5000/5500 series plotter or postscript files designed for an HP Design Jet 5000/5500 using Postscript 3 printer driver v5.0. The postscript files should plot on all Hewlett Packard plotters that can interpret Postscript 3 files. $10.

GPR 2006-3-1a. Total magnetic field of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, 2 sheets, scale 1:63,360. Full color; contains topography. $26.

GPR 2006-3-1b. Total magnetic field of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, 2 sheets, scale 1:63,360. Full color; contains magnetic contour lines. $26.

GPR 2006-3-2a. 56,000 Hz coplanar resistivity of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, 2 sheets, scale 1:63,360. Full color; contains topography. $26.

GPR 2006-3-2b. 56,000 Hz coplanar resistivity of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, 2 sheets, scale 1:63,360. Full color; contains resistivity contour lines. $26.

GPR 2006-3-3a. 7200 Hz coplanar resistivity of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, 2 sheets, scale 1:63,360. Full color; contains topography. $26.

GPR 2006-3-3b. 7200 Hz coplanar resistivity of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, 2 sheets, scale 1:63,360. Full color; contains resistivity contour lines. $26.

GPR 2006-3-4a. 900 Hz coplanar resistivity of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, 2 sheets, scale 1:63,360. Full color; contains topography. $26.

GPR 2006-3-4b. 900 Hz coplanar resistivity of northeast Fairbanks area, Fairbanks and Circle mining districts, Interior Alaska, 2 sheets, scale 1:63,360. Full color; contains resistivity contour lines. $26.

GPR 2006-5. Line, grid, and vector data and plot files for the airborne geophysical survey data of parts of the East Richardson, Liscum, and Black Mountain areas, Interior Alaska, by Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp., 2006, 2 CD-ROMs. Line data in ASCII format; gridded data in Geosoft and ER Mapper formats; vector files in Autocad version 13 dxf files. Includes 29 maps (aeromagnetic or resitivity) listed below as GPR2006_5_xy as plot files in both HPGL/2 format and postscript printer format, and as Adobe Acrobat format files. For the plotter files, software is needed with ability to plot HPGL2 files for an HP Design Jet 5000/5500 series plotter or postscript files designed for an HP Design Jet 5000/5500 using Postscript 3 printer driver v5.0. The postscript files should plot on all Hewlett Packard plotters that can interpret Postscript 3 files. $20.

GPR 2006-5-1a. Total magnetic field of the east Richardson area, Fairbanks mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-1b. Total magnetic field of the east Richardson area, Fairbanks mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains magnetic contour lines. $13.

GPR 2006-5-2a. 56,000 Hz coplanar resistivity of the east Richardson area, Fairbanks mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-2b. 56,000 Hz coplanar resistivity of the east Richardson area, Fairbanks mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

GPR 2006-5-3a. 7200 Hz coplanar resistivity of the east Richardson area, Fairbanks mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-3b. 7200 Hz coplanar resistivity of the east Richardson area, Fairbanks mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

GPR 2006-5-4a. 900 Hz coplanar resistivity of the east Richardson area, Fairbanks mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-4b. 900 Hz coplanar resistivity of the east Richardson area, Fairbanks mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

GPR 2006-5-7a. Total magnetic field of the Liscum area, Goodpaster mining district, Interior Alaska, 2006, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-7b. Total magnetic field of the Liscum area, Goodpaster mining district, Interior Alaska, 2006, 1 sheet, scale 1:63,360. Full color; contains magnetic contour lines. $13.

GPR 2006-5-8a. 56,000 Hz coplanar resistivity of the Liscum area, Goodpaster mining district, Interior Alaska, 2006, 1 sheet, scale 1:63,360. Full color; contains topog-raphy. $13.

GPR 2006-5-8b. 56,000 Hz coplanar resistivity of the Liscum area, Goodpaster mining district, Interior Alaska, 2006, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

GPR 2006-5-9a. 7200 Hz coplanar resistivity of the Liscum area, Goodpaster mining district, Interior Alaska, 2006, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-9b. 7200 Hz coplanar resistivity of the Liscum area, Goodpaster mining district, Interior Alaska, 2006, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

GPR 2006-5-10a. 900 Hz coplanar resistivity of the Liscum area, Goodpaster mining district, Interior Alaska, 2006, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-10b. 900 Hz coplanar resistivity of the Liscum area, Goodpaster mining district, Interior Alaska, 2006, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

GPR 2006-5-13a. Total magnetic field of the Black Mountain area, Goodpaster mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-13b. Total magnetic field of the Black Mountain area, Goodpaster mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains magnetic contour lines. $13.

GPR 2006-5-14a. 56,000 Hz coplanar resistivity of the Black Mountain area, Goodpaster mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-14b. 56,000 Hz coplanar resistivity of the Black Mountain area, Goodpaster mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

GPR 2006-5-15a. 7200 Hz coplanar resistivity of the Black Mountain area, Goodpaster mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-15b. 7200 Hz coplanar resistivity of the Black Mountain area, Goodpaster mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

GPR 2006-5-16a. 900 Hz coplanar resistivity of the Black Mountain area, Goodpaster mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains topography. $13.

GPR 2006-5-16b. 900 Hz coplanar resistivity of the Black Mountain area, Goodpaster mining district, Interior Alaska, 1 sheet, scale 1:63,360. Full color; contains resistivity contour lines. $13.

INFORMATION CIRCULARS

IC 12. Services of the Alaska Division of Geological & Geophysical Surveys, by D.R. Roberts, revised June 2005, 2 p. Free.

IC 50. Alaska's mineral industry 2004: a summary, by D.J. Szumigala and R.A. Hughes, 2005, 18 p. Free.

MISCELLANEOUS PUBLICATIONS

MP 135. Alaska gas hydrate planning workshop proceedings: Anchorage, Alaska, August 17–18, 2005, by T.S. Collett, R.F. Swenson, and B. Pierce, 2005, 39 p. $4.

PRELIMINARY INTERPRETIVE REPORTS

PIR 2004-4b. Summary of coalbed methane studies, Delta Junction, Alaska, by P.R. Peapples, 2004, 11 p. $2.

PIR 2005-1. Bristol Bay and Alaska Peninsula 2004: Fieldwork and sample analysis compilation report, by R.R. Reifenstuhl, R.D. Bailey, and E.S. Finzel, 2004, 20 p. $2.

PIR 2005-2. Architectural analysis of fluvial conglomerate in the Nanushuk Formation, Brooks Range Foothills, Alaska, by E.S. Finzel and P.J. McCarthy, 2005, 18 p. $2.

PIR 2005-3. Preliminary investigation of the Lisburne Group, upper Nanushuk River region, central Brooks Range, Alaska, by J.G. White, 2005, 28 p. $3.

PIR 2005-4. Sedimentology, stratigraphy, and hydrocarbon reservoir-source rock potential, using surface and subsurface data, of Tertiary and Mesozoic strata, Bristol Bay Basin and Alaska Peninsula, by Emily S. Finzel, Rocky R. Reifenstuhl, Paul L. Decker, and Kenneth D. Ridgway, 2005, 66 p. $7.

PIR 2005-5. Principal facts for gravity data collected in the northern Susitna Basin area, southcentral Alaska, by John F. Meyer, Jr., 2005, 12 p. $2.

PIR 2005-6. Oil and gas seeps of the Puale Bay–Becharof Lake–Wide Bay region, northern Alaska Peninsula, by Robert B. Blodgett and Karen H. Clautice, 2005, 13 p., 1 sheet, scale 1:250,000. $10.

PIR 2005-7. Preliminary summary of the 2005 field season: Port Moller, Herendeen Bay, and Dillingham areas, Bristol Bay Basin, Alaska Peninsula, by P.L. Decker, E.S. Finzel, K.D. Ridgway, R.R. Reifenstuhl, and R.B. Blodgett, 2005, 55 p., 2 sheets. $32.

PROFESSIONAL REPORTS

PR 121. Surficial geology of the Dalton Highway (Itkillik–Sagavanirktok rivers) area, southern Arctic foothills, Alaska, by T.D. Hamilton, 2003, 32 p., 1 sheet, scale 1:63,360. $7.50.

RAW-DATA FILES

RDF 2005-1. 30-meter shaded relief image of Okmok Volcano, Umnak Island, Alaska, by J.R. Schaefer, 2005, 1 CD-ROM. $10.

RDF 2005-2. Major-oxide, minor-oxide, trace-element, and geochemical data from rocks collected in the Solomon, Bendeleben, and Nome quadrangles, Seward Peninsula, Alaska in 2003 and 2004, by M.B. Werdon, D.J. Szumigala, R.J. Newberry, J.E. Athey, and S.A. Hicks, 2005, 46 p. $5.

RDF 2005-3. Latitudes and longitudes of volcanoes in Alaska, by C.E. Cameron, 2005, 1 CD-ROM. $10.

RDF 2005-4. Geochemical data from reanalysis of stream-sediment samples collected in 1982 from the Livengood area, Tolovana mining district, Alaska, by D.J. Szumigala, C.C. Puchner, and R.E. Myers, 2005, 45 p. $5.

RDF 2005-5. Major-oxide, minor-oxide, and trace-element geochemical data from rocks collected in the Liberty Bell area, Fairbanks A-4 Quadrangle, Alaska in 2005, by J.E. Athey, M.B. Werdon, R.J. Newberry, D.J. Szumigala, L.K. Freeman, and R.R. Lessard, 2005, 29 p. $3.

REPORTS OF INVESTIGATONS

RI 2004-3. Preliminary volcano-hazard assessment for Okmok Volcano, Umnak Island, Alaska, by J.E. Begét, J.F. Larsen, C.A. Neal, C.J. Nye and J.R. Schaefer, 2005, 32 p., 1 sheet, scale 1:150,000. $17.

RI 2005-1. Explanatory booklet to accompany geologic, bedrock, and surficial maps of the Big Hurrah and Council areas, Seward Peninsula, Alaska, by M.B. Werdon, D.S.P. Stevens, R.J. Newberry, D.J. Szumigala, J.E. Athey, and S.A. Hicks, 20 p. $2.

RI 2005-1a. Geologic map of the Big Hurrah area, northern half of the Solomon C-5 Quadrangle, Seward Peninsula, Alaska, by M.B. Werdon, D.S.P. Stevens, R.J. New-berry, D.J. Szumigala, J.E. Athey, and S.A. Hicks, 2005, 1 sheet, scale 1:63,360. $13.

RI 2005-1b. Bedrock geologic map of the Big Hurrah area, northern half of the Solomon C-5 Quadrangle, Seward Peninsula, Alaska, by M.B. Werdon, R.J. Newberry, D.J. Szumigala, J.E. Athey, and S.A. Hicks, 2005, 1 sheet, scale 1:63,360. $13.

RI 2005-1c. Surficial geologic map of the Big Hurrah area, northern half of the Solomon C-5 Quadrangle, Seward Peninsula, Alaska, by D.S.P. Stevens, 2005, 1 sheet, scale 1:63,360. $13.

RI 2005-1d. Geologic map of the Council Area, Solomon D-4 and Bendeleben A-4 quadrangles, Seward Peninsula, Alaska, by R.J. Newberry, M.B. Werdon, D.S.P. Stevens, J.E. Athey, and D.J. Szumigala, 2005, 1 sheet, scale 1:63,360. $13.

RI 2005-1e. Bedrock geologic map of the Council area, Solomon D-4 and Bendeleben A-4 quadrangles, Seward Peninsula, Alaska, by R.J. Newberry, M.B. Werdon, J.E. Athey, and D.J. Szumigala, 2005, 1 sheet scale 1:63,360. $13.

RI 2005-1f. Surficial geologic map of the Council area, Solomon D-4 and Bendeleben A-4 quadrangles, Seward Peninsula, Alaska, by D.S.P. Stevens, 2005, 1 sheet, scale 1:63,360. $13.

RI 2005-2. Tsunami hazard maps of the Homer and Seldovia areas, Alaska, by E.N. Suleimani, R.A. Combellick, D. Marriott, R.A. Hansen, A.J. Venturato, and J.C. Newman, 2005, 28 p., 2 sheets, scale 1:12,500. $29.

SPECIAL REPORTS

SR 59. Alaska's mineral industry 2004, by D.J. Szumigala and R.A. Hughes, 2005, 75 p. Free.