AIRBORNE GEOPHYSICAL SURVEY OF THE LADUE AREA, FORTYMILE MINING DISTRICT, EASTERN ALASKA

The Airborne Geophysical/Geological Mineral Inventory (AGGMI) program, supported by State General Funds, is a multi-year investment to expand the knowledge base of Alaska's mineral resources and catalyze private-sector mineral development. The program 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 the AGGMI program are identified considering existing geologic knowledge, land ownership, and responses to solicitations for nominations from Alaska's geologic community. As a result of this investment, the mineral industry has spent millions of dollars of venture capital in the local economies of the surveyed mining districts and adjacent areas in direct response to the new geologic knowledge provided by the surveys.

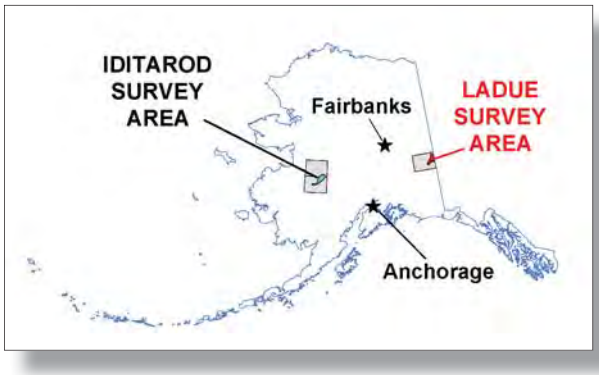

Figure 1. Locations of recent airborne geophysical surveys. The Ladue survey is in the Tanacross Quadrangle; the Iditarod survey is in the Iditarod and Ophir quadrangles.

Through the AGGMI program, DGGS acquired and released airborne-geophysical data for the Ladue and Iditarod areas (fig. 1; see p. 38) in FY11 and FY12. The 742-square-mile Ladue survey tract, about 25 miles east of Tok, is all State land and is part of the Fortymile mining district, the oldest placer gold camp in Alaska. More than 500,000 ounces of placer gold have been produced from the district. Like much of the Yukon–Tanana Uplands, the Ladue survey area is underlain by Paleozoic and older(?) deformed and regionally metamorphosed rocks, including quartzite, schist, gneiss, marble, greenstone, amphibolite, and orthogneiss. Cretaceous- to Tertiary-age igneous rocks of mafic, intermediate, and granitic composition intruded the metamorphosed rocks. The survey area contains large, low-grade copper–molybdenum±gold(?) porphyry deposits, plutonic-related lode gold prospects, and prospects with anomalous lead and zinc concentrations. The survey area also has the potential for hosting emerald deposits similar to the Tsa Da Glisza property in Yukon, Canada, and metamorphic/orogenic lode gold deposits similar to those of the historic Klondike Gold District in Yukon, Canada, and the Napoleon deposit northeast of Chicken, Alaska.

Airborne-geophysical surveys enable users to delineate regional geologic structures and identify metamorphic–stratigraphic lithologies and plutonic rock types based on their geophysical characteristics. The magnetic map (fig. 2) reveals numerous lineations trending northeast, northwest, and west. Observable geophysical offsets on the lineations suggest many are probably high-angle faults. These potential faults are not necessarily currently active. Follow-up geologic mapping tests geophysical anomalies and interpretations, and provides detailed documentation of the types, locations, and spatial distribution of metamorphic and plutonic rocks and structural features. By completing an integrated geophysical–geological mineral inventory study, new zones of mineralization may be identified, and extrapolation of some of the information into surrounding areas may be possible.

The Ladue area aeromagnetic and electromagnetic maps and data were released in June 2011. A second publication, containing a project report, interpretation, and electromagnetic anomalies, will be released in spring 2012. DGGS believes these data will lead to a better understanding of the geologic framework of the area and will stimulate increased mineral exploration investment within the survey boundary and the surrounding area.

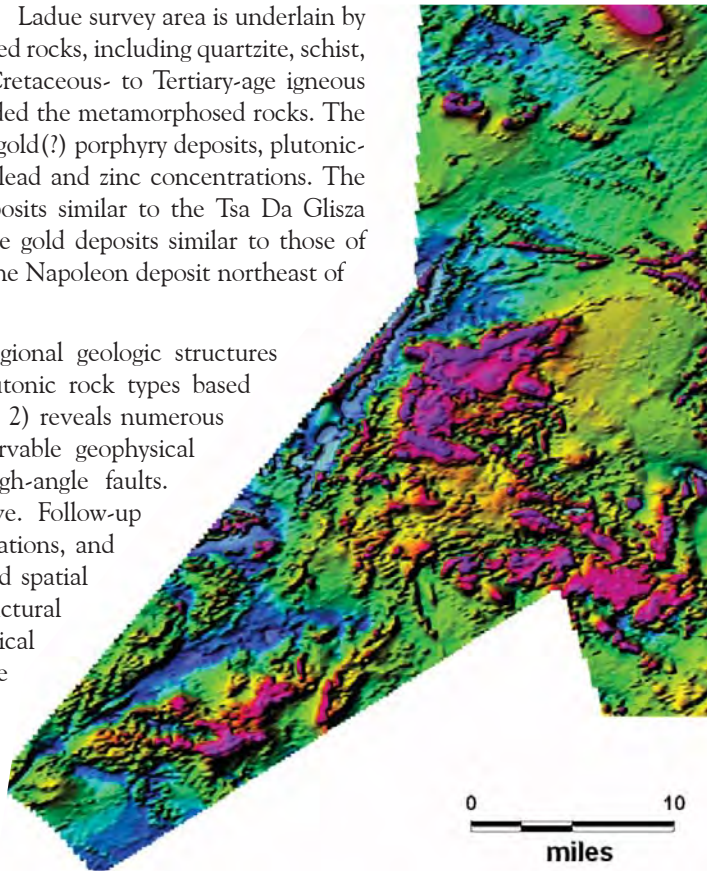

Figure 2. Ladue aeromagnetic data shown as a color shadow map. The rainbow of colors represents high magnetic values as magenta and low values as blues.

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AIRBORNE GEOPHYSICAL SURVEY OF THE IDITAROD AREA, IDITAROD, INNOKO, AND McGRATH MINING DISTRICTS, WESTERN ALASKA

The Airborne Geophysical/Geological Mineral Inventory (AGGMI) program, supported by State General Funds, is a multi-year investment to expand the knowledge base of Alaska's mineral resources and catalyze private-sector mineral development. The program 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 the AGGMI program are identified considering existing geologic knowledge, land ownership, and responses to solicitations for nominations from Alaska's geologic community. As a result of this investment, the mineral industry has spent millions of dollars of venture capital in the local economies of the surveyed mining districts and adjacent areas in direct response to the new geologic knowledge provided by the surveys.

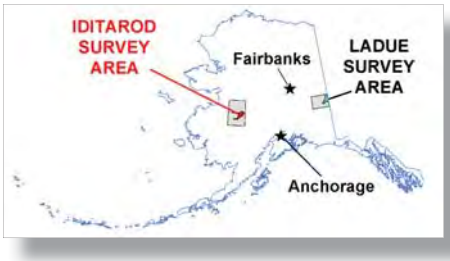

Figure 1. Locations of recent airborne geophysical surveys. The Iditarod survey is in the Iditarod and Ophir quadrangles.

Through the AGGMI program, DGGS acquired and released airborne-geophysical data for the Iditarod and Ladue areas (fig. 1; see p. **37**) in FY11 and FY12. The 852-square-mile Iditarod survey tract is about 20 miles west of McGrath and 240 miles northwest of Anchorage. The survey area is primarily State land, with a small amount of Federal and Native land. Most of the area is part of the Iditarod and Innoko mining districts, which have produced more than 2.3 million ounces of gold; only 3,000 ounces of this production has been from lode sources. The survey tract contains several known mineralized lode and placer areas, such as Ganes Creek, north Flat, Beaver Mountains (plutonic part of BMC discussed below), and Camelback Mountain (fig. 2). Besides plutonic-related gold deposits, other lode potential in the survey area includes mesothermal and epithermal deposits that contain mercury, tungsten, silver, antimony, and tin. The discovery of more than 30 million ounces of gold associated with a Late Cretaceous dike swarm at the Donlin Gold deposit, about 30 miles southwest of the survey area, has kept exploration activity high in the region.

Bedrock in the survey tract is very similar to that of the Donlin Gold area. It is composed of the Upper Cretaceous Kuskokwim Group, a flysch sequence of interbedded sandstone and shale; the Upper Cretaceous—Early Tertiary Beaver Mountain volcano–plutonic complex (BMC); the northern part of the Upper Cretaceous–Early Tertiary Flat volcano–plutonic complex (FC); and numerous dikes throughout the survey area. Mineralization is thought to be contemporaneous with plutonism at several localities. The most strongly magnetized rocks in the survey are the volcanic rocks of the BMC (figs. 2, 3A), which are reversely magnetized such that their magnetic field points about 180 degrees from the current magnetic pole. The southwestern and northeastern parts of the tract also show signatures of reversely magnetized igneous rocks. Magnetic data also suggest the presence of a previously unknown, low to moderately magnetic intrusion(s) at depth in the Ganes Creek area. Small, normally magnetized dikes of low to moderate amplitude are present throughout the northern area. The apparent resistivity map (fig. 2B) shows volcanic and plutonic rocks of the BMC as most strongly conductive and strongly resistive, respectively. Geophysical data indicate that both volcano complexes are more extensive than mapped (fig. 3).

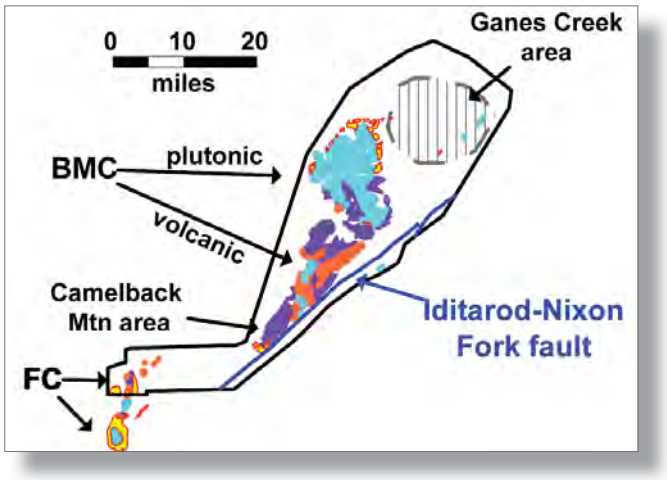

Figure 2. Generalized geologic map showing some mineralized areas and the volcano–plutonic complexes.

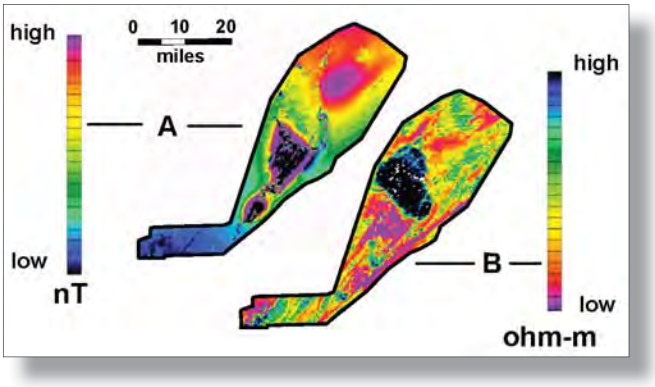

Figure 3. A. Aeromagnetic map. B. 900 Hz apparent resistivity map. Conductive values are low, resistive values are high.

The Iditarod area aeromagnetic and electromagnetic maps and data were released November 3, 2011. A second publication containing a project report, interpretation, and electromagnetic anomalies will be released in spring 2012. DGGS believes these data will lead to a better understanding of the region's geologic framework and will stimulate increased mineral exploration investment in the survey area and the surrounding region.

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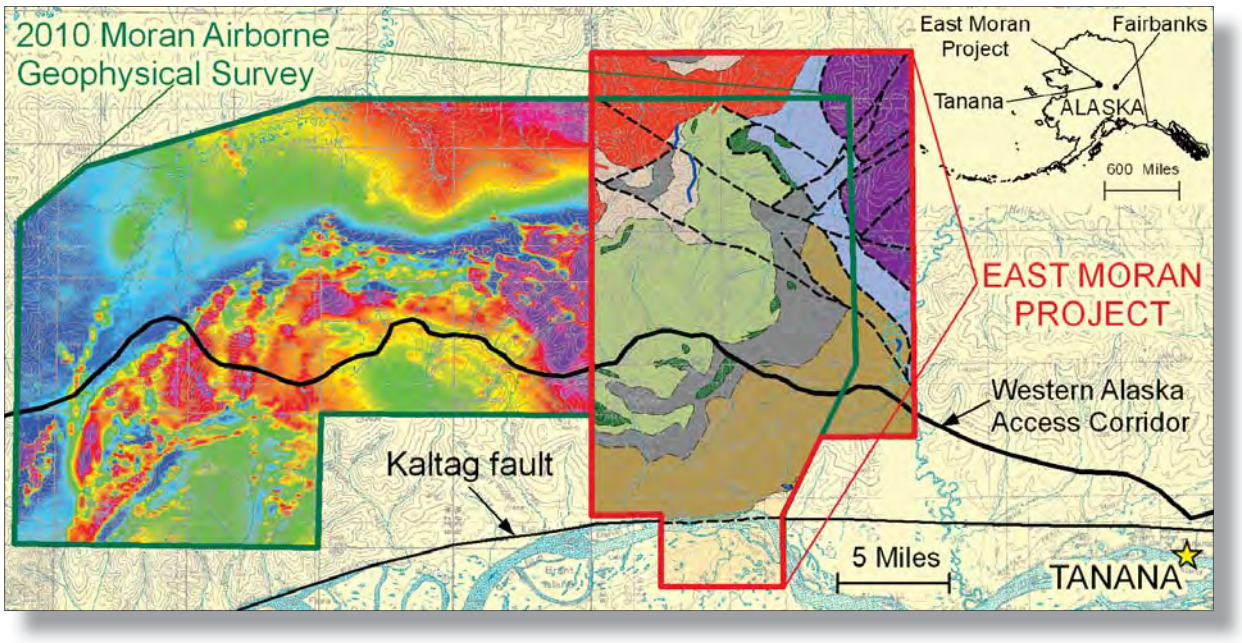
GEOLOGIC MAPPING IN THE EASTERN MORAN AREA, TANANA AND MELOZITNA QUADRANGLES, ALASKA

Historic and active placer mines in the Melozitna mining district, which encompasses the Moran Dome area, have produced more than 12,000 ounces of gold and an undetermined amount of tin, yet little is understood about sources for the placer metals, or the area's gold and polymetallic lode occurrences. To encourage renewed industry exploration for mineral deposits in this region, in 2010 DGGS released the 653-square-mile Moran airborne-geophysical survey (see figure) as part of the State-funded Airborne Geophysical/Geological Mineral Inventory program. The Moran survey area is 150 miles west of Fairbanks, on the north side of the Yukon River between the villages of Ruby and Tanana. During the summer of 2011, the DGGS geologically mapped 301 square miles in the eastern part, and conducted reconnaissance mapping in the western part of the Moran geophysical survey. Products will include a 1:63,360-scale geologic map and supporting data, which will foster a better understanding of the area's geology and mineral potential. The map and interim data releases will be published in 2012. This mapping project is funded primarily by State General Funds, with supplemental funding from the Federal STATEMAP program through the U.S. Geological Survey.

Prior to 2011, only reconnaissance-level, 1:250,000-scale geologic maps were available for the Moran area; DGGS's 2010 geophysical data indicate the geology is much more complex than shown on these maps. During 2011 fieldwork, DGGS geologists field-checked airborne geophysical interpretations, identified the location, type, and character of bedrock and surficial-geologic units, examined and geochemically sampled known and newly discovered lode and placer occurrences, and determined the location and kinematics of structural features. This detailed geologic framework, supported with ongoing geochemical, geochronologic, and petrographic studies, will allow us to develop deposit models for the area's gold and polymetallic lode prospects and explain the distribution and metal content of local placer deposits. Concurrent surficial-geologic mapping will illuminate potential engineering-geologic challenges of future infrastructure development, including the preferred Western Alaska Access Corridor, which transects the Moran map area. Regional geologic hazards are also of concern, and potentially include the Kaltag fault, which crosses the southern edge of the map area. Part of the 2011 study includes evaluation of possible Holocene and Quaternary displacement history of the Kaltag fault and its associated seismic hazards between Tanana and Ruby. As DGGS's investigations progress, preliminary results will be presented in public venues, allowing timely access to the new information on the Moran area's geology, mineral resources, and geologic hazards.

The primary objective of the eastern Moran project is to map the geology in sufficient detail to inform State and local land-use decisions and to guide mineral industry exploration efforts. The timing of this project coincides with renewed mineral-industry interest in underexplored gold districts and in critical and strategic metals. Because economic or infrastructure development could potentially conflict with other land uses, the availability of DGGS's detailed geologic, mineral-resource, and hazard assessments is important for long-range planning by State and local agencies that need to balance resource and infrastructure development with other land-management strategies.



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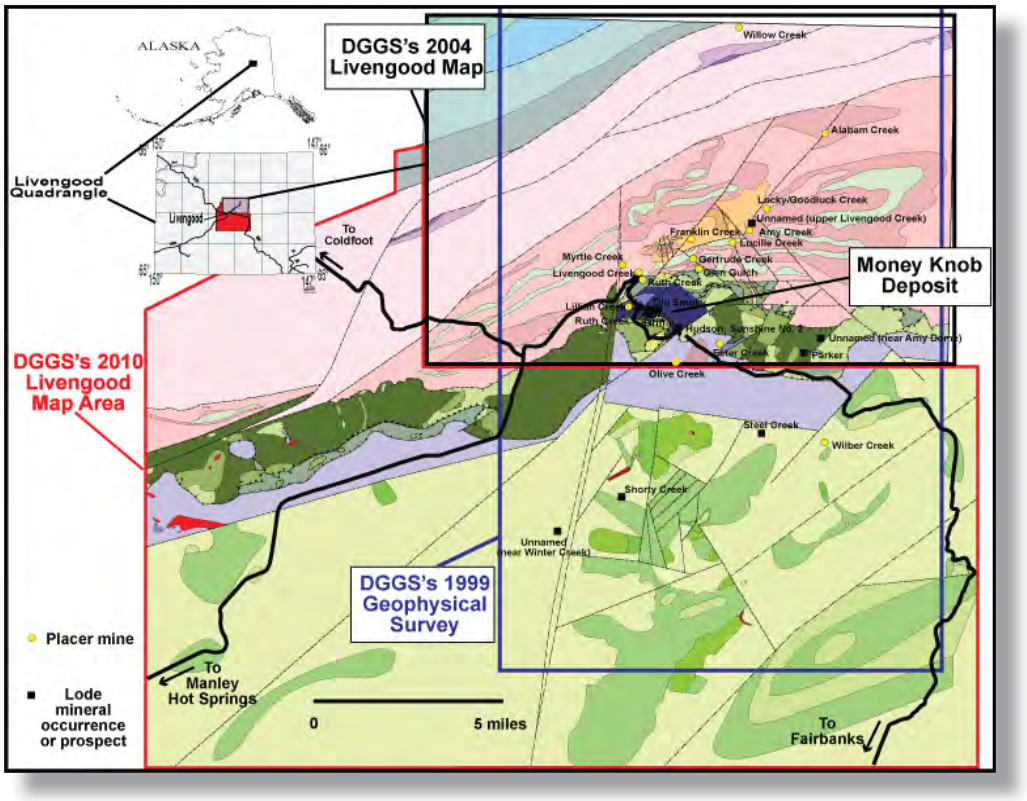
BEDROCK GEOLOGIC MAPPING IN THE TOLOVANA MINING DISTRICT, LIVENGOOD QUADRANGLE, ALASKA

Historic and active placer mines have produced more than 500,000 ounces of placer gold in the Livengood area. To encourage renewed industry exploration for mineral deposits in this region, and to provide geologic data for State and local land-use management, the DGGS has conducted a series of geophysical and geological investigations in the area. This work is part of the Airborne Geophysical/Geological Mineral Inventory (AGGMI) program, supported by State General Funds. DGGS released a 230-square-mile airborne-geophysical survey of the Livengood area in 1999. In 2004, DGGS published a geologic map and associated geologic report for an area that includes the northern portion of the 1999 geophysical survey (see figure). Subsequent mineral industry exploration within this map area resulted in the discovery of a large gold deposit at Money Knob, with a defined resource of 20.6 million ounces. In 2010, DGGS conducted geologic mapping and sampling of the southern portion of the 1999 geophysical survey and surrounding area (see figure). A geochemical report for the south Livengood area was published in 2010, and a 1:50,000-scale bedrock-geologic map and accompanying interpretive report will be published in 2012.



The purpose of DGGS's mapping is to provide geologic context for known lode and placer deposits and occurrences, and to evaluate the area's mineral-resource potential. The only known significant lode mineralization within the 2010 map area is located 5.5 miles south of Money Knob at Shorty Creek, a high Ag–Bi–Sn and locally anomalous Au prospect. Felsic igneous rocks spatially associated with the Shorty Creek prospect are compositionally different and temporally about 25 million years younger than the Money Knob gold-related plutonic rocks; hence they represent two different types of mineralizing systems. Rocks of the Cascaden Ridge pluton, 13 km southwest of Money Knob, are compositionally equivalent to Money Knob dikes and, similarly, intrude Devonian volcanic rocks that act as the host rock in the Money Knob system.

Wilber Creek is the only creek in the 2010 map area with known placer gold production. Its gold compositions are similar to placer gold of the Livengood area, and the area's present stream morphology suggests the gold is derived from the 2010 map area. Magnetic anomalies in the 1999 geophysical survey indicate a potential igneous source for the Wilber Creek placer deposit. A group of felsic dikes, of similar composition to the gold-related Money Knob rocks, occur within the area and may represent the placer source.

In 2012, DGGS will release an interpretive report and bedrock-geologic map of the entire Livengood study area. These publications will summarize the collective findings of the DGGS 2004 and 2010 investigations, as well as incorporating industry data around the Money Knob deposit. AngloGold (2003–2006) and International Tower Hill Mines Inc. (2006–present) have conducted detailed geologic mapping of Money Knob and the surrounding area, and contributed to geologically subdividing the Paleozoic Amy Creek assemblage, the Cambrian ophiolite package, and the Devonian Cascaden Ridge unit. DGGS also used the 2010/2011 lidar survey of the Trans-Alaska Pipeline corridor to identify faults in the map area. The lidar project is described separately (p. 54).

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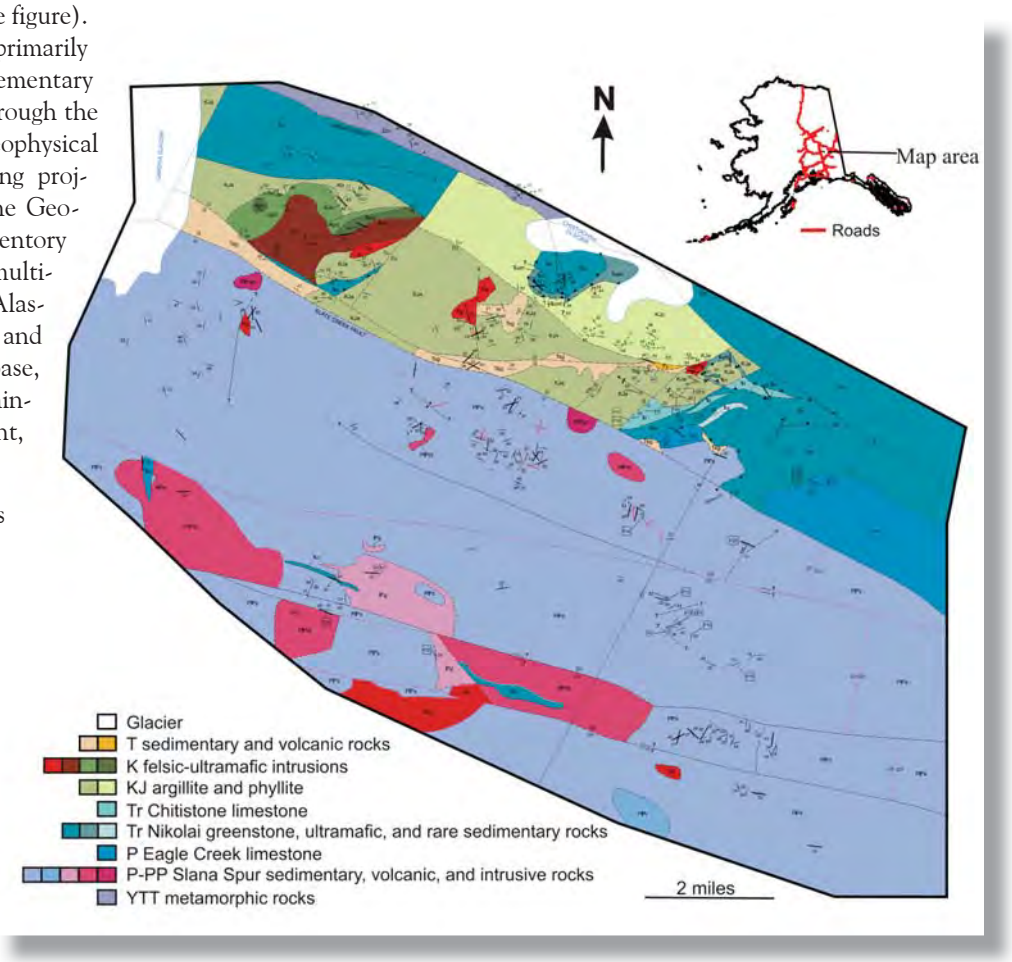
BEDROCK GEOLOGIC MAPPING OF THE SLATE CREEK AREA, MT. HAYES QUADRANGLE, SOUTH-CENTRAL ALASKA

The Division of Geological & Geophysical Surveys (DGGS) released a 442-square-mile airborne geophysical survey, including magnetic and electromagnetic data, for the Slate Creek–Slana River area in the northern Chistochina mining district in early 2009. DGGS conducted geologic mapping of about 113 square miles in the western Slate Creek portion of the geophysical survey tract during July 2009 (see figure).

This mapping project is funded primarily by State CIP funds, with supplementary Federal STATEMAP funding through the U.S. Geological Survey. The geophysical survey and Slate Creek mapping project are part of DGGS's Airborne Geophysical/Geological Mineral Inventory (AGGMI) program, 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.



The Slate Creek study area is in the southern foothills of the Alaska Range, about 140 miles southeast of Fairbanks and 20 miles east of Paxson. Approximately 183,000 ounces of placer gold have been mined from the region since 1898, with most production from the historic Slate Creek subdistrict. One active placer gold mine, 64 inactive placer gold occurrences and mines (with minor platinum-group metals [PGM]), and 29 metallic lode occurrences are present in the map area. There are no significant known lode gold occurrences to explain the extensive placers. Gold chemical data suggest the placers are derived from transported and reworked auriferous Tertiary gravels instead of from the local gold-bearing bedrock. The Mentasta–Slana area also hosts many plutonic-related skarn, replacement, and vein–gossan occurrences as well as potential porphyry(?) copper–gold lode prospects and 'Alaska-type' PGM lode occurrences associated with Cretaceous mafic–ultramafic rocks.

A portion of the main strand of the Denali fault system (DFS), which ruptured in 2002 (with an associated magnitude 7.9 earthquake), bounds the northern edge of the study area. DGGS is identifying, determining orientations, and characterizing the kinematics of active and inactive faults along the DFS and subsidiary faults to provide a better understanding of the regional stress regime and earthquake potential. The results of a paleoseismic trench study across the 2002 rupture trace of the Denali fault were published by DGGS in 2011. These data are necessary for subsequent assessment of earthquake hazards to critical infrastructure and population centers.

New geologic mapping and neotectonic studies, incorporating interpretations of DGGS's airborne geophysical data, will lead to a better understanding of the region's geologic framework, provide data on recent fault movement essential to geologic hazard assessments, provide geologic-resource data critical to land-use decisions, and help to stimulate increased mineral exploration investment in this belt of rocks. Products will be a series of geologic maps at 1:50,000 scale, and reports containing geological, geochemical, and geophysical data. Geologic maps of the Slate Creek–Slana River area will be completed in 2012.

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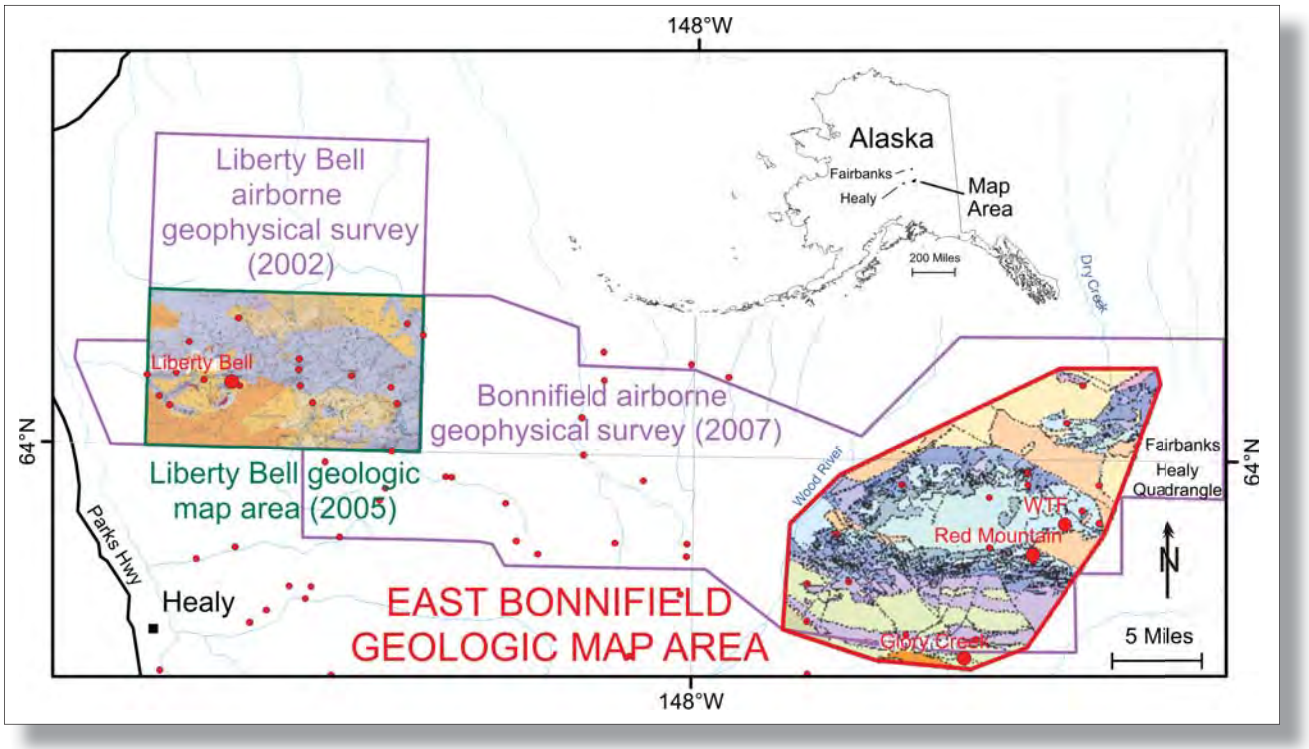
GEOLOGIC MAPPING IN THE EASTERN BONNIFIELD MINING DISTRICT, HEALY AND FAIRBANKS QUADRANGLES, ALASKA

Historic and active placer mines in the Bonnifield mining district have produced more than 86,000 ounces of gold; the region also contains numerous significant polymetallic volcanogenic massive-sulfide (VMS) and gold–polymetallic pluton-related lode occurrences. To encourage renewed industry exploration for mineral deposits in this region, and to provide geologic data for State and local land-use management, in 2007 DGGS released a 613-square-mile airborne-geophysical survey for the eastern two-thirds of the area outlined in purple (see figure) as part of the State-funded Airborne Geophysical/Geological Mineral Inventory program. In summer 2008, DGGS conducted fieldwork to geologically map an approximately 27,300-square-mile area in the eastern Bonnifield mining district (outlined in red; see figure). A geochemical data report was published in 2009, and 1:50,000-scale bedrock- and comprehensive-geologic maps will be published in 2012. This project is funded primarily by State Capital Improvement Project (CIP) funds, with supplemental funding from the Federal STATEMAP program through the U.S. Geological Survey.

The eastern Bonnifield map area is 60 miles south of Fairbanks in the northern foothills of the Alaska Range. The area contains significant mineral occurrences, most notably the WTF and Dry Creek VMS prospects, which contain drill-inferred resources of copper, lead, zinc, silver, and gold. Lithologic and structural relationships and interpretations from 50-year-old published geologic maps of the area are not supported by our summer 2008 investigations. DGGS's new geologic map incorporates interpretations of our Bonnifield airborne geophysical survey data, aerial photographs, donated industry data, and our 2008 field observations and new scientific analytical data. Our work documents many sets of newly discovered inactive faults and one potentially active fault, and presents a revised stratigraphic section based on actual lithologic units instead of grouped rock packages.

The eastern Bonnifield project's primary objective is to map the geology in sufficient detail to facilitate wise State and local land-use decisions and to guide mineral industry exploration efforts. The timing of this project coincides with renewed mineral-industry interest in exploration for volcanogenic massive-sulfide deposits including those in the eastern Bonnifield mining district; exploration activity in Alaska in general is near an all-time high. Economic development could potentially conflict with other land uses, thus DGGS's detailed geologic, resource, and reconnaissance hazard assessments are important for long-range planning. A basic geologic framework and an inventory of potentially mineralized areas will help State and local planners balance the need for resource development versus other land-management strategies. Geologic maps and data produced by this project will also serve as a framework for further scientific studies and for increased regional understanding of this tectonically active area 21 miles north of the Denali fault.



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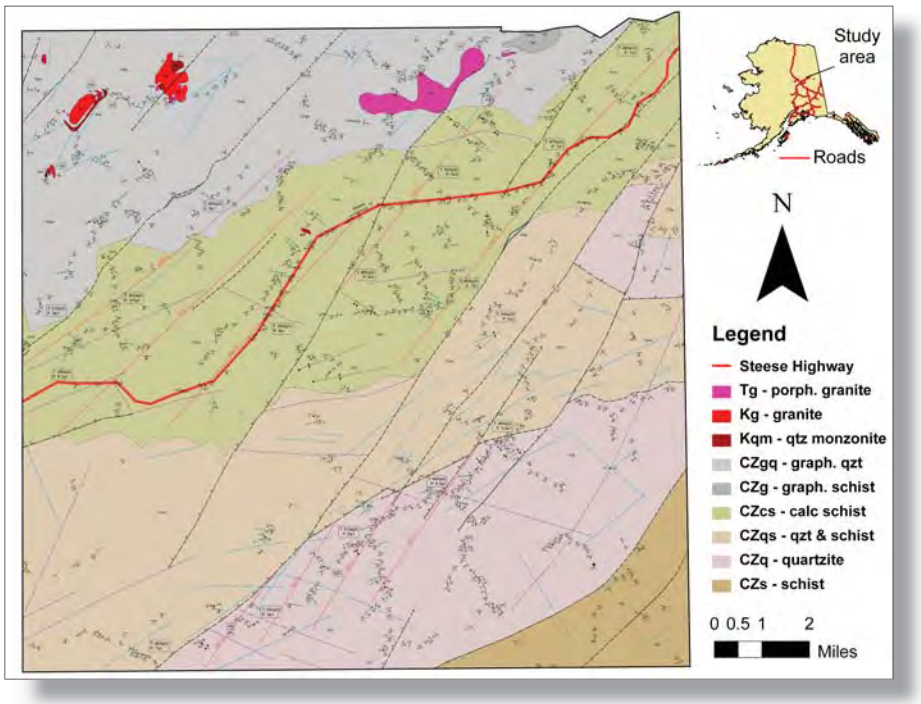
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
FY12 Project Description

BEDROCK GEOLOGIC MAPPING, NORTHERN FAIRBANKS MINING DISTRICT, CIRCLE QUADRANGLE, ALASKA

In summer 2007, DGGS conducted fieldwork for geologic mapping of 189 square miles northeast of Fairbanks, covering the central portion of DGGS's 404-square-mile Northeast Fairbanks airborne magnetic and electromagnetic geophysical surveys released in January 2006. The mapping project is part of DGGS's Airborne Geophysical/Geological Mineral Inventory program, an annual investment by the State of Alaska to expand Alaska's geologic- and mineral-resource knowledge base, catalyze future private-sector mineral exploration and development, and guide state planning. This project received a portion of its support from the federal STATEMAP program through the U.S. Geological Survey.



Draft bedrock geologic map.

The Steese Highway bisects the study area from highway mileposts 66 through 85. Good access from the highway, placer mining roads, and a few trails, in addition to nearby power from the high-voltage power lines of the Fort Knox gold mine 25 miles to the southwest, would facilitate possible mineral development. The map area lies in a northeast-oriented trend of plutonic-related gold mineralization between the central and southwestern Fairbanks and Circle mining districts. The Fairbanks mining district boasts the most historic gold production in Alaska, with nearly 12.9 million troy ounces of gold produced as of 2007. Three placer mines (two active) and one lode gold prospect are present in the Northeast Fairbanks map area. Placer gold is spatially associated with monzogranite and quartz monzonite plugs, dikes, and sills. The distribution of paystreaks within the placers and the paucity of mineralization within the intrusions suggest some of the gold may be structurally controlled. In 2007, DGGS identified arsenopyrite–pyrite–quartz veins and boxworks and semi-massive stibnite–quartz veins proximal to the intrusive suite.

View, looking north, of the Faith Creek gold placer.

In addition to geologic mapping, DGGS conducted a rock and stream-sediment geochemical study instrumental in the Alaska Division of Mining, Land & Water's decision to relocate a portion of the proposed Mount Ryan Remote Recreational Cabin Sites Staking Area to an area with lower perceived mineral potential. Land open to settlement is usually closed to mineral exploration and development, thus, knowledge of an area's mineral potential is crucial to decisions on whether to retain that land for subsurface uses. These geochemical data were published in January 2008.

DGGS's geologic mapping incorporates interpretations of our airborne geophysical data, and provides: (1) a better understanding of the lithologic, metamorphic, and tectonic framework of Interior Alaska; (2) baseline geologic-materials and hazards data for future infrastructure and residential construction, and current maintenance of the Steese Highway; (3) geologic-resource data critical to land-use decisions; and (4) geologic knowledge that will help encourage mineral exploration investment in the northern section of the Fairbanks mining district. A series of 1:50,000-scale geologic maps and associated scientific studies for this project will be completed in 2013. Surficial-geologic mapping performed in conjunction with this project was published in 2011 as DGGS Report of Investigations 2011-4.

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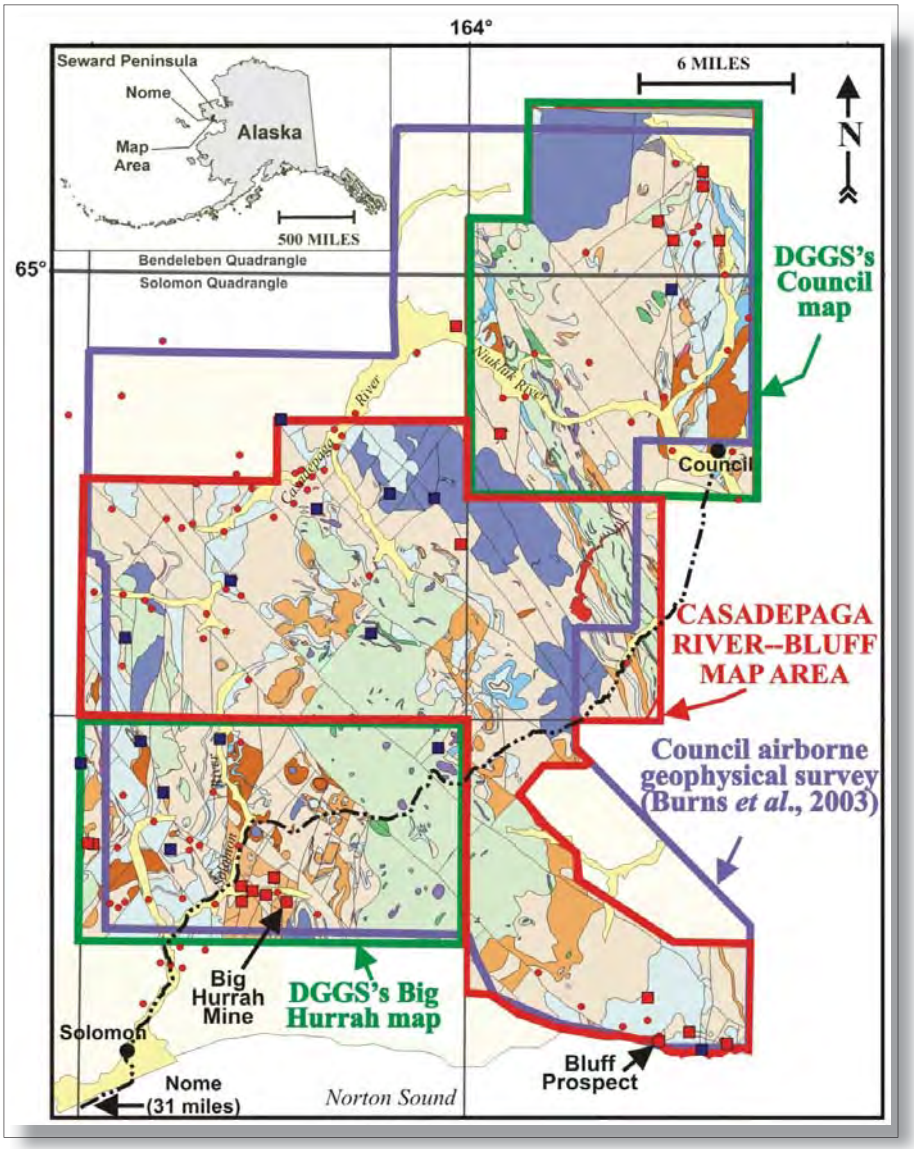
BEDROCK GEOLOGIC MAPPING OF THE COUNCIL–BIG HURRAH–BLUFF AREA, SEWARD PENINSULA, ALASKA

More than 1 million ounces of placer gold have been extracted from the Solomon–Council area of Alaska's Seward Peninsula during the past century, but gold production has declined in recent decades. To encourage renewed industry exploration for lode gold and base-metal deposits in this region, and to provide geologic data for land-use management, in 2003 DGGS released airborne-geophysical surveys for the area outlined in purple (see figure). In 2004, DGGS conducted 1:50,000-scale geologic mapping and geochemical sampling in the Big Hurrah and Council areas (green outline in figure). In 2006, DGGS extended this mapping into the Casadepaga River–Bluff area (red outline in figure), and will produce a combined bedrock map and a geologic report of the entire project area in 2012. A geochemical report for the 2006 map area was released in 2007. This project is part of the ongoing Airborne Geophysical/Geological Mineral Inventory (AGGMI) program, supported mainly by State Capital Improvement Project (CIP) funds, with 2007 contributions from the U.S. Geological Survey's STATEMAP program.



DGGS's mapping provides geologic context for known lode gold and base-metal deposits and occurrences, and helps to 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 area is underlain by Proterozoic to Lower Paleozoic metasedimentary and metaigneous rocks of the Nome Group, including the Solomon Schist, Mixed Unit, Casadepaga Schist, and undifferentiated marble. DGGS's recent detailed geologic mapping defines the internal metamorphic stratigraphy of these rock units, and is revealing new relationships between units as well. Stratigraphic relationships and depositional-age data are essential for evaluating the economic potential of the Nome Group for hosting base-metal sulfide deposits.

In the Casadepaga River–Bluff area, DGGS's geologic mapping and associated studies have documented the location, geochemistry, age, distribution, orientation, and regional structural controls on the area's gold-bearing quartz vein systems. To help predict 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 ~200 million years ago, and were later partially overprinted by a greenschist-facies mineral assemblage. Rare, extension-related alkalic intrusions of Cretaceous to Quaternary age are scattered throughout the map areas, but are not spatially associated with gold-bearing quartz veins. These veins yield $^{40}Ar/^{39}Ar$ adularia and white mica ages of ~105 to 115 Ma. Hydrothermal kaolinite, cinnabar, and adularia indicate epithermal-style mineralization on the southern Seward Peninsula, as well as the more widely distributed gold-bearing veins of possible orogenic or extensional origin.

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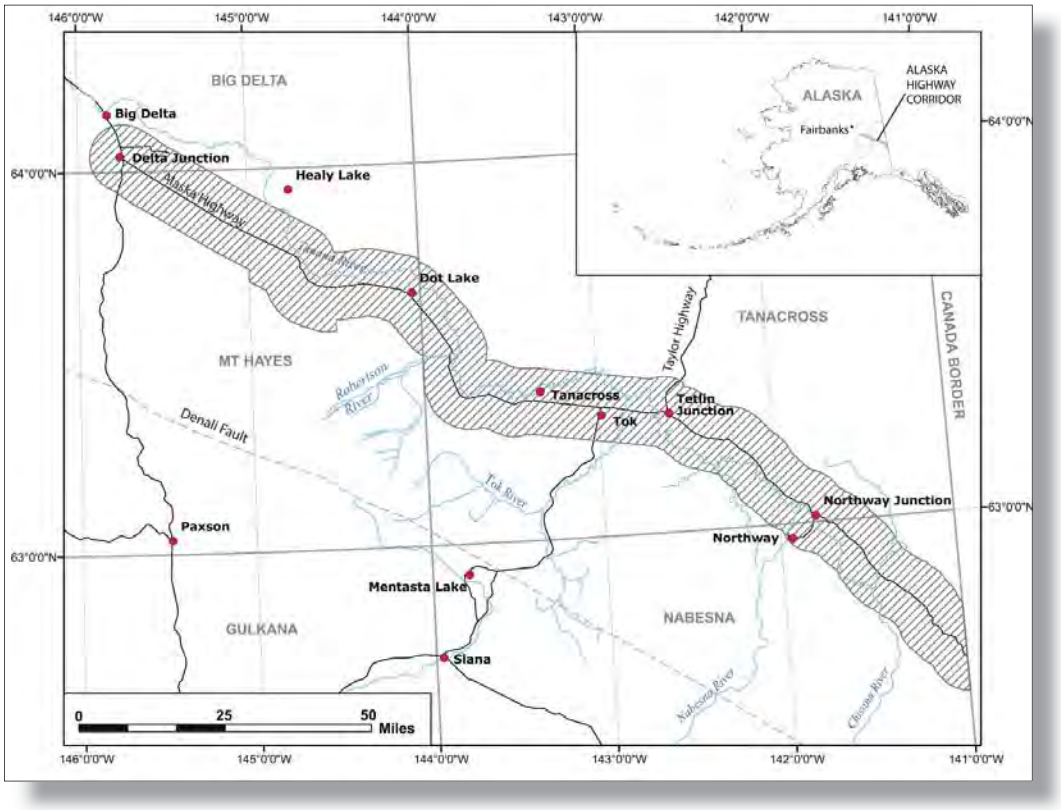
BEDROCK GEOLOGY & MINERAL-RESOURCE ASSESSMENT ALONG THE PROPOSED GAS PIPELINE CORRIDOR FROM DELTA JUNCTION TO THE CANADA BORDER

The Alaska Highway is the primary land transportation route to Interior Alaska from the contiguous United States, and is likely to become the locus of increasing development, especially if the proposed natural gas pipeline or Alaska Railroad extension are constructed along this route. Despite the corridor's strategic location, relatively little geological and geotechnical work has been published relating to this corridor. This multi-year program, primarily supported by State Capital Improvement Project (CIP) funds, is providing a framework of geologic data upon which engineering, design, and resource decisions may be evaluated for future development between Delta Junction and the Canada border. In 2006, as the first phase of this project, DGGS collected, interpreted, and published airborne-geophysical data for a 16-mile-wide corridor centered on the Alaska Highway. In the second phase of the project, DGGS is charged with mapping the bedrock and surficial geology of the area and evaluating the geologic hazards and resources. The surficial-geology and geologic-hazards segments of the project are described separately (p. 53).

DGGS staff have completed the field data collection phase needed to assess the mineral resources of the area and create a 1:63,360-scale bedrock-geologic map. In 2006 and 2007, DGGS conducted geologic fieldwork between Delta Junction and Dot Lake, in 2008 between Dot Lake and Tetlin Junction, in 2009 between Tetlin Junction and the Canada border, and in 2010 from Delta Junction to the Canada border.



The bedrock maps incorporate interpretations of DGGS's airborne magnetic and resistivity data, field data, and various scientific analytical data. The geophysical data is particularly valuable for interpreting the geology in areas covered by surficial deposits or vegetation. Preliminary results from 2009 fieldwork showed a continuation of geologic relationships determined from 2006–2008 fieldwork, along with new features and interpretations. Numerous plutonic rock suites were defined; these plutons intruded complexly deformed, amphibolite-facies metasedimentary and metaigneous rocks similar to those elsewhere in the Yukon–Tanana Upland, as well as a suite of greenschist-facies metasedimentary rocks and metamorphosed mafic intrusions, which likely correlate with similar units directly across the border in Canada. DGGS also determined the location and kinematics of many smaller-scale faults in the corridor that are related to the Denali fault system; this data will provide a better understanding of the history and potential impacts of these faults.

DGGS also evaluated the mineral potential of bedrock units by sampling and analyzing altered rocks to provide baseline geochemical data for use by State land-use planners and mineral exploration companies. Geochemical analyses, U-Pb and $^{40}Ar/^{39}Ar$ age dates for samples collected during 2008–2010 fieldwork will be published in 2012. The bedrock-geologic maps for the 2006–2009 corridor segments will also be published in 2012.

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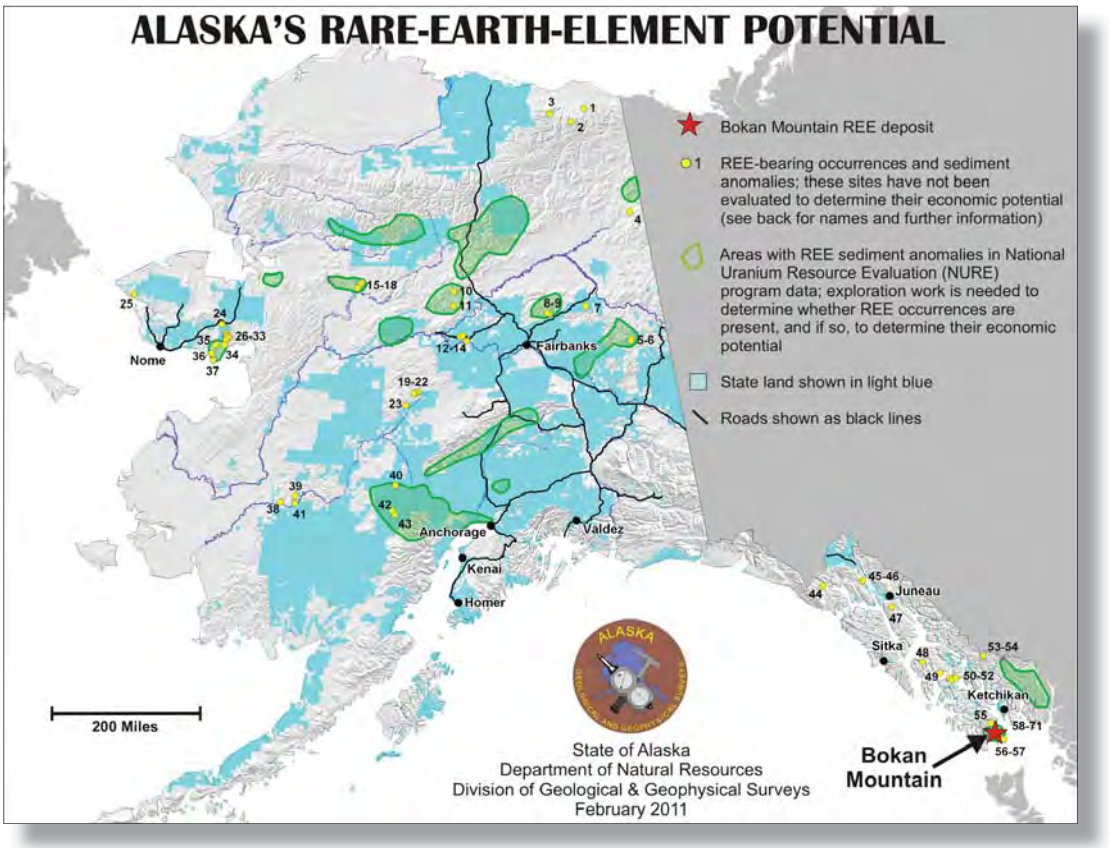
RARE-EARTH ELEMENTS AND STRATEGIC MINERALS ASSESSMENT

Rare-Earth Elements (REE) are indispensable for military and high-technology applications, as well as clean/renewable-energy technologies (such as wind turbines, solar panels, batteries for electric vehicles). For instance, liquid-crystal displays for computer monitors and televisions use the REE europium, which produces the color red; there is no known substitute. REEs are used to convert heavy crude oil into gasoline and other products, and REEs are also used to make "permanent magnets," which enable miniaturization of electronic components (e.g. cell phones). U.S. defense systems depend heavily upon REEs for current technology and system designs, and there is a lack of effective non-REE substitutes. The lack of a domestic REE supply chain in the U.S., and near 100 percent dependence on imports for these elements, presents national security concerns for the U.S. and diminishes its ability to be a world technology leader.

At least 70 mineral localities in Alaska contain REEs, and additional areas, identified during the 1970s National Uranium Resource Evaluation (NURE) program, have sediments with anomalous REE values (see figure). Although many areas of Alaska are geologically permissible for hosting REEs, the lack of basic geologic data hinders evaluation of the state's true REE potential. To advance the state's knowledge of its geologic resources, promote informed state management decisions, and encourage mineral industry exploration for REEs and other strategic minerals in Alaska, in 2011 the state's Division of Geological & Geophysical Surveys (DGGS) initiated the *Rare-Earth Elements and Strategic Minerals Assessment* project. The goals of this 3-year project are (1) to compile historic and industry-donated data in digital format; (2) to obtain new field and analytical data critical for assessing Alaska's REE potential; (3) to evaluate the historic and new data to identify areas of Alaska with the highest REE potential, as well as those needing additional geologic evaluation; (4) to communicate the results of our work to the public; and (5) to publish the data and results of our studies on the DGGS website (free access). Work conducted as part of this project is supported by State Capital Improvement Project funds.

In 2011, DGGS collected rock, soil, stream-sediment and/or pan-concentrate samples in the Moran area of central Interior Alaska, and near William Henry Bay in Southeast Alaska. The Moran area (see p. 39 for project description) spatially coincides with NURE sediment anomalies with elevated uranium and REE values. The William Henry Bay area contains uranium-, thorium-, and REE-bearing lode mineral occurrences, and genetically associated intrusions. Geochemical data from these two areas will be released in the first half of 2012. Currently, DGGS is actively compiling historic geochemical data for areas with REE mineral potential throughout Alaska, and in early 2012, will start obtaining modern geochemical analyses for archived samples stored at the DGGS Geologic Materials Center. In the summer of 2012, DGGS will conduct geologic fieldwork in one or two areas identified as having high REE potential.



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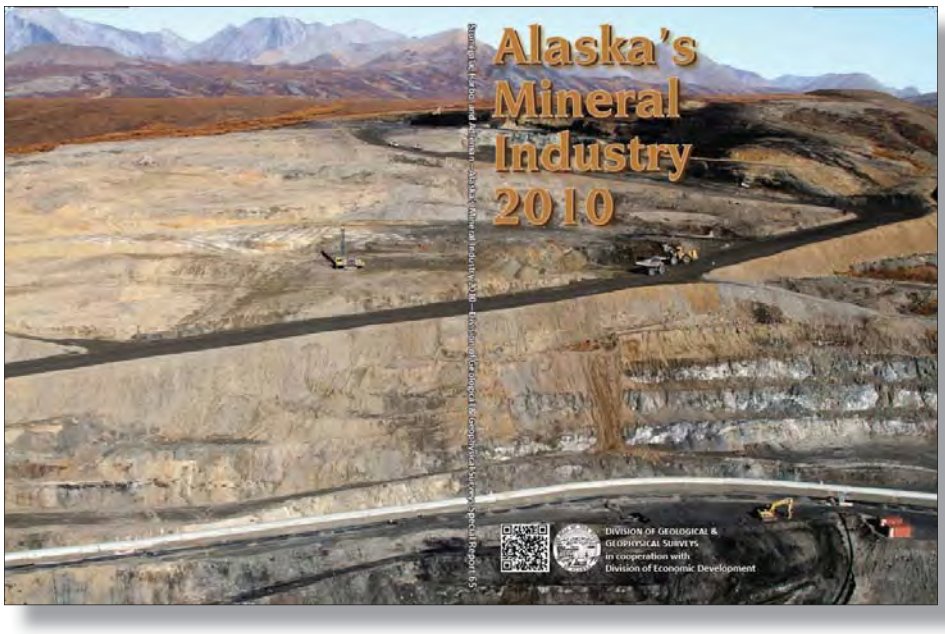
ANNUAL ALASKA MINERAL INDUSTRY REPORT

Alaska Statute 41.08 charges the Division of Geological & Geophysical Surveys (DGGS) *"…to determine the potential of Alaska land for production of metals, minerals, fuels, and geothermal resources…"; "…conduct such other surveys and investigations as will advance knowledge of the geology of Alaska…"; and "…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."* To meet part of this goal, we gather, verify, collate, and distribute statistics and summary observations about Alaska's mineral industry and release this information in a timely manner to the public in the form of an annual mineral industry report, an interim summary, and public presentations. This project supplies information to the mineral industry, provides the State and the public with valuable data pertaining to the health of Alaska'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 report and its findings at professional mineral industry conventions and trade shows, at chambers of commerce and other organizations' meetings, and in professional journals informs the general public, local and international mineral industry, and local, state, federal, and international government agencies about current activities in Alaska's 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. Government personnel rely on the report as an essential tool for formulating public policy affecting resource and land management.



The 2010 Alaska mineral industry report, released in November 2011, summarizes information provided through replies to questionnaires mailed by DGGS, phone interviews, press releases, and other information sources. The 2010 cumulative value of Alaska's mineral industry, the sum of exploration, development, and production values, was $3.685 billion, $718.1 million higher than 2009's value of $2.966 billion. Exploration expenditures for 2010 were $264.4 million, approximately one-third of the United States total, and a 47 percent increase from the $180.0 million expended on exploration in 2009. Development expenditures amounted to $293.3 million, down 11 percent from the $330.8 million spent in 2009, and the estimated first market value of mineral production was $3,126.8 million, an increase of more than 27 percent from the 2009 value of $2,455.6 million. The estimated value of mineral production has exceeded $1 billion for nine consecutive years. Alaska's mineral industry value will increase in 2011 to more than $4 billion in total value due to strong metal prices and new mines starting production in 2010 and 2011.

The annual mineral report has been published for 30 consecutive years as a cooperative venture between the Department of Natural Resources' Division of Geological & Geophysical Surveys, and the Division of Economic Development in the Department of Commerce, Community & Economic Development. A summary of the 2011 Alaska mineral industry activities will be released by February 2012. The 2011 Alaska mineral industry report will be released by early November 2012.

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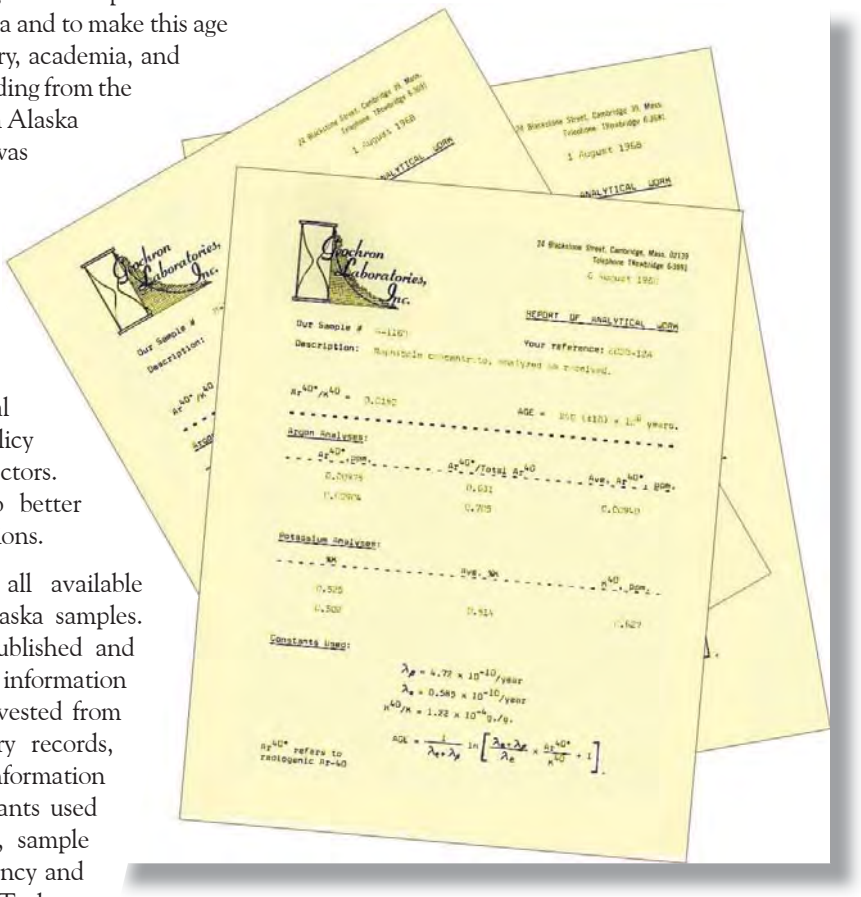
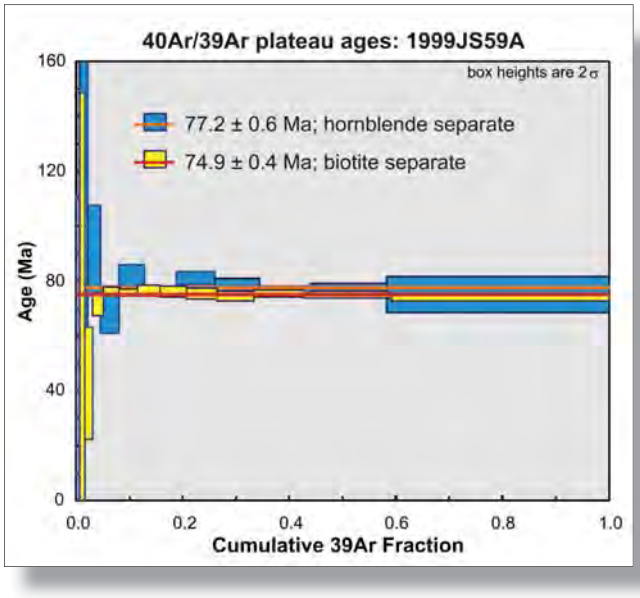
GEOCHRONOLOGIC DATABASE FOR ALASKA

In 2005, DGGS initiated development of a comprehensive geochronologic database for Alaska. The geochronologic database contains summary interpretive and detailed analytical data and associated information for all available radiometric ages of rocks and minerals in Alaska. The project is designed 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 was initiated with funding from the Federal Minerals Data & Information Rescue in Alaska (MDIRA) program, whose primary objective was to ensure that all available Alaska minerals data are securely archived in perpetuity, in a format easily accessible by all potential users. Since 2008, the Geochronologic Database for Alaska has been supported by State General Funds, with help from the National Geological & Geophysical Data Preservation Program (NGGDPP). Information about mineral resources is important for management policy decisions in both the public and private sectors. Increased use of high-quality data leads to better economic, legislative, and environmental decisions.



The compilation includes information for all available U-Pb, K-Ar, $^{40}Ar/^{39}Ar$, and Rb-Sr ages of Alaska samples. Radiometric ages are compiled from both published and unpublished sources. Essential basic supporting information that is currently not easily accessible was harvested from original publications, student theses, industry records, and laboratory archives. This detailed information includes 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. To date, more than 4,925 age records have been compiled.



Age spectra plot generated from detailed $^{40}Ar/^{39}Ar$ age data stored in the geochronologic database.

In 2009, DGGS loaded the compiled geochronologic data into its enterprise Oracle database. In 2010, DGGS created a beta-version Web Feature Service (WFS) containing age sample locations, basic metadata, and references to the appropriate original publications that were harvested by the NGGDPP's National Digital Catalog. WFS data are served online to the public in real time directly from DGGS's Digital Geologic Database (described on p. 70) and are importable into Geographic Information Systems (GIS) software. In 2012, DGGS anticipates upgrading the WFS with summary age data, developing a WFS-type data release with instructions for GIS users, and publishing a report of all summary geochronologic data in the central database. The final stage of the geochronology project will be to make these data fully accessible via an interactive, map- and text-based search application on DGGS's website and through a link on the MDIRA resource page (http://akgeology.info). DGGS's enterprise database will serve as a repository for future Alaska radiometric data and provide an authoritative, up-to-date, digital source of this important geologic information.

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