Testimony before the U.S. Senate Committee on Energy and Natural Resources

S. 883
The American Mineral Security Act of 2015

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Submitted by:
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Testimony on behalf of:
The State of Alaska
The Interstate Mining Compact Commission

I. Introduction

Chairwoman Murkowski, Ranking Member Cantwell, and honorable members of the Senate Committee on Energy and Natural Resources – My name is Ed Fogels and I am Deputy Commissioner of the Alaska Department of Natural Resources (AK DNR). On behalf of Governor Bill Walker, thank you for this opportunity to testify in strong support of the American Mineral Security Act of 2015. We applaud this effort to revitalize the United States' critical minerals supply chain and reduce the nation's dependence on foreign supply.

I have also been entrusted by the 26 member and associate-member states of the Interstate Mining Compact Commission (IMCC) to convey their strong support for S. 883 to the Subcommittee, and to express their gratitude for your leadership in this area.

S. 883 calls for the development of a formal federal classification system for critical minerals, which have been categorized in many different ways in recent history. However, most of these categories draw on a very important reality – that strategic and critical minerals (SCM) are essential for use in the United States' technology and manufacturing industries but are subject to potential supply disruptions.

The U.S. Geological Survey (USGS) has maintained a list of critical minerals in the past on the basis of supply risk and changing technologies. The list includes rare-earth elements, the platinum-group metals, graphite, and many other elements or element groups. It is worth noting that these are just a subset of the 37 elements identified by the USGS for which the United States imports more than 70 percent of its supply, and that this list will change over time based on supply and the evolution of demand. As the United States strives to further advance high-tech manufacturing, secure supplies of these inputs become even more important to our nation's economic and national security.

II. Overview of Today's Testimony

My testimony today will address why this legislation is necessary and, especially for the State of Alaska, very timely. Many of you will recognize many of the points I will make today, as both Alaska and the IMCC have been working for some time to advance the development of domestic supplies of critical minerals, including through prior testimony to this Committee. I want to again thank Senator Murkowski for continuing to be a leader on this issue, and all of you for hearing my testimony today.

I will outline very similar and complementary efforts the State of Alaska is undertaking through its strategic minerals initiative that was launched in 2011. My primary objective is to share specific examples of how government focus and investment can significantly improve our understanding of resource potential, ensure protection of the environment, and encourage private sector investment to help meet our mineral commodity needs.

However, before getting into substantive matters, I would like to briefly mention my professional background as it pertains to this testimony and provide some information about the IMCC.

As Deputy Commissioner of AK DNR, a state agency employing more than 1,000 resource management professionals, I have been integrally involved with implementing the State of Alaska's strategic and critical mineral effort. This initiative has been part of a broader effort to improve state permitting and increase government efficiency – a need only amplified by the budget realities currently faced by the State of Alaska. Our workforce includes scientists with expertise in conducting geological mapping and airborne geophysical studies as well as experts in permitting who work to ensure that exploration and development is conducted in a manner that is compatible with Alaska's unique environment and stringent regulatory standards.

The IMCC, of which the State of Alaska became a full member in 2013, is a multi-state organization that represents the natural resource and related environmental protection interests of its member states. Twenty-three states have ratified their membership in the IMCC through acts of their respective state legislatures, and three others participate as associate members while they pursue enactment of state legislation ratifying their membership. A primary focus of the IMCC is liaising with Congress and the federal government to promote a cooperative effort between state and federal agencies in advancing responsible mining development and environmental protection.

As the primary regulators of mineral production activity within their borders, the IMCC member states have a vital interest in the development of all minerals, particularly those of strategic and critical importance to the United States. Even where minerals are produced on federal lands, states often work in concert with our various federal agency partners to ensure that these minerals are mined in an efficient and effective manner, while also protecting the environment and balancing impacts on other resources such as the land, water and air.

III. Significance of S. 883

The Policy section of S. 883 identifies several important goals for the federal government related to strategic and critical minerals, including the need to forecast supply and demand, facilitate development and production, and promote efficiency in use and production. We strongly endorse all of these objectives.

Under S. 883, the federal government would take important steps towards a new critical minerals policy that:

- Facilitates domestic production;
- Promotes investment-quality, environmentally-sound domestic mining, processing and minerals recycling;
- Establishes a national assessment for mineral demand, supply and needs; and
- Addresses permitting inefficiencies that impact the minerals sector.

Some of our Nation's key federal resource management agencies (the USGS and the U.S. Bureau of Land Management (BLM) within the Department of the Interior, the Department of Energy, and the U.S. Forest Service (USFS) within the Department of Agriculture), will take a lead role in implementing this new policy. To be successful, they will need to establish strong partnerships with the states that have the resource base to support a strategic minerals sector and the regulatory systems and expertise to develop those resources.

Appendix I is a graph from the U.S. Geological Survey's 2015 mineral commodity summary of 63 minerals important to the United States. This figure starkly shows the magnitude of mineral imports – as of 2014, the United States relied on imports for *almost all* of its strategic and critical minerals. We import 100 percent of 19 of the 63 minerals and more than 50 percent of 24 additional minerals. Furthermore, the numbers of materials we import over 70% of have been increasing – from 17 in 1996 to, just under 20 years later, 37 – while our reliance on SCM-intensive technology has also increased.

Our over-reliance on imported minerals, however, is certainly not due to an absence of resource potential. In fact, while much additional work and investment is needed to develop domestic supplies, many U.S. regions contain significant potential for strategic and critical minerals. For example, we have indicated current, past, and potential production in Appendix I to showcase Alaska's potential. With the reforms outlined in S. 883 and strengthened partnerships between States and the federal government, this potential in Alaska and the other IMCC member states can be explored.

IV. Alaska's Strategic and Critical Minerals Initiative

The State of Alaska is blessed with vast mineral potential on its lands. Based on USGS estimates, if Alaska was a country, it would be in the top 10 for:

- Coal (17% of the world's coal; 2nd most in the world)
- Copper (3% of the world's copper; 5th most in the world)
- Lead (3% of the world's lead; 8th most in the world)
- Gold: (7% of the world's gold; 5th most in the world)
- Zinc: (4% of the world's zinc; 6th most in the world)
- Silver (1% of the world's silver; 9th most in the world)

In addition, Alaska has more than 70 known occurrences of rare earth elements (REEs) and multiple occurrences of other SCMs, as noted on Figure 2. For example, Alaska has two exciting projects that this Committee should be aware of. The Graphite-1 deposit is the largest graphite deposit in the US, and is currently in the pre-permitting phase. There has not been any graphite mined in the US since 1991. The Bokan Mountain project is also in the pre-permitting phase, and

contains significant amounts of heavy Rare Earth Elements. We expect that continued exploration will lead to additional discoveries, and welcome federal initiatives to stimulate this exploration.

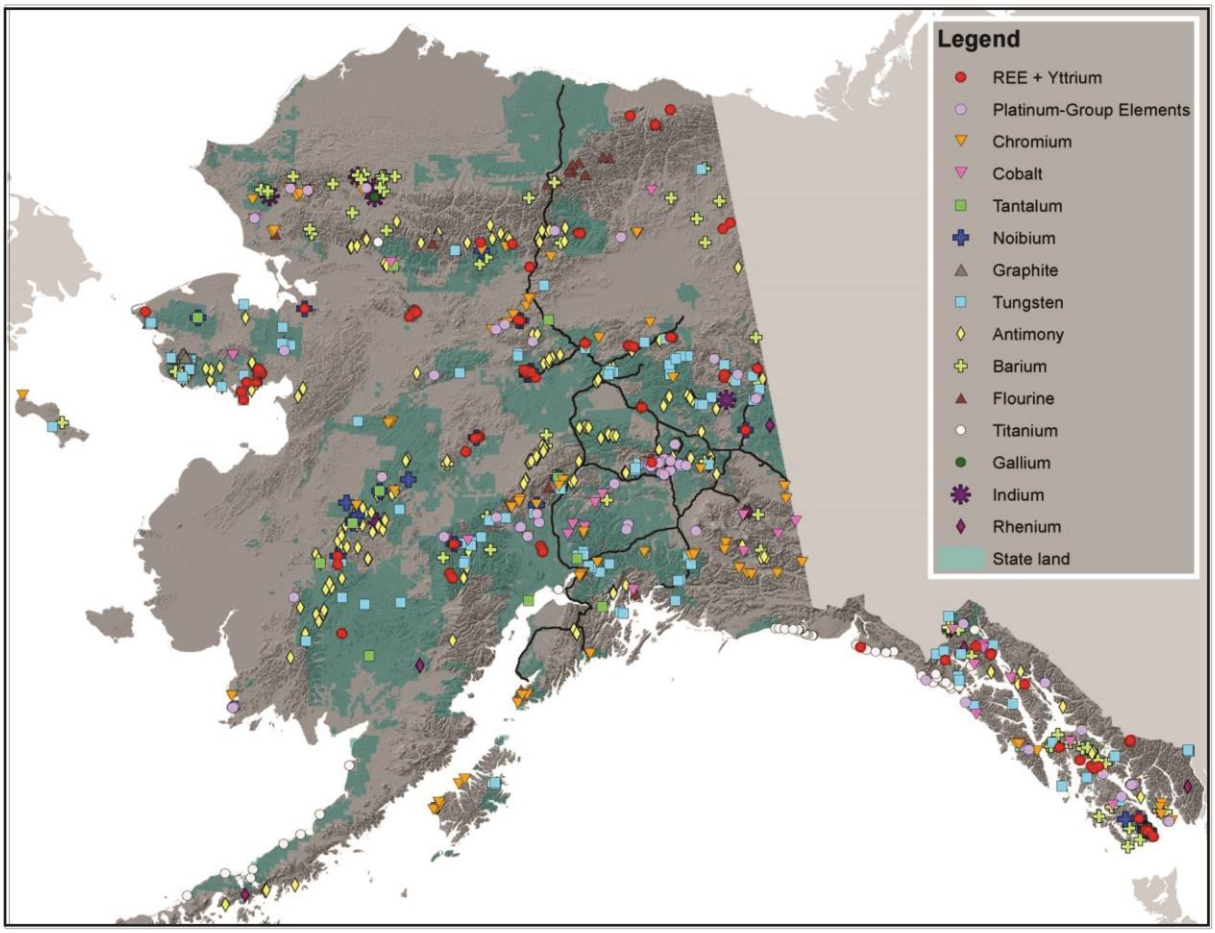


Figure 1: Strategic and critical mineral occurrences in Alaska (Source: AK DGGS).

Recognizing the nation's need for domestic production of SCMs and the significant minerals potential in Alaska, the Department of Natural Resources has increased its efforts to incentivize and promote the development of strategic minerals in Alaska. These efforts include:

- Undertaking a statewide assessment of Alaska's strategic mineral potential;
- Supporting the development of known and highly-prospective strategic mineral occurrences through infrastructure partnerships and incentives;
- Improving the structure and efficiency of the permitting process;
- Deepening partnership and cooperation with the federal government and other stakeholders to encourage domestic exploration, development, and processing of REEs and other strategic minerals;
- Attracting new investment and markets for Alaska's abundant mineral resources; and
- Improving access to geologic data, including through the opening of an expanded modern Geologic Materials Center to showcase the State's geological samples.

I will provide a brief summary of these efforts as an example of what can be done with proper leadership, cooperation, and funding. My hope is that this Committee can use Alaska's Strategic Minerals Initiative as an example of successful government investment in the minerals sector and gauge the level of investment needed to address a national effort. As we see it, S. 883 supports *all* of our initiative's goals on the federal level – including the critical partnership element.

Statewide Assessment

Starting in 2011, with funding approved by the Alaska Legislature, the Alaska Division of Geological & Geophysical Surveys (DGGS) embarked on a program to better characterize Alaska's SCM endowment. This schedule and timetable for completion of the division's Strategic and Critical Minerals Assessment project is shown in Figure 2, and Appendix II of this testimony provides a list of products that may be made available through this project.

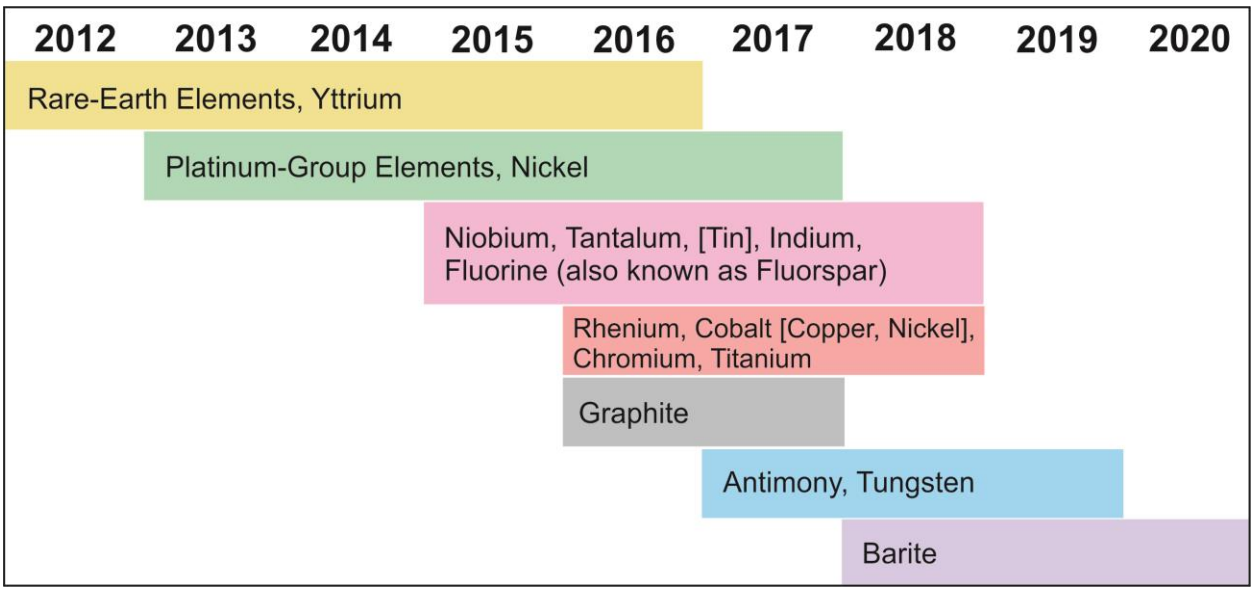


Figure 2: Alaska planned strategic and critical minerals project schedule (Source: AK DGGS)

Compiling existing data sets was a key first step in the process and it allowed the state to focus limited funds on highly-prospective state lands that are open to mineral exploration. Partnering with federal agencies was an important step to ensure that geopolitical boundaries do not hinder the geological analysis – and we are encouraged that S. 883 contains similar provisions.

High-quality, district-scale geological data is lacking for most areas of Alaska with known SCM occurrences. The most basic and useful data – geologic maps – are generally not available at a scale useful for mineral exploration (1:63,360 or 1" = 1 mile). Much of the other available public data occurs in a patchwork of coverage of varying quality, vintage, and scale. The state's efforts to provide publicly available, high quality and consistent digital geologic datasets will allow policy makers and land managers to make informed decisions; spur mineral exploration and subsequent mine development; and ultimately reduce the nation's reliance on foreign supply. S. 883 will greatly enhance and support these types of efforts and initiatives on both state and federal lands.

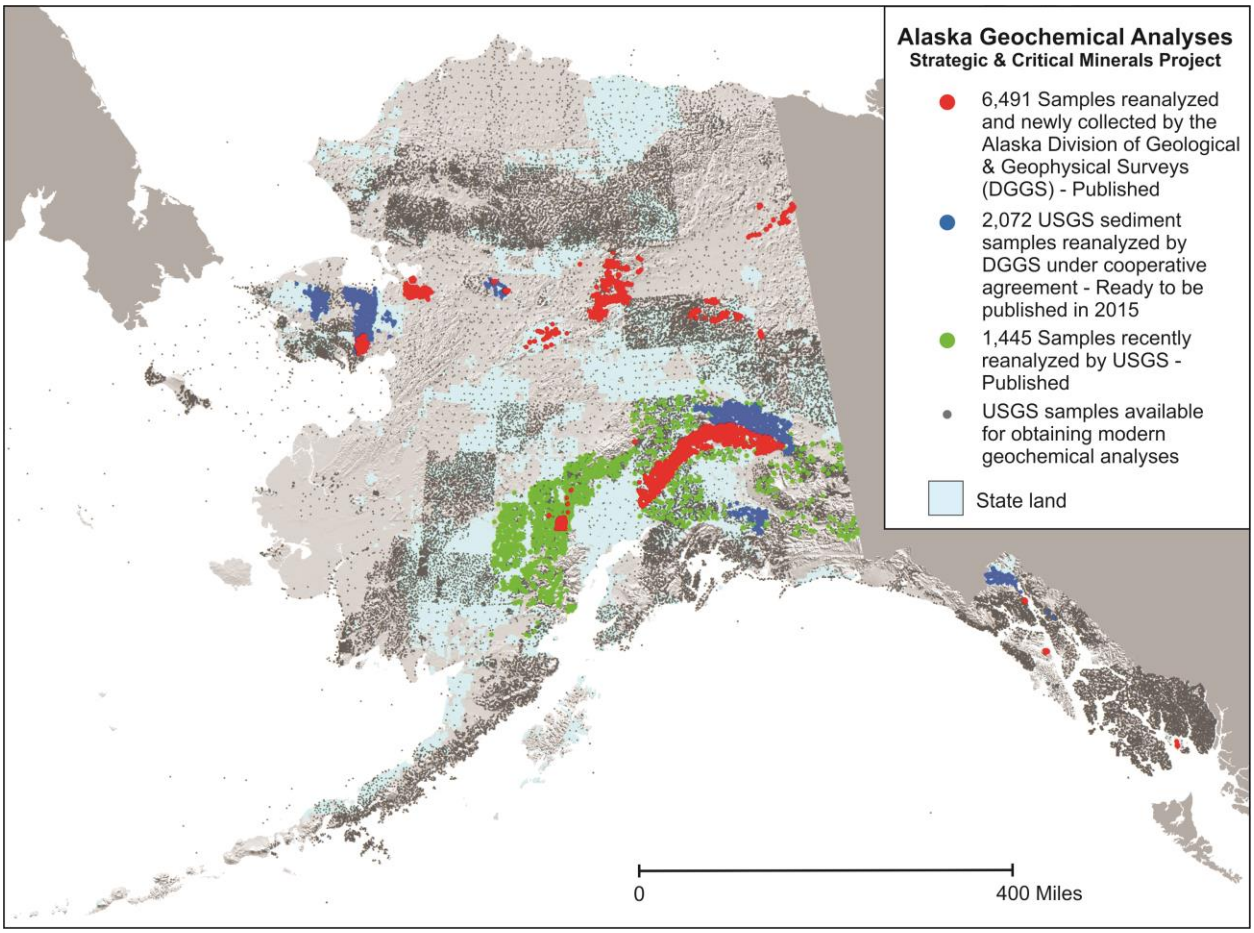


Figure 3: USGS/DGGS geochemical analysis of nearly 10,000 archived and new samples. (Source: AK DGGS)

The Strategic and Critical Minerals Project initially called for spending $2.5 million a year for five years, and since project initiation in 2011, DGGS has spent $5.7 million on field investigations. However, revenues to the State of Alaska have been impacted by the decrease in oil price, and the public capital investment available for these strategic programs has correspondingly been limited. This is why a federal focus on SCM assessment and production is so timely for Alaska.

As Alaska and all of the IMCC member states deal with the many competing priorities for state capital expenditures, it is critical for our collective economic and national security that we have a federal partner that is efficient and engaged in SCM-related issues to support state efforts.

Results of the Assessment Program

Alaska's Strategic and Critical Minerals Project has produced a significant amount of data since its initiation in 2011. In geologic mapping at both reconnaissance and detailed scales, over 5.3 million acres have been assessed, and more than 2.4 million acres of high resolution airborne geophysics has been acquired, for a total of 7.7 million acres of mapping. To put this into context, the Commonwealth of Virginia contains approximately 27.4 million acres within its boundaries. With the available funding over just a few years we have been able to cover almost 30 percent of the area of Virginia. In addition to the mapping effort, the state has obtained modern geochemical

analysis (focused on the full suite of elements) of nearly 10,000 archived and new samples collected during the mapping effort. Much of this geochemical work has been in cooperation with the USGS, which has significantly broadened the aerial coverage and distribution of the information, as shown in Figure 3.

To contemplate similar programs for a nationwide effort, significantly more funding and 'boots on the ground' would be necessary. Certainly, there is a tremendous variability in the level of data coverage and data quality across the nation, and, as a result, performing comprehensive resource assessments will require a coordinated effort and the creation of a robust funding mechanism between states and federal agencies. S. 883 would move us in this direction in meaningful ways, and is why Alaska and the IMCC states join in its support.

Cooperation: Federal funding through STATEMAP and data preservation

An excellent example of cooperative funding and leveraging of state and federal dollars to acquire geologic information is the National Cooperative Geologic Mapping Program (STATEMAP). This national program has been a cornerstone of cooperation between State Geologic Surveys and the USGS and has been supported by Alaska and IMCC over the years.

Another key federal program that helps to archive samples and other forms of legacy geological and geophysical data is the National Geological and Geophysical Data Preservation Program. A tremendous amount of valuable new information was acquired at a very low cost in Alaska by sampling archived materials from both the State and USGS collections. It is imperative that these cost-effective programs are maintained and sufficiently funded to address the evolving geologic needs of the nation, including the strategic minerals assessment program. Again, the provision in S. 883 will facilitate this type of work greatly.

V. Alaska's Efforts to Improve Permitting

Since 2011, AK DNR has pursued permitting reform to make our processes more timely, predictable and efficient. This has including investing in our staff, modernizing our technology, and working with the Alaska Legislature to enact statutory changes – all of which are integrally related to our efforts to promote the development of Alaska's SCMs.

This effort has been grounded in the support of the Alaska Legislature, and S. 883 lays the framework for a federal analog. At the State level, we received approximately $2.7 million in operating funds and $2.5 million in capital funding for our Division of Mining, Land & Water to create efficiencies in its permitting process and to fill vacant positions focused on permitting. With this support, Division Director Brent Goodrum and his staff have been able to reduce what had been a longstanding backlog of permit and authorization applications by more than 50 percent.

Alaska's permitting reforms also include gathering *more* information when necessary. For example, we have recently developed a program for Health Impact Assessments (HIA) for some projects. These reviews objectively evaluate the potential impacts to human health – both negative and positive – from mine development. The HIA program is housed in the Alaska Department of Health and Social Services and is staffed by public health professionals.

Alaska has invested significant effort into improving the permitting regime for Clean Water Act Section 404 wetlands authorizations in our state. This is important in Alaska given that much of

Alaska is wetlands. The state has been evaluating the potential of assuming primacy over wetlands permitting, and is in the process of investigating the possibility of a state-run wetlands mitigation bank. Such improvements could make permitting mining projects, including those for SCM in Alaska, more efficient, timely, and certain.

S. 883 also demonstrates an intent to make practical improvements to the federal process along the lines Alaska has taken to modernize our mining permit application forms. Streamlining these forms has simplified the process for miners, eliminated duplicative and confusing technical terms, and will improve application processing by reducing errors and increasing readability. These changes – while they may seem minor to those unfamiliar with the complexity of mine permitting – impact critical performance metrics such as compliance by applicants and administrative efficiency. Most importantly, they promote domestic supplies of SCMs.

Large Project Coordination

A cornerstone of Alaska's process – which could assist the federal agencies accomplish the objectives of S. 883 – is the interagency Large Mine Permitting Team (LMPT) approach to the review of permits and authorizations for mining projects. This team-based approach, to our knowledge, is unique in the nation.

Applicants can voluntarily enter into an agreement with AK DNR's Office of Project Management and Permitting (OPMP) to provide a Large Project Coordinator who tracks every permit for the project – across state agencies as well as the federal government. This coordinator serves as a liaison between the applicant and all of the relevant state regulators to provide a single, efficient point of contact for the applicant to eliminate duplication and confusion. This process also prevents permitting requirements from being overlooked by applicants, and helps the state agencies identify technical capabilities across the state and, when necessary, in contractors that need to be brought to bear on applications during review.

When a project requires a federal Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA), OPMP typically signs on as a Cooperating Agency on behalf of the State as a whole and coordinates state participation in the NEPA environmental review. The State of Alaska has long felt that a federal counterpart to the State Coordinator would vastly improve the NEPA process.

Recent projects for the OPMP LMPT have been the EIS for the Greens Creek Tailings Expansion, the re-issuance of authorizations and financial assurances for the Kensington Gold Mine, and modifications to the Fort Knox Gold Mine's Plan of Operations and Waste Management Permit. Under S. 883, we would look forward to even smoother regulatory reviews in the future.

VI. Working with Federal Agencies and Industry

One of the most cost-effective ways to gather new data in remote areas with high costs of data acquisition is through partnerships and grant programs that leverage the limited funding of all interested parties. Methods for leveraging can include data sharing, direct contribution to expand programs, cost sharing through competitive grant programs, and the cooperative use of archived samples and data sets where results are shared by all parties.

In fall 2013, DGGS leveraged its Wrangellia airborne survey by coordinating with a mineral exploration company, allowing the company to fly an airborne survey that overlapped a portion of the DGGS survey area. DGGS was given the results from the company's survey, at no cost, and incorporated it into our analyses and made it available to the public. DGGS made a similar arrangement with Cook Inlet Region, Inc. (CIRI), an Alaska Native regional corporation, for a 100-square-mile area adjacent to the state's Farewell survey area. DGGS is open to working cooperatively with other private, industry, and government partners to leverage limited funding. This is an example of the multi-stakeholder approach that could be utilized at the federal level under S. 883.

DGGS maintains close working relationships with the USGS and BLM as part of the state's SCM project. Specifically, DGGS and the USGS signed two memoranda of understanding (MOU) to support the effort. The first is a cooperative agreement to evaluate Alaska's Strategic & Critical Minerals potential, which includes:

1) statistically identifying SCM-related elements with high values in statewide geochemical data in order to identify areas with high SCM potential;
2) identifying areas in Alaska with geology favorable for finding SCM-related mineral deposits; and
3) re-analyzing historic USGS samples and obtaining modern geochemical analyses to facilitate mineral exploration for SCM; and
4) cooperatively publishing results of geologic studies.

The second MOU with the USGS is a cooperative agreement to enhance DGGS geophysical surveys and to contract additional geophysical surveys. The agreement formalizes a cooperative program for the USGS and DGGS to:

1) collaborate on applying new processing techniques to existing and any future DGGS airborne geophysical survey data;
2) collaborate on development of new interpretative products (appropriate to both agencies);
3) provide for the ability to share appropriate confidential geophysical data and information between the geophysical personnel of both agencies; and
4) contract for additional airborne geophysical surveys in Alaska.

DGGS also has an informal cooperative agreement with the BLM to document, archive, and make publically available (on DGGS's web site) all of the historic U.S. Bureau of Mines Strategic & Critical Minerals data and publications in Alaska. In addition to these agreements, USGS recently made a donation of their Anchorage geological samples catalog to the State to support the new State Geological Materials Center mentioned above.

This kind of partnership is a strong foundation for the cooperative work between the federal and state governments under S. 883 to stimulate mineral production on both state and federal lands across the country. We are particularly supportive of those provisions in S. 883 that would require enhanced coordination between federal government agencies such as BLM and USFS and state government agencies that have similar responsibilities for the development of mineral resources. We believe that renewed and revitalized efforts in this regard would avoid duplicative reviews, minimize paperwork and result in timelier processing of permit applications. The bill also recognizes and gives credence to the critical role played by the states with jurisdiction over the mining projects that will hopefully result from cooperative work.

VII. Summary

As domestic needs and supply constraints evolve, it is imperative that government is ready with the data and regulatory environment necessary to address the unique challenges and meet the nation's needs for domestic resources. For its part, the State of Alaska has invested in the assessment of its resources for many years. Historically, the federal government has made significant investments in these critical activities as well. However, the recent failure to prioritize the USGS minerals program has created a situation where these assessments are difficult or nearly impossible to implement at a national scale.

The American Mineral Security Act of 2015 is a much needed effort to address, and reverse, this situation. The bill addresses the supply chain of critical and strategic minerals that are important for national security, protection of the environment, and economic well-being of the nation. By focusing on the data requirements for resource assessments and examining the permitting process for inefficiencies that may unnecessarily hinder responsible development, this legislation will help remove some of the barriers to environmentally sound domestic production and provide the raw materials for new technologies that will provide a host of benefits to the nation.

As stated in the bill, the federal government cannot accomplish these tasks alone. It is critical that state and federal agencies work in close cooperation, leveraging their expertise and funding to maximize efficiency. Providing sufficient federal funding and matching grant opportunities will be a crucial part of this work going forward and will be needed for all sections of the bill, including the resource assessments.

Alaska's strategic minerals initiative can be instructive of how this effort might work on a national scale, and we will continue to be available to share lessons we have learned. While Alaska's work isn't finished yet, we have gathered the data needed to assess the mineral potential of more than 7.7 million acres of highly-prospective state land, addressed inefficiencies in our regulatory framework, coordinated permitting, and increased the domestic exploration and production of a host of mineral commodities, including strategic and critical minerals. The investment depicted in Figure 4 shows how successful these efforts have been. In Alaska, exploration expenditures – the front-end risk money that leads to the next discovery and potential development – have exceeded $100 million dollars for each of the last nine consecutive years, and exceeded $300 million per year for three of those years.

The experience in many of the IMCC member states, particularly in the West, has been similar and highlights the importance of a coordinated approach for mineral development and related environmental protection. The efforts and investment contemplated by the American Mineral Security Act of 2015 will help achieve similar results across our country on a national scale.

Thank you again for the opportunity to testify before this committee. I would be happy to answer any questions you may have.

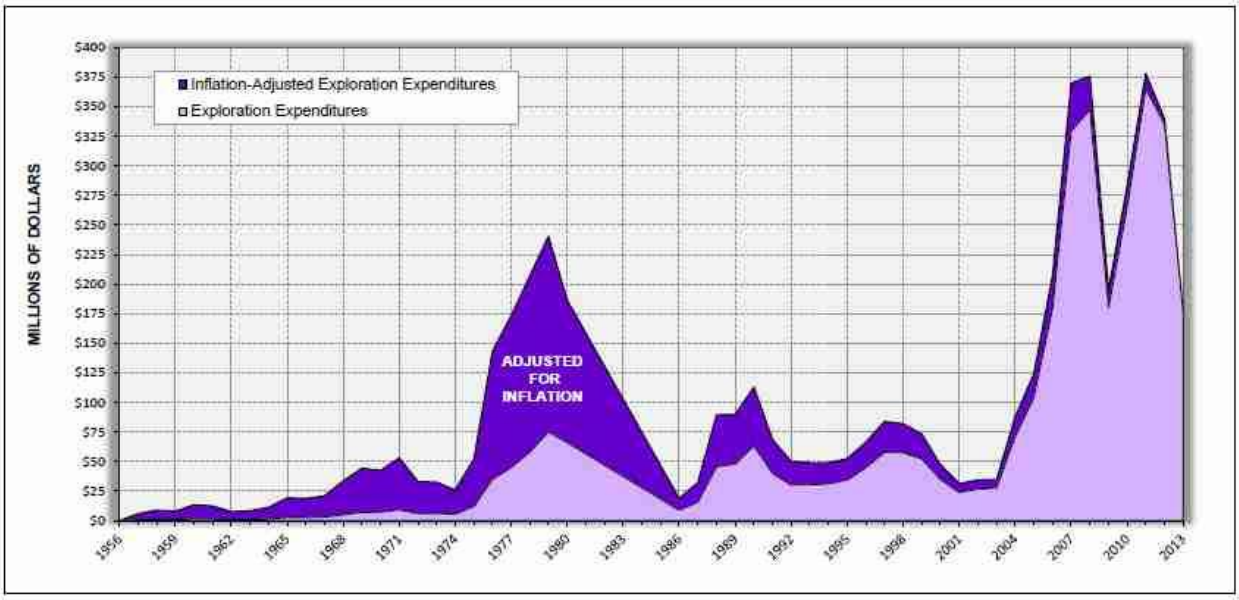
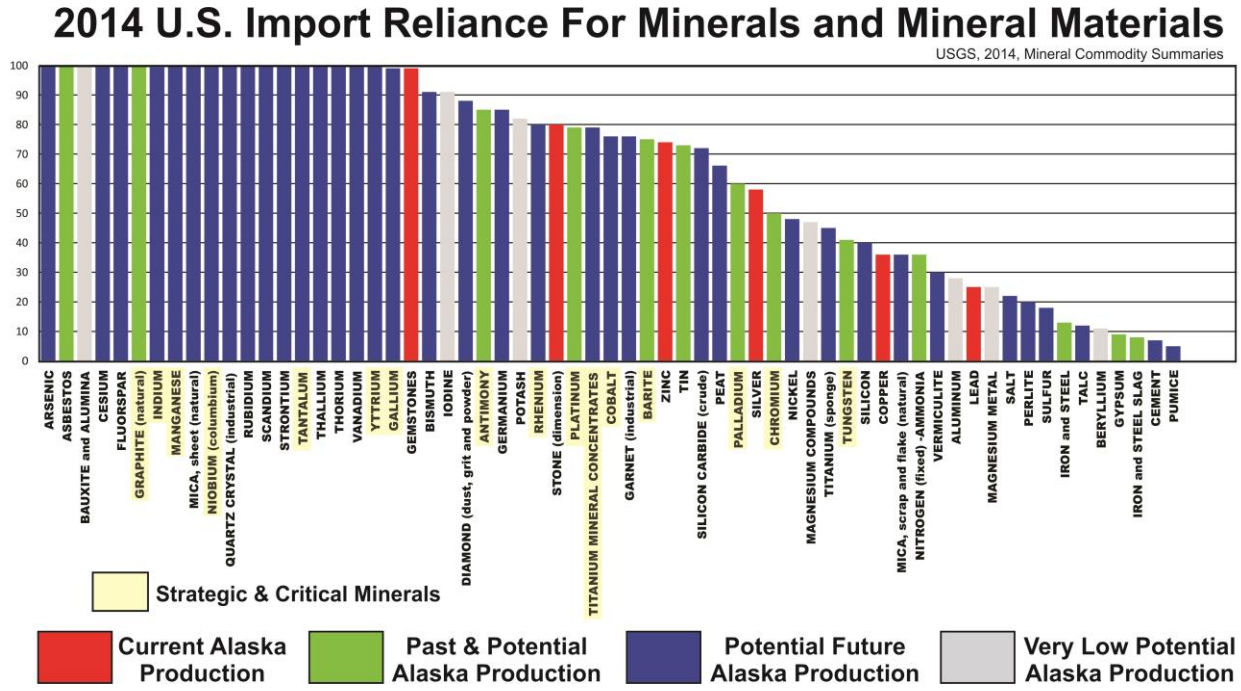


Figure 4: Alaska mineral exploration expenditures, 1956-2013. Curve in the background is inflation-adjusted for 2013 dollars. (Source: Alaska's Mineral Industry 2013, Special Report 69)

Appendix I



United States' import reliance on selected minerals (Source: USGS Mineral Commodity Summaries, 2015). Modified to show Strategic and critical minerals (highlighted in yellow), and Alaska's current (red), past and potential (green), and potential future production (blue)

Appendix II

Products to be published from the State of Alaska Strategic and Critical Minerals Assessment Project include:

- A statewide evaluation by element or element group of known SCM resource areas, summarizing ore deposit models and resource potential for use in strategic assessments and planning.
- District-scale geologic maps, geologic reports, geophysical surveys, and geochemical data from our investigations made digitally available to aid mineral exploration.

Specific new studies DGGS conducts for any commodity will augment currently available information. Data we envision providing for investigated areas, either from existing or newly acquired data, includes:

- Draped airborne magnetic, electromagnetic, and radiometric (U, K, Th) surveys.
- Bedrock and surficial geological mapping at a scale of 1:63,360 (1 inch on the map=1 mile on the earth's surface).
- Geochemical analyses from stream sediment, pan concentrate, and mineralized rock samples to characterize metal distribution, as well as age dates and whole-rock and trace-element analyses to classify and characterize host rocks.

Appendix III
Publications and presentations resulting from the State of Alaska's Strategic and Critical Minerals Assessment project:

18 Presentations and Associated Abstracts

Swenson, R., 2011, Alaska Strategic & Critical Minerals Potential (presentation): Strategic & Critical Minerals Summit, Fairbanks, Alaska, September 30, 2011.

Swenson, R., 2012, Alaska Strategic & Critical Minerals Potential and Assessment (presentation); Strategic & Critical Minerals Summit; Fairbanks, Alaska, November 30, 2012.

Adleman, J.N., and Bluemink, Elizabeth, 2013, Second annual Alaska strategic and critical minerals summit: Alaska Division of Geological & Geophysical Surveys Miscellaneous Publication 151, 17 p. doi:10.14509/25095

Szumigala, D.J., 2010, REE Assessment (presentation); Native Corporations of Alaska Conference, Girdwood, Alaska.

Freeman, L.K., Newberry, R.J., Griesel, G.A., Szumigala, D.J., Elliott, B.A., Lough, T.A., Werdon, M.B., and Burns, L.E., 2011, Geologic Mapping and Mineral Investigations in the Moran Geophysical Survey Area, West-Central Alaska [abs.], *in* From Prospect to Feasibility, Alaska Miners Association Annual Convention, Nov. 7–13, 2011, Anchorage, Alaska, Proceedings: Anchorage, Alaska, Alaska Miners Association, p. 14–16.

Werdon, M.B., Burns, L.E., Blessington, M.J., and Freeman, L.K., 2012, DGGS Geophysical Surveys and Strategic and Critical Minerals Studies in Alaska, [abs.], in The Business of Mining, Alaska Miners Association Annual Convention, Nov. 5–11, 2012, Anchorage, Alaska, Proceedings: Anchorage, Alaska, Alaska Miners Association, p. 14–15.

Freeman, L.K., Newberry, R.J., Bachman, E.N., Blessington, M.J., Tuzzolino, A.L., and Werdon, M.B., 2012, Geologic Resource Assessment of Strategic and Critical Minerals, Ray Mountains Area, Central Alaska, [abs.], *in* The Business of Mining, Alaska Miners Association Annual Convention, Nov. 5–11, 2012, Anchorage, Alaska, Proceedings: Anchorage, Alaska, Alaska Miners Association, p. 16–18.

Combellick, Rod, Werdon, M.B., Freeman, L.K., Burns, L.E., and Swenson, Bob, 2013, Alaska Strategic & Critical Minerals Assessment project, [abs.], *in* Conference Juneau 2013, Alaska Miners Association Biennial Conference, Feb. 12–15, 2013, Juneau, Alaska, Proceedings: Juneau, Alaska, Alaska Miners Association, p. 8–10.

Twelker, E., and others, 2013, The Alaska critical minerals co-op project [abs.], in Mining in Alaska: Built – Keep It – Grow It, Alaska Miners Association Annual Convention, Nov. 4–13, 2013, Anchorage, Alaska, Proceedings: Anchorage, Alaska, Alaska Miners Association, p. 19–20.

Hayes, T.S., Werdon, M.B., Mauk, J.L., Schmidt, J.M., Jones III, J.V., Todd, Erin, Wang, Bronwen, Granitto, Matthew, Lee, G.K., Shew, N.B., and Labay, K.A., 2013, The Alaska critical minerals co-op project [abs.], in Mining in Alaska: Built – Keep It – Grow It, Alaska Miners Association Annual Convention, Nov. 4–13, 2013, Anchorage, Alaska, Proceedings: Anchorage, Alaska, Alaska Miners Association, p. 19–20.

Masterman, S., 2013, UAF talk on Strategic and Critical Minerals work by the State of Alaska.

Twelker, Evan, and Burns, L.E., 2014, New geochemical and geophysical data from the western Wrangellia minerals assessment area (presentation): Alaska Miners Association 24th Biennial Mining Conference, Fairbanks, Alaska April 7-13, 2014: Alaska Division of Geological & Geophysical Surveys, 34 p.

Tuzzolino, A.L., Newberry, R.J., and Freeman, L.K., 2014, The No Name Pluton: A potential rare-earth element (REE) resource in the Ruby Batholith, Alaska (presentation): Alaska Miners

Association, 24th Biennial Mining Conference, Fairbanks, Alaska, April 7-13, 2014: Alaska Division of Geological & Geophysical Surveys, 30 p.
Twelker, Evan, Wypych, A., Sicard, K.R., Newberry, R.J., Freeman, L.K., Reioux, D.A., and Lande, L., 2014, Preliminary results from 2014 geologic mapping in the Talkeetna Mountains, Alaska (abs.): Alaska Miners Association Annual Conference, November 3-7, 2014: Anchorage, Alaska, p. 33–34.
Karl, S.M., Jones, J.V., Labay, K.A., Shew, N.B., Granitto, M., Hayes, T.S., Mauk, J.L., Schmidt, J.M., Todd, E., Wang, B., Werdon, M.B., and Yager, D.B., 2014, GIS-based identification of areas that have mineral potential in the BLM Central Yukon Planning area, Alaska (poster): Alaska Miners Association Annual Conference, November 3-7, 2014: Anchorage, Alaska, 1 sheet.
Karl, S.M., Jones, J.V., Labay, K.A., Shew, N.B., Granitto, M., Hayes, T.S., Mauk, J.L., Schmidt, J.M., Todd, E., Wang, B., Werdon, M.B., and Yager, D.B., 2014, GIS-based identification of areas that have mineral potential in the BLM Central Yukon Planning area, Alaska (abstract): Alaska Miners Association Annual Conference, November 3-7, 2014: Anchorage, Alaska, 1 sheet.
Emond, A.E., Burns, L.E., and Graham, G.E., 2014, DGGS Airborne Geophysical data, Applications, Insights, and Updates: Fall 2014 (talk, abs.): Alaska Miners Association Annual Conference, November 3-7, 2014: Anchorage, Alaska.
Hayes, T.S., Jones, III, J.V., Karl, S.M., Labay, K.A., Schmidt, J.M., Shew, N.B., Todd, E., Wang, B., Granitto, M., Mauk, J.L., Yager, D.B., and Werdon, M.B., 2015, Strategic and critical element potential and certainty in Alaska: Quantitative evaluations from a new data-driven, geographic information system-based method: SGA meeting

9 Geologic Publications

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